



THE UNIVERSITY OF WOLLONGONG

Research Report
1989-90

Front cover

The Great Nebula in Orion

This great cloud of luminous gas is excited by thousands of young stars. It is one of the major sites of star formation being studied by astronomers in the Physics Department. This false colour photograph was obtained using the Department's fully computer controlled, 16-inch DFM telescope. A PC/AT and PCVISION plus digitiser were used to process the image

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The University of Wollongong
Northfields Avenue
Wollongong NSW

Postal address: PO Box 1144, Wollongong 2500

Telephone: (042) 27 0555

Telex: 29022

Facsimile: (042) 27 0477

Cable: UNIFWOL

All enquiries related to University research
should be addressed to the Deputy Vice-Chancellor



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Research Report

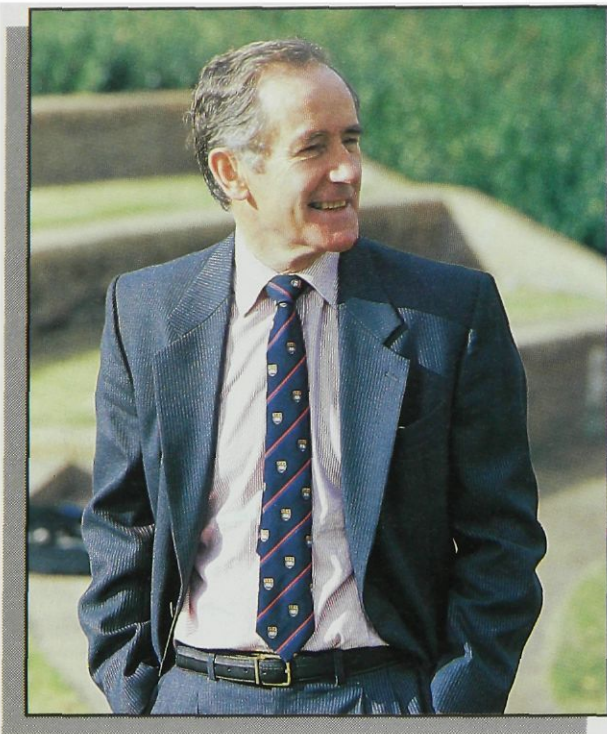
1989–1990

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It is now 18 months since the University implemented the first stage of its Research Management Strategy – a move designed to take advantage of the University’s full research potential. The strategy facilitates interdisciplinary research, encourages postgraduate training and generates external support. The emphasis throughout has been on the research activities of the academic staff and on establishing an enhanced environment for postgraduate student research, through the formation

of over 30 Research Programs. Each involves at least six academic staff grouped as a team. The second stage of the Research Management Strategy, now being implemented, will bring the postgraduate offerings of the University into a truly coherent format.



In the previous *Research Report*, the co-ordinators of the then recently established Research Programs outlined their plans and expectations for the future. In this Report, they have summarised current research activity and have signalled the directions in which they will be heading in the future. Other researchers, who are not members of Programs, have outlined their current research projects. There is much more. It has not, for obvious reasons, been possible in a journal of this size to cover the entire range of research activity.

While writing I seize this opportunity to put on record the University’s appreciation of the Deputy Vice-Chancellor Professor Ian Chubb who leaves us at the end of August to take up an appointment as Chairman of the Higher Education

Council of the National Board of Employment, Education and Training. His leadership in this important area of the University’s activities through his chairmanship of the Board of Research and Postgraduate Studies has established a very solid research pattern for the University.

The University of course welcomes enquiries and visits from people interested in finding out more about our research activity. I invite you – urge you – to contact our researchers by using the telephone numbers given below the program and project headings.

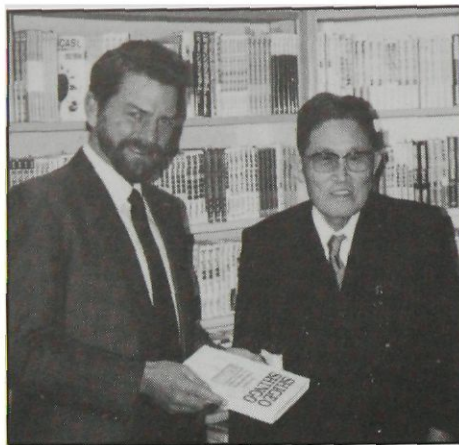
Ken McKinnon

Vice-Chancellor and Principal

August 1990



The Advanced Manufacturing Technology (AMT) Research Program continues to make significant contributions both to basic research in manufacturing and to R & D specifically for Australian manufacturing industry. Thirteen academic and five associate members, mainly from the Department of Mechanical Engineering and the Centre for Advanced Manufacturing and Industrial Automation (CAMIA), contribute directly to the program, together with 11 postgraduate and 20 final-year undergraduate thesis students. A total of 37 reports, conference papers and journal papers originated from the group in 1989, demonstrating that the University of Wollongong is



Discussions with world-famous Shigeo Shingo, guru of modern manufacturing

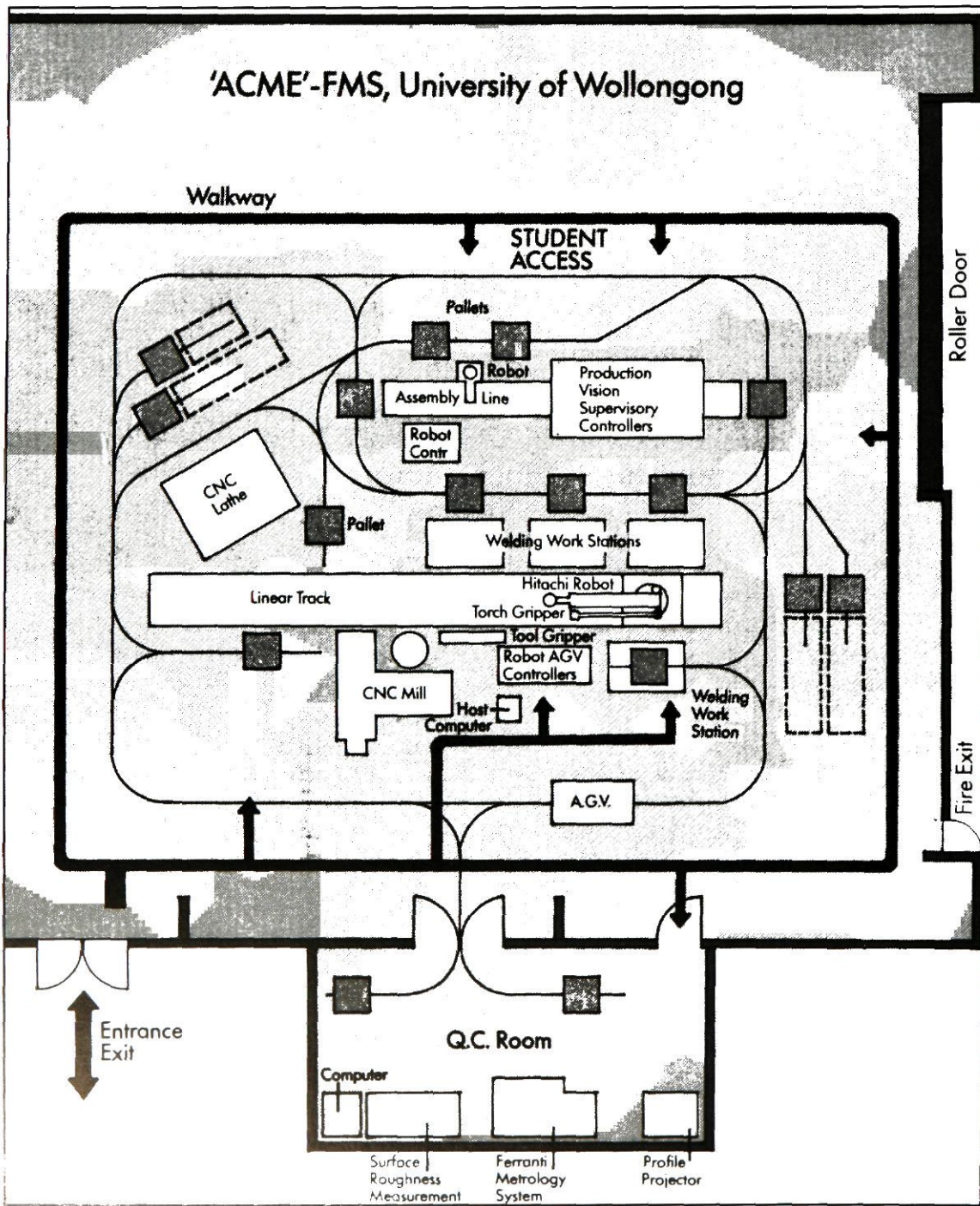
increasingly making its mark on the Australian manufacturing research scene. This is also acknowledged by the fact that this Department (effectively the members of the AMT Research Group) hosted this year's fifth IEAust International Conference on Manufacturing Engineering, ICME-90, in July, by which time Phase I of the computer-integrated 'ACME' Flexible Manufacturing System (FMS: jointly operated by AES/AEAC, CAMIA, Mechanical and Electrical & Computer Engineering) had become operational, as a major Australian FMS research and demonstration facility. Its final layout is shown in the drawing and picture below.

The AMT Research Program is broadly divided into five streams:

- Advanced manufacturing processes, machine tools and tooling
- Intelligent manufacturing systems
- Quality monitoring systems and technologies
- CAD/CAM and design for manufacture
- Integrated manufacturing planning and control systems.

While concentrating on technological aspects, 'people issues' associated with manufacturing are also being considered. The following summaries indicate the wide range of interests involved and some of the results recently achieved by this group:

- HSLA steel machinability: Because of their significantly increased strength, excellent formability, weldability and light weight, 'high-strength low-alloy' steels are used extensively in ships, pressure vessels, pipelines (oil and gas) and off-shore platforms, and especially in the transport industry. The effect of cutting parameters on the machinability of HSLA steels is being studied using multi-coated carbides, ceramics and cubic boron nitride inserts. Progress has been made in determining the conditions under which the various types of chip formation and chip breaking will occur. (Drs A Basu, T Chandra, I S Jawahir, R Rudziejewski).

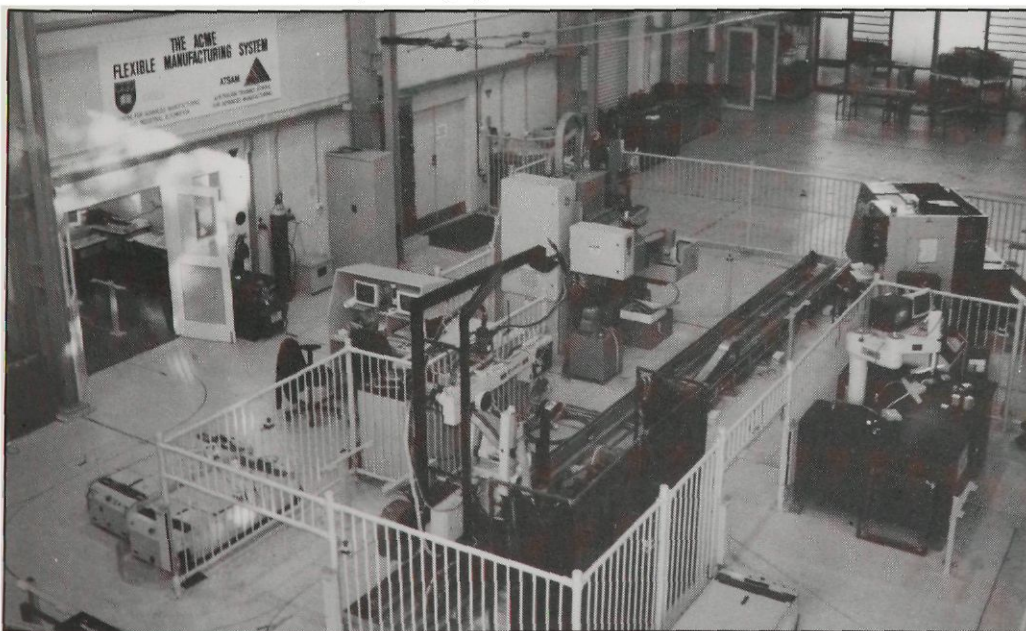




The high-performance on-line monitoring system into which diagnosis capabilities based on AI (artificial intelligence) principles are being incorporated

- Flexible assembly systems: Research work undertaken in the area of robotic assembly concentrates on handling various components with peculiar geometric configurations, which also necessitate flexible robot grippers. Work on existing vision system capabilities to achieve 3-D image recognition is proceeding using an autofocus lens attached to a vision system. Also, a

The ACME Flexible Manufacturing System



... and green tea with Professor Kaoru Ishikawa, essentially the founder of 'Japanese TQC'

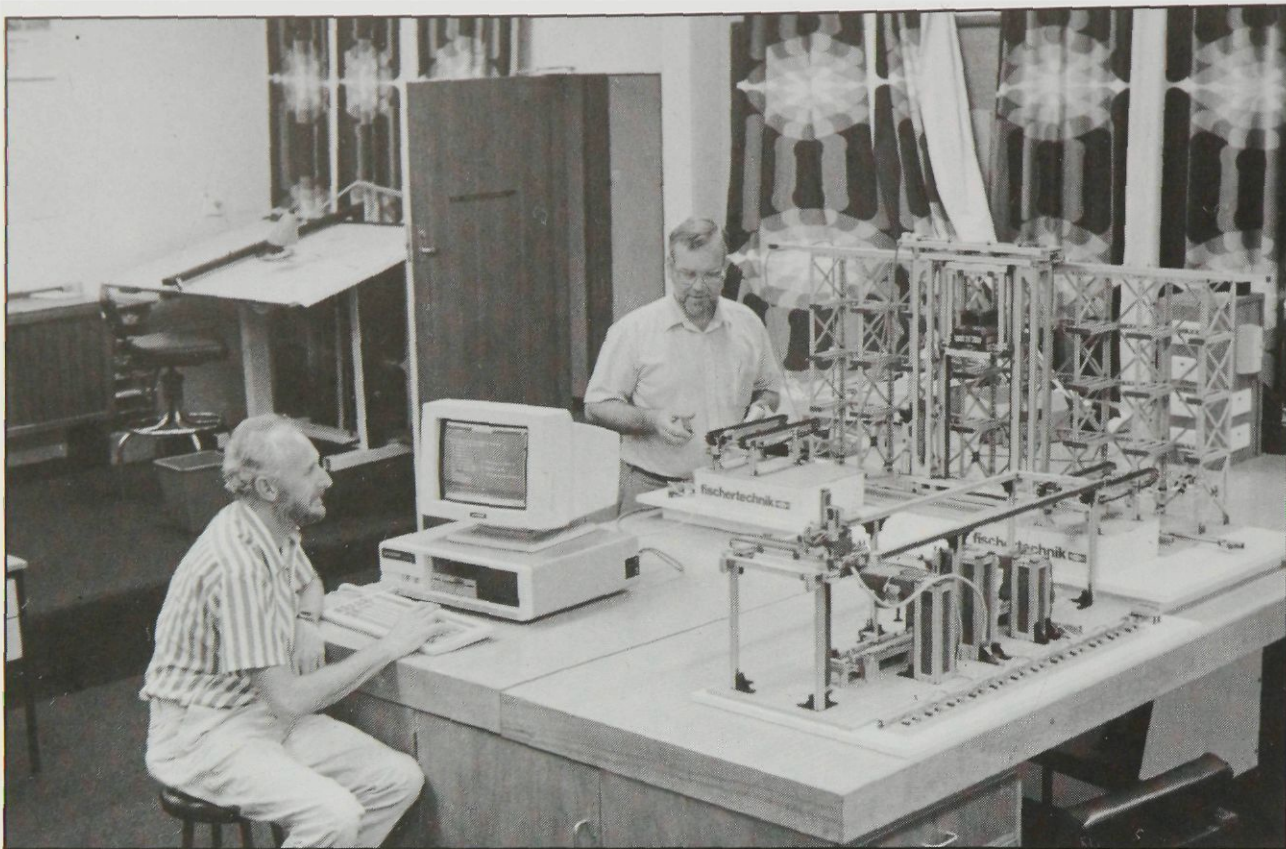


novel technique for joining plastics and composites using microwave energy is currently being developed, based on the self-bonding property of the thermo-plastic matrix and thus avoiding the need for any additional adhesive material to be introduced in the joint. The weldability of various materials when exposed to microwave energy has been assessed and results obtained have proved the viability of the technique. (Drs E Siores, R Rudziejewski, Associate Professor Paoloni).

- Monitoring, diagnosis and adaptive control of machining processes: Research has been centred on a multi-

sensor and multi-modelling strategy for on-line estimation of tool wear with high reliability. A high-performance on-line monitoring system has been developed into which diagnosis capabilities based on AI (Artificial Intelligence) principles are being incorporated. More effective algorithms suitable for adaptive cutting force control in turning operations are being developed, which should lead to better adaptive controllers. (Drs Y Yao, M Magdy, I S Jawahir).

- Friction and wear in heavy industry: In 1989 the design of a prototype pin-on-disc test rig was completed. A cooperative research project with BHP Steel SPPD is now being carried out, aimed at testing friction and wear of different materials, as well as further work on theoretical models thereof, and including construction and commissioning of the test rig, investigation of friction and wear in a steelworks environment and the determination of optimum anti-wear materials and lubricants. (Dr A K Tieu).
- Automatic ultrasonic inspection: The automation of different inspection tasks is an increasingly important requirement in modern manufacturing. A new project has been commenced to automate the ultrasonic inspection task utilising a robotic immersion scanner and data acquisition algorithms to extract information concerning the integrity of discrete components. (Dr E Siores).
- New product development: Research in this area continues with investigations



The AMT Research Program's new model 'unnamed' factory

into new automobile air conditioning systems and the use of ozone as an industrial steriliser, with a view to their manufacture. For the former the hardware has now been assembled and calibration of the data acquisition equipment is in progress, with close contacts with the automobile air conditioning heat exchanger industry continuing. In the ozone disinfection project, experiments are progressing to improve the efficiency of the jet pump in terms of the ozone-containing air to water volumetric flow rates. An acceptable nozzle configuration has been identified and will be developed further. A semi-empirical mathematical model has been developed, and analysis has shown that the aqueous ozone concentration generated by certain system configurations has the potential for an effective disinfectant. (Drs P Cooper, G J Montagner, W K Soh).

- Robotic gear restoring via CAD/CAM: A project has been started aimed at reduction in the high cost of gear overhaul and establishment of a technique for repairing rather than replacing gears. Automated robotic welding facilities are used to control the restoring process of the critical tooth dimensions, thus extending gear life. The process of 'remanufacturing' worn

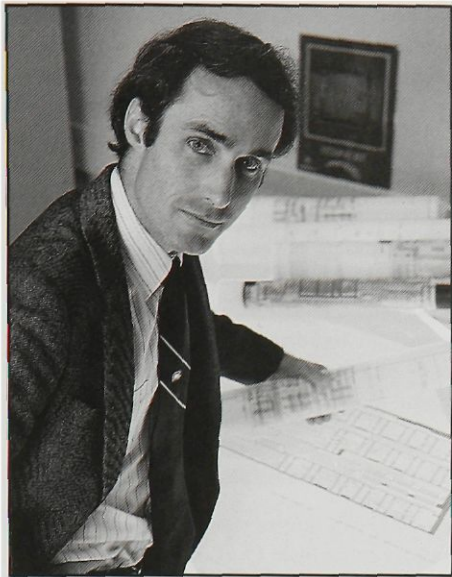
gears is computer-controlled since great dexterity is required to achieve the accuracies originally specified. (Assoc Prof R T Wheway, Dr E Siores).

- FMS simulation: As a concurrent activity to the physical development of the 'ACME' FMS, a complete computer simulation is proceeding for this system and its elements. The four levels used to study such systems are: 'pure' computer simulation, animated computer displays, physical scale (bench top) model, and the real life system. Each level has its own advantages and disadvantages, but must include all relevant factors. As a specific example, the simulation of the welding automation 'island' existing within the FMS and the spatial interaction of its facilities is being studied by animation, by modelling the way in which the robot arm moves in conjunction with the welding rotary table, with the graphics system creating a 3-D representation from geometric data. (Drs L Y Shue and E Siores and Mr. N Laszlo).
- 'Japanese' manufacturing and quality techniques: Research continues into the penetration into Australia of modern manufacturing concepts and techniques, essentially developed in Japan over the past 30 to 40 years, including for example TQM (Total Quality Control),

Kaizen (Continuous Improvement), JIT (Just-in-Time), TPM (Total Productive Maintenance), Poka-Yoke (Foolproof Devices), SMED (Single-Minute Exchange of Die). First results point to a serious lack of education and training in these techniques among Australian manufacturers. (Prof G Arndt). (Figure 4)

The future of the AMT Research Program, which may essentially be regarded as the 'research arm' of CAMIA, looks bright. Industrial cooperation and funding are an extremely vital ingredient for maintaining both the practical relevance of the research and the financial viability of the program. Suggestions from industry for new projects – both on the technical and the human side of manufacturing – are always welcome.

Among other developments, industrial ergonomics and industrial engineering laboratory study and research rigs are being developed; a new (National) Research Centre for 'Jet, Power Beam and Electromagnetic Manufacturing' (JBE) (including for example plasma-, electron- and laser-beam materials processing) has been proposed jointly with BHP and CSIRO; and national as well as international links and co-operation agreements have been developed. Such activities and arrangements will help to ensure a solid research base for intelligent manufacturing in Australia in the future.



Professor Chris Cook

In 1989 the program concentrated successfully on providing some basic facilities for researchers working in three interrelated and complementary strands. These strands were Robotics (including sensor fusion, autonomous mobile robots, robot kinematics, dynamics and control, force sensing and sensor development); Power Systems (including actuators and control, power system stability and machine and drive development); and Parallel Processing (transputers).

Several publications resulted from the efforts of program members, with several more under preparation. Final-year thesis students have been working on a number of projects within the program. There has been a significant contribution by post-graduate students to the program, with a number of new PhD enrolments at the beginning of 1990. Significant external support was received and substantial efforts made to attract future funding for program activities.

The quantity of the originally proposed activities was reduced at the beginning of the year in line with the available funding so that a sufficient concentration of resources could be achieved to provide the basis of an infrastructure as strong as possible for the program's projects. Two major purchases were made to provide strong general-purpose support for all the program's projects. These were a real-time computer development system and a mobile robot.

A Labmate mobile robot was ordered in March. It arrived in September and it has

now been successfully commissioned. This provides a basic mobile platform to support projects in sensors, sensor fusion, autonomous navigation and some control and actuation projects. Considerable enhancement of this basic platform during 1990 will be required as funds allow. A number of thesis projects, involving joint supervisory arrangements between Computer Science and Electrical and Computer Engineering, to enhance the research capability of this machine have been completed. Such development is also assisted by the VME system, which was purchased to provide a general real-time computer development environment intended to allow all researchers to develop powerful single-board computers to enhance their particular research projects. This system has been commissioned, hardware designs developed and built and substantial software written. The systems built to date support work in various robotic control, mobile robot, and power systems projects.

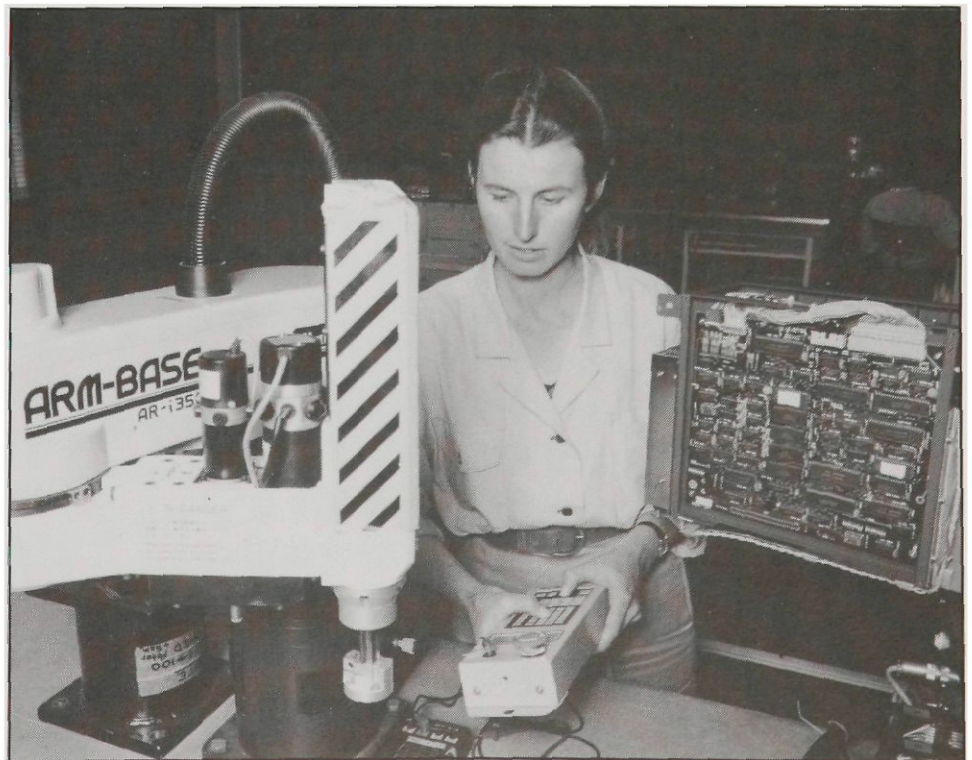
The program was granted auxiliary funding of \$2,500 towards work in transputers. This was augmented to over \$4,000 to enable the purchase of a transputer board which was commissioned in October. This board will allow up to ten transputers to be implemented as funds allow and will provide a general-purpose environment for development and verification of parallel processing

research ideas. Applications investigated this year included robot kinematic control.

Power systems, actuator and control work centred on continuing work in high-performance electric drives and on the stability of power systems. Two motors were built to test the theory. The VME system was used to assist in the development of a general-purpose testbed.

Several new members joined the program in 1989-90, including Drs Y Yao and F Siores (Mechanical Engineering), Drs F Naghdy and G Naghdy and Associate Professor V J Gosbell (Electrical and Computer Engineering). The program now consists of 12 academic staff members from three different departments and has additional strength in robotics (allowing force control to be addressed), and in parallel computing. Parallel computing can potentially increase the computing power and performance available to researchers in all three major program strands provided the transputer hardware, purchased in 1989 with the assistance of a small additional grant in June, can be enhanced in 1990. This expertise in parallel processing, combined with specific efforts in 1989 to develop an understanding of applications of neural networks, may also allow the program to benefit in 1990 from special research funding available in 'Cognitive Science'.

A PhD student Bronwyn Evans at work on the development of a robotic system





Associate Professor Tony Hulbert (left) captures a tamar wallaby in the Campus East animal yards, as part of a research project on marsupial development. On the right is Dr Rob Whelan

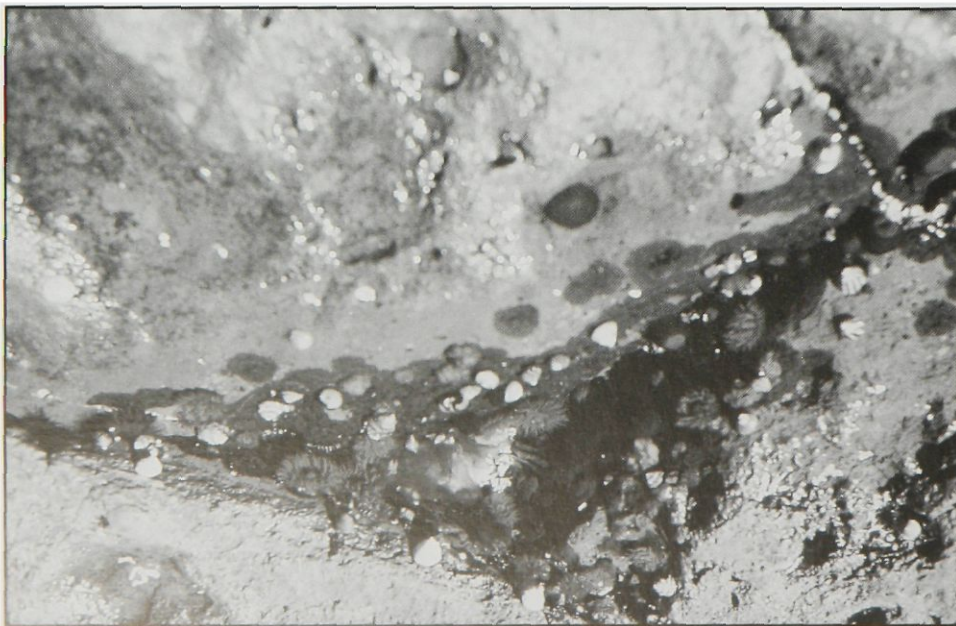
members are Dr Andy Davis and Dr Roger Coles. Andy Davis is a marine ecologist whose research interests include the ecological and chemical processes which influence settlement of marine organisms. Roger Coles is a neuroethologist whose research involves studies on the acoustic behaviour, including echolocation, of native bats and birds.

The program attracted several international visitors during the year: Prof Lee Johnson (marine biology, South Dakota); Dr Craig Young (marine biology, Harbour Branch Oceanographic Institute, Florida); Prof Brian McNab (physiological ecology, University of Florida); Dr Jack Putz (plant ecology, University of Florida); and Dr Martin Brand (biochemistry, Cambridge). The program

The Australian Flora and Fauna Research Program had an active year in 1989-90. Membership of the program includes seven staff members of the University (Geography and Biology Departments) and an Associate in industry (Dr Roslyn Muston). Two new

biology, South Dakota); Dr Craig Young (marine biology, Harbour Branch Oceanographic Institute, Florida); Prof Brian McNab (physiological ecology, University of Florida); Dr Jack Putz (plant ecology, University of Florida); and Dr Martin Brand (biochemistry, Cambridge). The program

The waratah anemone, Actinia tenebrosa, an anemone commonly found in rock pools in the Illawarra, has been the subject of research in ecological genetics by Dr David Ayre



also hosted the annual conferences of the Ecological Society of Australia and the Australasian Pollination Ecologists' Society.

Development of facilities for field-based research continued in 1989-90 with the purchase of a four-wheel-drive vehicle; the construction of animal yards, sea-water aquaria and glass-houses at Campus East; and the Janet Cosh bequest to the Biology Department, which includes a large herbarium and an extensive collection of books on plant ecology, taxonomy and natural history.

Postgraduate Research

Two PhD candidates started in 1990. Patrice Couture came from Quebec to work with Associate Professor Hulbert on metabolism and body size in vertebrates, and Siegfried Krauss, from the Royal Botanic Gardens, Sydney, came to work with Drs Ayre and Whelan on the population biology and taxonomy of a local *Persoonia* (geebung). There are 21 higher-degree and honours students in the program.

Additional opportunities for research students have been provided by the involvement of Dr Roslyn Muston. Some students have helped with ecological consulting conducted by Muston & Associates, and research grants for studies on rainforest disturbance and the endangered Yallah orchid have come from this collaboration.

Reports of projects

The following reports outline developments in three of the projects in the program.

Conservation Biology of the Proteaceae

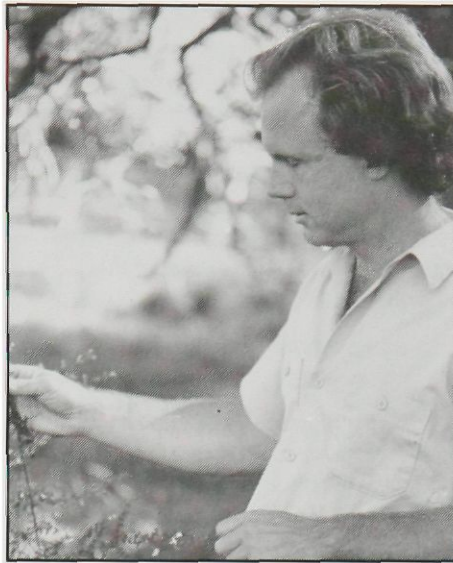
This year has seen a shift in emphasis of the studies of pollination biology by David Ayre, Rob Whelan and various research students. Using biochemical, behavioural and ecological studies, the mating systems of various native plants in the family *Proteaceae* (banksias, grevilleas and relatives) have been determined. In the process, several surprising features of their reproductive biology were discovered: the importance of nocturnal mammals as pollinators of what were thought to be bird-pollinated species and the ability of plants to mature seeds from cross-pollinations (flowers pollinated by other plants) in favour of selfing, even though most flowers must receive the latter. Management strategies aimed at conserving these species can be

formulated only after minimum viable population size and composition and extent of the plant communities needed to support the pollinators have been addressed. This is becoming the focus of the research group, now including Toni O'Neill, through studies of the threatened *Grevillea barklyana* in the Jervis Bay region and several *Banksia* species in the Water Board catchments.

Marine ecology

Current research by David Ayre and Andy Davis has the aim of determining the patterns and mechanisms of reproduction and dispersal of marine invertebrates. During the past year, surveys of genetic variation within and among populations of the intertidal sea anemone, *Actinia tenebrosa*, have revealed that the eastern population is split into genetically distinct northern and southern groups of local populations. Each local population is made up of a few clonal genotypes, which seem likely to be the survivors of past episodes of colonisation by sexually produced larvae.

To understand the evolutionary significance of widespread dispersal of larvae, reciprocal transplantation experiments are being set



Dr Jack Putz, from the University of Florida, examines natural tree regeneration in abandoned agricultural land – a project being undertaken by Dr Whelan and Dr Ros Muston with Water Board support

up. These will reveal whether existing clones are highly adapted to their specific habitat patch or are the chance survivors of

rare colonisation events. This work is being extended to include investigations of organisms such as ascidians and starfish, which appear to have life-histories which differ from the anemones, in that larvae are produced sexually but have restricted dispersal.

Development of the Tammar Wallaby

The Australian fauna include the marsupials, with their distinctive developmental biology. One project in this Research Program involves studies of the physiological development of the tammar wallaby, *Macropus eugenii*. This small wallaby is no longer common on the Australian mainland but various breeding colonies have been set up around Australia, one at the University of Wollongong. These mammals give birth to very immature young, and most differentiation and development of organ systems happen during pouch life, when the young are supported exclusively by lactation. This feature of the tammar life cycle provides the ideal system for the research project, by permitting study of very early developmental stages without invasive surgery.

Research on the ecology and genetics of marine invertebrates forms an important part of this Research Program, with projects being conducted by Dr David Ayre and Dr Andy Davis



ELECTRONIC AND VIBRATIONAL PROPERTIES OF SEMICONDUCTORS*

Co-ordinator: Professor P Fisher, tel. 27 0556



Professor Peter Fisher

In the *University of Wollongong Research Report, 1988-89* (pp 16 - 19), a general description was given of the physical processes involved and experimental techniques being used in the semiconductor program being carried out in the Department of Physics. The present report describes some of the results which have recently been obtained as part of that program.

(i) *Fano resonances due to singly ionised zinc in germanium*

The main optical absorption ($p_{3/2}$ spectra) due to acceptors in semiconductors results from direct transitions between bound hole states of the impurity. The sharp spectral features are broadened by the coupling of the impurity states to the thermal vibrations of the host crystal. A number of mechanisms have been identified which explain the various types of broadenings which have been observed, the common one being the emission and absorption of those lattice waves whose properties are essentially the same as those of sound waves when the latter propagate through the host. This mechanism becomes dominant as the temperature of the solid is increased and ultimately smears the features beyond recognition. However, other types of lattice waves can be excited in the crystal, namely those in which adjacent atoms move in opposite directions; such types of vibrations are called 'optical modes'. Because of the nature of crystalline germanium, these cannot be induced by electromagnetic radiation unless defects are present. In this case, such vibrations

can be stimulated or emitted around the defect site. It has been observed for bound holes in silicon that when the energy associated with the incident electromagnetic wave (the photon energy) is close to the sum of the energies of an optical mode and one of the $p_{3/2}$ spectral lines, an interesting spectral feature known as a Fano resonance results, provided the photon energy is greater than that required to ionise the impurity. In the past year, we have observed such features for the first time for acceptors in germanium. Results are shown in fig 1. This is the optical absorption spectrum of singly ionised zinc (Zn^-) in germanium where the sample is held at a temperature near that of liquid helium (- 269 degrees Celsius). The observations were made using the Faculty of Science state-of-the-art Bomem DA3.26 Fourier transform infrared spectrometer. The spectral lines labelled A, B, C, D, E and G are part of the $p_{3/2}$ -series while those designated C^F , D^F and G^F are the Fano counterparts of the C, D and G transitions.

The inset shows the Fano series on an enlarged vertical scale. As indicated, the D line and its Fano companion are separated by the energy of the optical phonon involved, which in this case is 305.1 cm^{-1} . The other two features C^F and G^F are also separated from their parent lines by the same energy. The general shape of the Fano resonances is described by the relation $F(e,q) = (q+e)^2 / (1+e^2)$, where e is a reduced energy variable and q is a number, either positive or negative, which depends mainly on the nature of the bound hole transition.

From the data of fig 1, q and other parameters involved in the resonance have been deduced. An interesting characteristic of the process giving rise to the Fano resonances is the enhancement of transitions such as the G line, which are very weak under direct excitation but significant in the compound process. The behaviour of the Fano series under applied uniaxial compressive force is currently under investigation.

(ii) *High Resolution and Variable Temperature Studies of the $p_{3/2}$ Spectra of Zinc Impurities in Germanium*

The $p_{3/2}$ absorption spectrum of Zn^- in germanium has been re-examined under high resolution. A variety of samples with a range of impurity concentrations

Figure 1

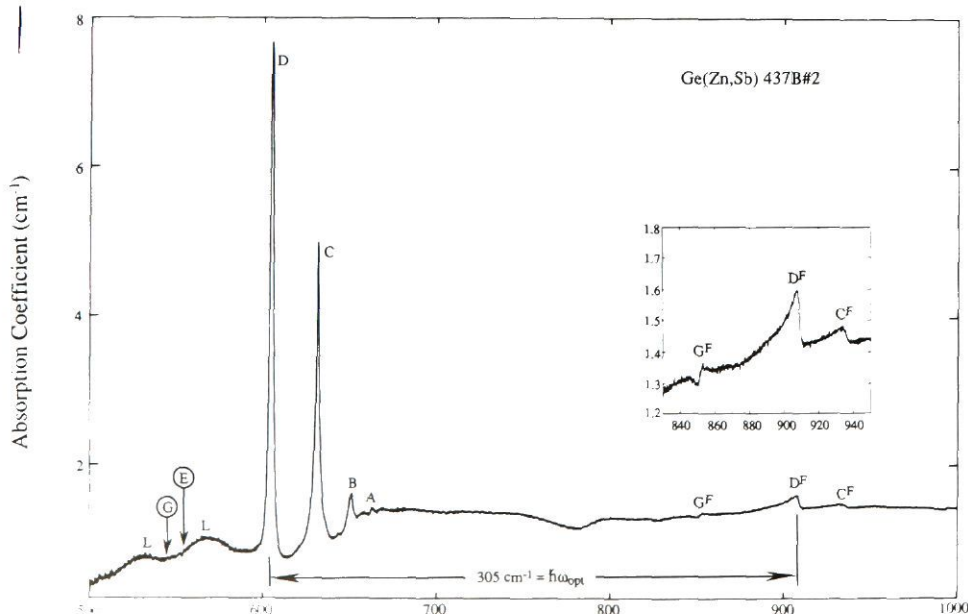


Figure 2

have been studied at and between liquid nitrogen and liquid helium temperatures. Some of the samples are deliberately compensated with antimony to provide a significant concentration of Zn at the lowest temperatures while others are not intentionally double-doped (Zn⁰ samples). A number of characteristics have been observed for the first time. The new results include observation of additional A lines and some of the I lines (see fig 2; compare with fig 1) and thermal enhancement of the Zn⁺ concentration, presumably from the indigenous uncompensated zinc population. Also the Zn⁰ samples have exhibited strong thermally-generated Zn⁺ spectra at temperatures between 5 and 77 K. The richness of the p_{3/2} Lyman series now observed for Zn⁺ permits a detailed comparison to be made with the recent theoretical results for this singly ionised double acceptor; the agreement is found to be extremely good.

(iii) *Piezospectroscopy of Bound Hole Transitions to Coulomb-Related Landau States in Germanium*

Since the original observations of the spectra due to transitions from neutral acceptor states in germanium to Coulomb-related Landau levels, very little further work on this had been done until recently. The present program involves a systematic study of this phenomenon including the effects on these transitions of a uniaxial compressive force, *F*, using polarised radiation and for different crystallographic orientations. These observations have been carried out on boron and gallium doped germanium with the magnetic field *B* along either a <111> or a <100> direction.

Without stress, the observed bound hole absorption spectra above the zero field ionisation edge consist of two series of well-defined 'Landau oscillations' or 'lines' and some, as yet unidentified, additional weaker features (see fig 3, where *B* || <111>). The two series of 'lines' are associated with the light hole Landau levels of the valence band. In the absence of stress, the 'Landau lines' of the lower energy series are more

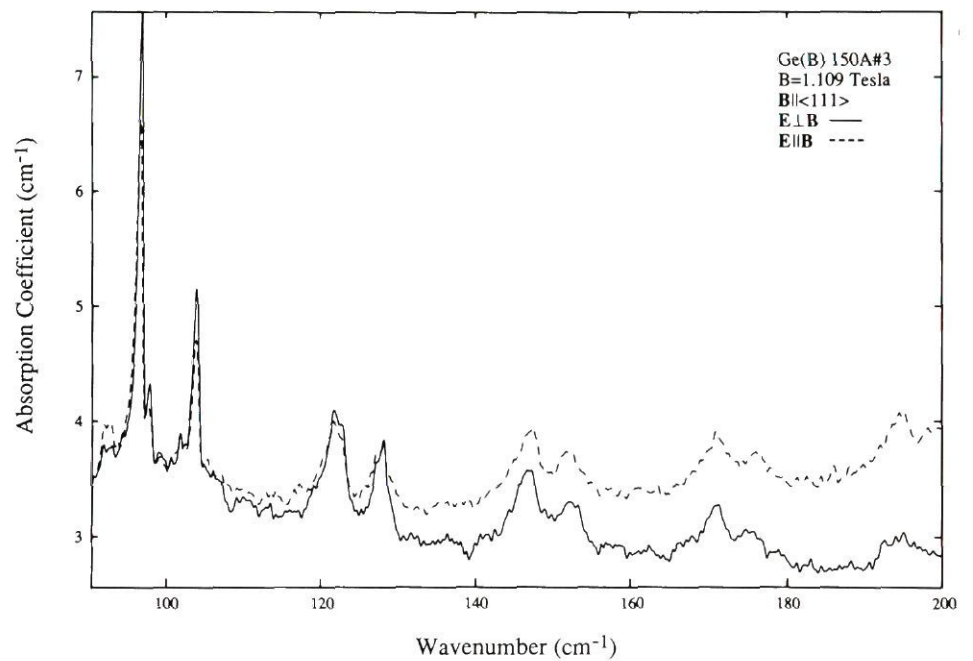
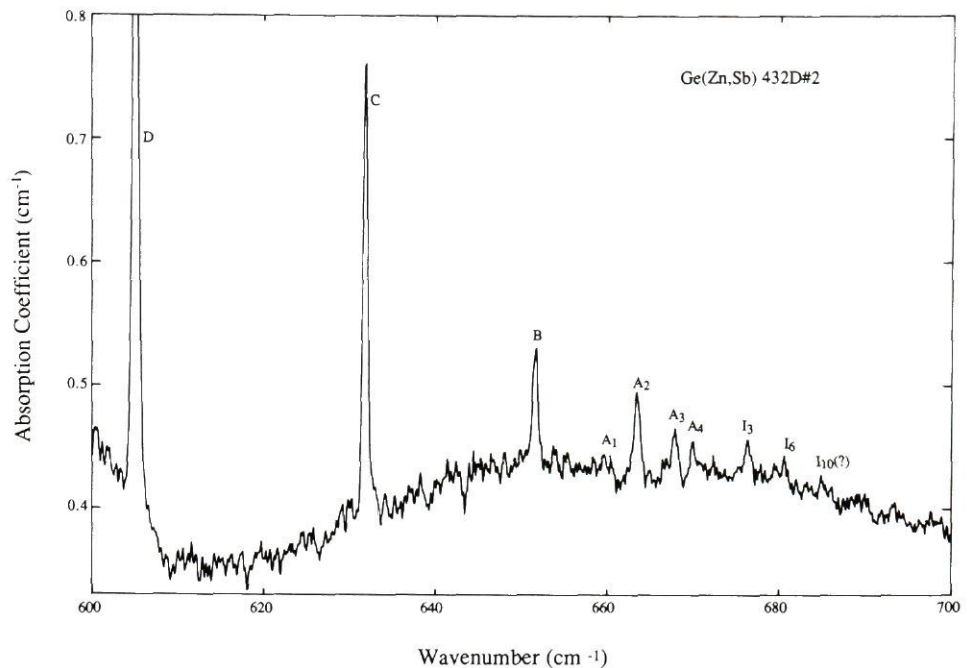


Figure 3

intense than those of the higher energy series, as can be seen from fig 3; this difference is more pronounced for *B* || <111> than for *B* || <100>. Also, a moderate dichroic behaviour is observed for each series.

Under stress, significant changes occur. For example, with *B* || [111] and *F* || [112], the two lowest energy 'Landau lines', one from each series of such transitions, exhibit substantial splittings and dichroic behaviour. A significant part of this splitting can be attributed to that of the acceptor ground state. These effects are being examined in relation to the electric dipole selection rules involved, the piezo-Zeeman

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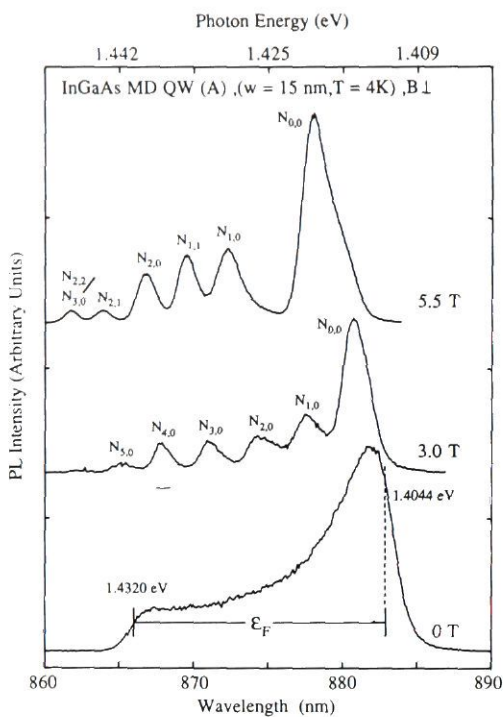


Figure 4a

splitting of the acceptor ground state and the piezo-magneto behaviour of the valence band of germanium as the light and heavy hole bands are decoupled under stress.

(iv) *Magnetophotoluminescence of modulation doped quantum wells and resonant tunnelling structures.*

Photoluminescence spectroscopy has proved to be an effective means for studying the optical properties of electron and hole gases in quasi-two dimensional systems in a magnetic field. In a modulation doped quantum well structure (MDQW) free carriers are confined, at low temperatures, in the plane of the lower band gap semiconductor layer by the combined action of the electrostatic space charge potential and the 'intrinsic' potential energy profile of the heterostructure. The barrier layer in such a structure contains heavy donor doping, which results in the formation of a high mobility two-dimensional electron gas in the quantum well. Energy sub-bands form as a result of confinement. An interesting characteristic of structures containing free charge carrier accumulation is that the energy band potential profiles are not 'fixed', but are determined in part by the electronic states occupied by the free electrons. Optical spectroscopy is a very effective means of examining this effect.

In order to do this, special structures based on the (AlGa)As/(InGa)As/GaAs system have been grown, using Molecular Beam Epitaxy deposition, by collaborators at Telecom Research Laboratories, Royal Signals and Radar Establishment (UK), GEC (UK) and the Department of Physics, Nottingham University (UK). Many of the measurements were carried out using the new superconducting magnet in the Department of Physics.

Experimental photoluminescence results have been obtained, under magnetic field, from a range of strained-layer (AlGa)As/(InxGa)As/GaAs MDQW structures. These incorporate quantum wells of various widths containing free electrons at various densities, up to $1.5 \times 10^{12}/\text{cm}^2$. It is possible to arrange for the Fermi level to be located in either the first or near the bottom of the second energy sub-band in these structures.

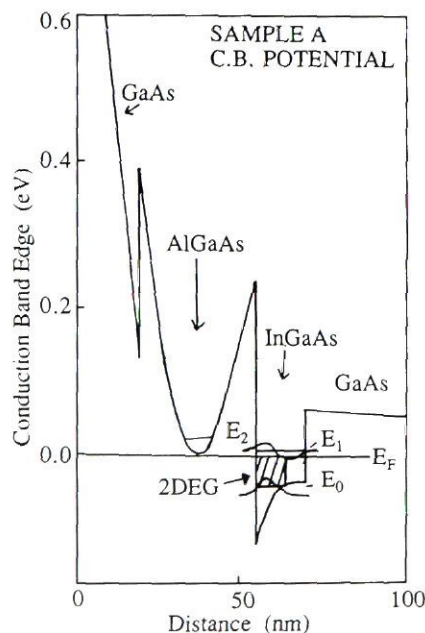
Of particular interest are many body-effects for optical transitions involving electrons close to the Fermi energy. These effects are very sensitive to electron density. They also depend on the maximum energy of electrons in the electron gas (ie Fermi) level relative to the bottom of the quantum well energy subbands.

Figure 4a shows photoluminescence traces with a magnetic field oriented perpendicular to the layers of one such

structure. It consists of an (InGa)As quantum well, sandwiched between (AlGa)As and GaAs barriers, as shown in the schematic band diagram (fig 4b). Emission arises from recombination between these electrons and photo excited holes trapped in the well. In a magnetic field, the electrons occupy quantized magnetic 'Landau' levels which give rise to the series of discrete lines shown in the spectrum. In addition to details of the valence and conduction band dispersion, the experiments provide information on how the excitonic character of the recombination process depends on the density of the electron gas.

Optical studies on resonant electron tunnelling devices are also underway. These are designed to probe the distribution of electronic charge and the recombination processes which lead to light emission in these structures.

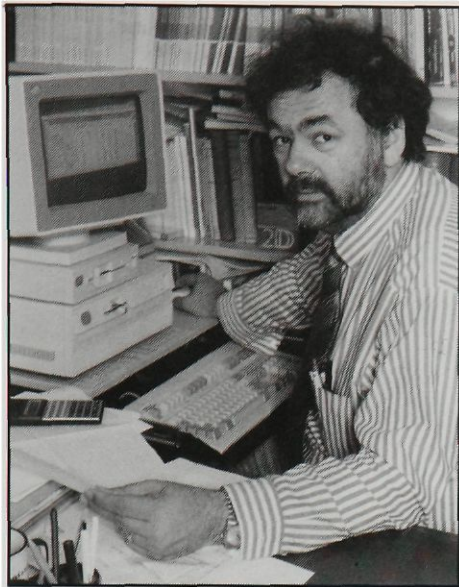
Figure 4b



The program involves the following personnel:

K J Duff (Sen Lect), P Fisher (Professor), T A Fisher (PhD student), C A Freeth (Sen. Lect), R A Lewis (Lect), A D Martin (Sen Lect), N A McLean (Res Assist), G Piao (PhD student), A R Riza (Hons student), D S Ryan (PhD student), J E Schenk (Hons student), R M Silver (PhD student), P E Simmonds (Sen Lect), G Takacs (Teaching Fellow; PhD student), R E M Vickers (Res Fellow) and A D Warner (PhD student).

* *The work has been supported by the Australian Research Council, the University of Wollongong Board of Research and Postgraduate Studies, the Science and Engineering Research Council (UK) and the Australian Academy of Science.*



Professor Michael Gaffikin

Progress in this research program has been steady rather than spectacular. This has partly been the result of an exceptionally high teaching load on members and partly because of the long gestation period of the type of activity involved. However, judging from the intense research activity, this year promises to be very different. Members are seeing some of the fruits of last year's work.

Associate Professor Garry Tibbits and Mary Greenwell completed their pilot study for their project on the role of intangible assets in the accountability process. They have written up the results of this study and Mary Greenwell presented their paper at the European Accounting Association Conference in Budapest, Hungary. Response to the paper was good and after incorporating the comments and feedback received, they hope to publish the results in a top international journal. Meanwhile, the results of the pilot study have enabled them to proceed with their main project. With the help of a large Australian public company they have solicited responses from 60,000 shareholders. They have had an excellent response rate and processing is well under way. A preliminary report has been prepared and presented to the company.

Warwick Funnell has continued with his project on the cogency of efficiency audits and the Australian Audit Office. Some of the results generated from his efforts to date have been written-up and are under review for journal publication. Government Audit Offices have found it increasingly difficult to compete with the private sector for staff. They have been unable to pay graduates the attractive salaries offered by the private sector. Despite this they have had to maintain their function of monitoring the accountability of government (and quasi-government) organisations. They have, therefore, had to investigate alternative methods for completing their tasks and efficiency audits were seen as one alternative. But whether they are is still an unanswered question.

The accounting profession in Australia is attempting to set up a conceptual framework for external financial reporting. Kathie Cooper has been investigating the feasibility, given the cultural and political constraints, of such a project. Not only has this involved her in trips to Melbourne to examine archival material but she has had to come to grips with some post-modern European philosophical notions of power and culture. Professor Michael Gaffikin is also interested in applying the notions of these philosophers to the development of

the accountability relationships in financial reporting. He has some postgraduate research students working in the area. This is also the motivation for Mary Kaidonis's study of the operation of the South Australian Housing Commission.

Too much regulation of financial reporting of entities imposes unwarranted costs on small businesses. This is the thrust of Robert Shannon's research. He recently presented his first paper arising from this project at the European Accounting Association Conference in Budapest. The paper aroused a deal of interest and he has since had numerous requests for copies. He also visited Great Britain to collaborate with researchers who have similar research aims at the University of Southampton. When he completes this project he intends making representations to major policy bodies such as the Small Business Council of NSW who can lobby governments to reduce any administrative burdens deemed unnecessary for small businesses.

Information is also used within organisations to privilege power in the hands of a few. Traditional management accounting systems have been designed to reinforce management control and the way in which it has been used has been negative. Professor Gaffikin is working with research students to present an alternative viewpoint - that internal accounting information systems reinforce the positive aspects of the various responsibility centres. Such research involves close examination of management practices within large organisations. Preliminary work has resulted in a paper submitted for presentation at the National Management Accounting Research Conference to be held at the University of New South Wales later this year.

There is still work to be carried out on the more traditional viewpoints of Management Accounting. Associate Professor Hai Hap Teoh has made this the focus of his research. He compared notes with other Pacific-rim researchers when he presented his paper recently at an international conference in Seoul, South Korea.

There are several new members of the Department of Accountancy and most have expressed an interest in joining the Program. The Department runs an annual research consortium through which it is hoped that new members of staff, students and visitors can appreciate the problems associated with accounting research. By bringing in, from outside the University, international experts it is hoped that Program members can also receive a wider perspective on their research activities.

The Water Engineering and Geomechanics Research Program has further consolidated its activities and has also taken new initiatives. Research concerning slope stability and risk assessment (Professor R N Chowdhury) has progressed significantly and the Australian Research Council has continued to fund the project. Part of the research related to water quantity modelling of urban catchments (Dr Michael Boyd and Ms Monica Bufill) has reached a completion stage and other aspects of the work are being continued.

Research related to the engineering use of industrial waste materials under the direction of Dr D G Montgomery has progressed well during the past 12 months. The investigation of the behaviour of reinforced earth continues and both analytical studies and model tests are being carried out under the direction of Dr R M Arenicz and Professor R N Chowdhury.

The research project 'Numerical Modelling of Sedimentation Dynamics' is progressing well under the direction of Dr M Sivakumar. The experimental program is under way in the newly constructed wind-water tank research facility. Dr E Baafi developed and implemented an algorithm for sequential exploration. He also received research funding for dust control on a longwall face jointly with Dr N Aziz.

Seminars and Major Publications

An in-house seminar concerned with the activities of the program was organised towards the end of 1989 and was very successful. Several research seminars concerned with soil improvement and optimisation of geotechnical structures were presented by Professor E Dembicki of Gdansk University, Poland. Contributions are at present being received from several countries for the proposed book on Geomechanics and Water Engineering in Environmental Management (Professor R N Chowdhury). A successful seminar on Effluent Reuse was held at The University of Wollongong (Co-organiser Dr M Sivakumar) and attracted more than 190 delegates from all over Australia.

Water Quality Research

An initiative taken by Dr M Sivakumar concerns the project 'Destratification of Reservoirs' which has great significance for the quality of urban drinking water supplies. This project received external funding against keen competition from other researchers within and outside New South Wales.

Biofly Brick Project

An initiative of special environmental significance is that concerned with the proposed production of bricks using sludge (from sewage) and flyash (from powerstations). The utilisation of these two waste products in this way has not previously been achieved. The Electricity Commission of New South Wales and Water Board (Sydney, Illawarra, Blue Mountains) have committed significant financial support for this project, provided a brick production company joins the venture (Project Leader, Dr M Sivakumar supported by Professor Chowdhury and Dr Montgomery). Significant energy savings are anticipated in manufacture. Preliminary work is under way to outline the engineering, environmental and economic aspects of the project.

Industry - DEET PhD Award and CSIRO collaboration

An initiative taken by Dr D Montgomery has led to funding for a PhD project entitled 'Slag Blended Cement Concrete' and CSIRO (National Building Technology Centre) are participating in this project.

CSIRO/University of Wollongong Joint Project

A joint research program between the University of Wollongong (Dr Michael Boyd) and the CSIRO Division of Water Resources on Parameter Estimation for Flood Hydrograph Models has been initiated. Dr Boyd has been invited to work with CSIRO over the summer of 1990/91.

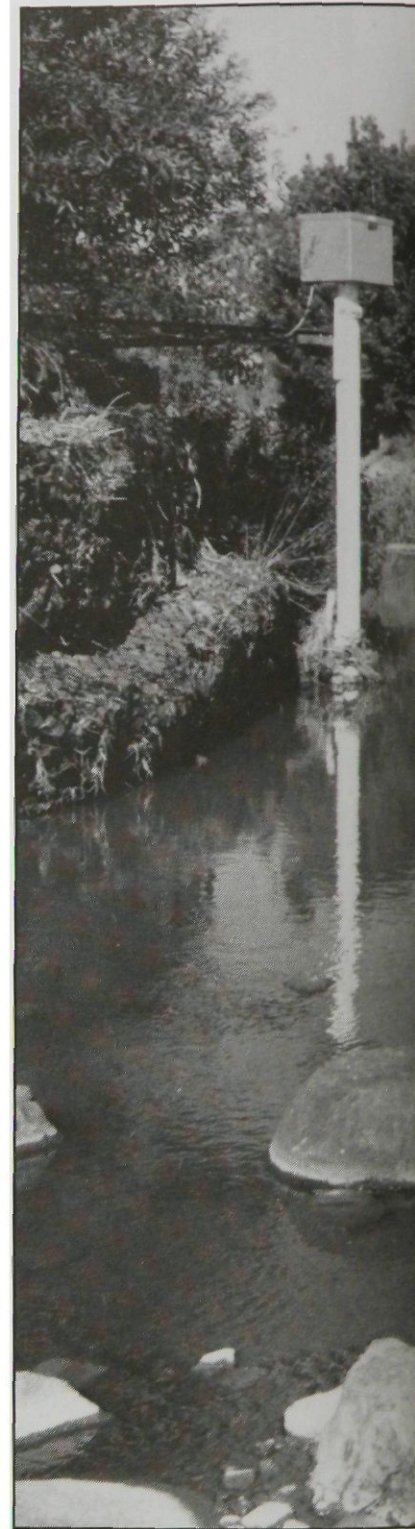
Integrated Approach to Rainfall-triggered Landslides

Expertise in hydrological modelling of catchments, slope stability analysis and probabilistic assessment of risk of failure is being combined to develop an integrated approach to the modelling of instability triggered by rainfall. (Professor Chowdhury, Dr Boyd). This approach is systematic and innovative and is particularly useful in understanding long-term behaviour of slopes although it can also be used for the analysis of catastrophic situations associated with unusual rainfall events.

Modelling of Suspended Sediment in Streams

Another interdisciplinary project is being developed which concerns the modelling of

suspended sediment transport in Australian streams. This project combines expertise in water quantity and quality modelling with that on riverbank erosion and instability processes. (Dr Sivakumar, Professor Chowdhury, Dr Boyd).





Modelling of Suspended Sediment in Streams: the researchers confer 'on location'. From left are Associate Professor Robin Chowdhury, Dr Richard Arenicz, Dr 'Siva' Sivakumar (whose project this is), Dr Michael Boyd and Monica Bufill

Doctoral Theses

A PhD has been awarded to Mr Peter Gray for the thesis 'Slope Stability Considerations of a Major Excavation in Rock'. Part of this work earned the candidate an award of excellence from the Institution of Engineers, Australia (WA Division). Mr Zhang Shu has submitted a PhD thesis entitled 'Evaluation and Updating of Slope Reliability'. Ms

Monica Bufill has submitted a PhD thesis entitled 'Effects of Urbanisation on Floods'.

New Members and Associates

Dr V U Nguyen has joined the group as a Member. His expertise is in geomechanics, computer modelling and expert systems in civil engineering. Professor R.N. Singh has

joined as an Associate. He has a wide range of interests in both underground and surface mining and is well known for his studies of mine water problems. Professor E. Dembicki has also joined as an Associate and has proposed interaction between his research group at Gdansk Technical University and the WEGRP at the University of Wollongong.

The Quaternary Period is the past two million years and is, from a human perspective, the most important geological period of the Earth's history. During this time humans evolved from early Hominid stock and the Earth has been devastated by a succession of wild climatic oscillations which plunged much of the northern hemisphere (and the alpine regions of the southern hemisphere) into a series of intense glaciations. These caused the sea level to fall and rise again by as much as 150m with each glaciation, and entire terrestrial ecosystems have migrated hundreds or thousands of kilometres in response to severe changes in climate. In Australia there was little glaciation but climate swung from being very arid with the formation of desert dunes, to moderately wet, with the development of large rivers and lakes.

It is generally believed that we still live in this period of fluctuating conditions, so a clear understanding of past environmental change will give us a very good indication of what we can expect to occur in the future. It is also widely accepted that such human practices as burning and clearing, agriculture, settlement and industrialisation have changed the face of the planet more than the actions of any other organism, and we can expect our future impact to be equally great. Yet any study of the impact of human activity must take into account the realisation that we do not live in a period of natural environmental stability; human-induced changes must be examined and separated from those that are simply part of the normal variability of the Quaternary Period in which we live. The Quaternary Environmental Change Program focuses on both natural and human-induced environmental change in the Australian region in order to understand past environmental relationships and better predict future ones.

Dating environmental change in Central Australia

The Australian continent has ancient river, aeolian dune and lake systems that contain stratigraphic evidence of changes of climate and moisture regime throughout much of the Quaternary Period. The major obstacle to interpreting this evidence is the difficulty of establishing a reliable chronology of events beyond the last few tens of thousands of years for which radiocarbon is considered accurate. Associate Professor Gerald Nanson and Mr David Price have recently applied thermoluminescence (TL) dating to river (alluvial) and dune (aeolian) systems in the Eyre Basin of central Australia, with

spectacular results. In collaborative work with Dr Stephen Short of the Australian Nuclear Sciences and Technology Organisation, they have checked their results by uranium/thorium-dating weathering minerals that have precipitated within the river alluvium, and the two sets of data show excellent agreement. It is now apparent that the climate of central Australia during the Quaternary has alternated from arid during the glacial episodes (periods of low sea level with extensive glaciation in the Northern Hemisphere) to 'wet' during the interglacials. Such dramatic changes have had a profound effect on the development of Australian flora and fauna.

Fundamental to the research activities of this program is establishing rates of environmental change during the Quaternary. Consequently a great deal of effort has been put into the establishment and operation of a TL dating laboratory under the direction of Mr David Price. Sedimentary TL dating depends on the acquisition of luminescence energy by crystalline minerals buried within sedimentary units. This energy is derived from radiation flux delivered by long-lived isotopes of uranium, thorium and potassium found in soil and sediment, and a small amount from cosmic radiation. Successful dating is dependent on the removal of the TL acquired by the sediment prior to its last episode of burial, a process requiring exposure to sunlight during sediment transport. Following burial, TL energy once again begins to build up at a rate commensurate with the surrounding radiation flux. As a consequence, the period of time since last exposure to sunlight is calculated by measuring the total amount of TL energy absorbed (the palaeodose) and dividing this by the rate at which the energy is acquired.

As part of a broad assessment of fluvial and aeolian activity and hence climatic change during the late Quaternary of central Australia, this Research Group examined the incidence of river and dune deposition in the Eyre Basin. By taking a relatively large number of sedimentary TL dates from a variety of deposits over a geographically broad area of the basin, they have shown that the frequency of ages of a particular sediment type (figure 1) is indicative of the depositional activity in that sedimentary environment. Extensive alluvial sand sheets beneath overlying mud along the channels of Cooper Creek and the Diamantina River in western Queensland yielded two distinct groupings of TL ages. The oldest that could be dated were laid down by large meandering rivers that broadly correspond in age with the second to last interglacial (240,000

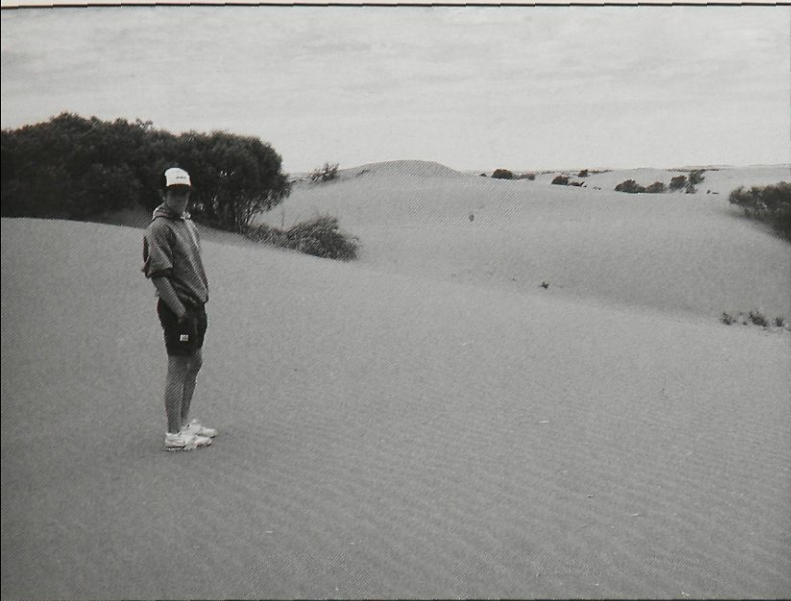
to 200,000 years before present [BP]), a period of climate believed to be similar to the present. The next 100,000 to 80,000 years appears to have been a period of little or no river activity (a cool dry period). Another phase of pronounced river activity was associated with the last interglacial (125,000 to 100,000 years Before Present, BP) which is also believed to have had a climate similar to the present. Following this, the large meandering channels ceased to function and were replaced by numerous small, low-energy, mud-transporting channels. The muds TL date at 85,000 years BP to the present and correspond to a period of increasing aridity and dune building in the Basin which peaked during the last glacial maximum (25,000-10,000 years BP).

The abundant fossil remains of a diverse Pleistocene fauna characterise the interglacial sandy river sediments. Large carnivores including the estuarine crocodile (*Crocodylus porosus*), giant goanna (*Megalania prisca*), giant python (*Wonambi sp.*) and marsupial lion (*Thylacoleo carnifex*) were present. Marsupial grazers and browsers included the rhinoceros-sized *Diprotodon optatum*, the large short-faced 'kangaroo' (*Procoptodon sp.*), the giant kangaroo (*Macropus giganteus titan*), the giant wombat (*Phascolonius gigas*) and numerous smaller mammals and birds. The interglacial river-dominated episodes must have presented conditions suitable to permit this complex megafaunal ecosystem to utilise the river corridors and invade the heart of the Australian continent, only to be driven back to the margins during the arid glacial phases when the rivers became inactive and dune fields again dominated the Eyre Basin.

Coral Atolls

Isolated in the central Pacific and Indian Oceans, coral atolls exist in a subtle balance with the sea. They have evolved, in their present form, only in the past few thousand years, during which period there has been little change of sea level but continued coral reef growth and sediment production. A more detailed picture of this recent period of atoll development is being put together by Dr Colin Woodroffe as a part of this research program.

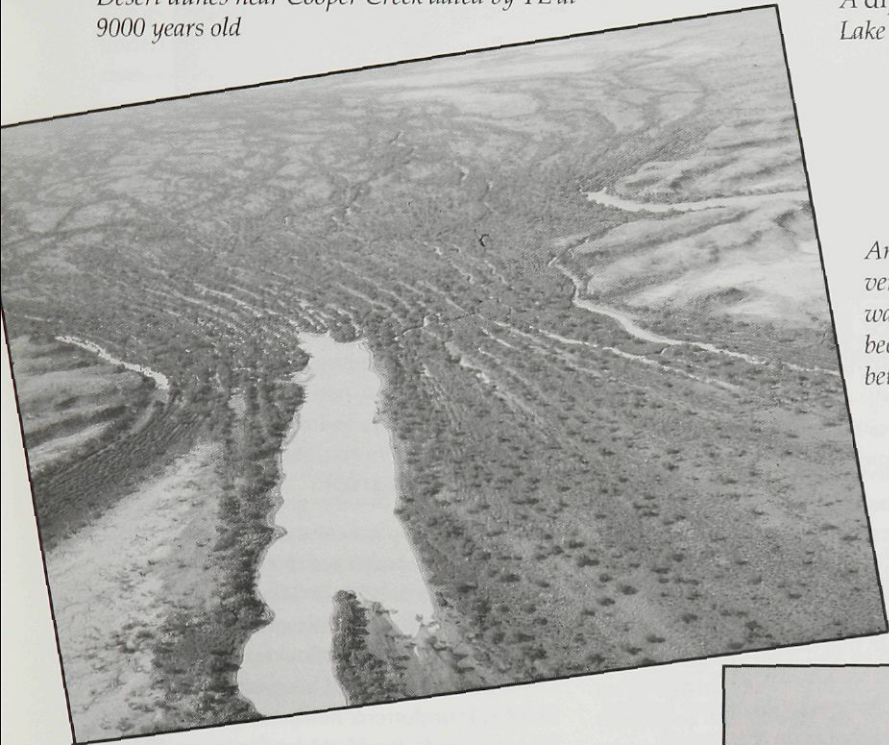
Dr Woodroffe, together with Professor Roger McLean (Australian Defence Force Academy), Mr Eugene Wallensky (Australian National University) and an Honours student from the Department of Geography, University of Wollongong, undertook further field studies on the Cocos (Keeling) Islands in April 1990. This recent research



Desert dunes near Cooper Creek dated by TL at 9000 years old



A diprotodon sp (giant marsupial) scapula from river sands near Lake Eyre. The deposit TL dated at 110,000 years old



An aerial view of the Diamantina River at Hunters Gorge. Once very active, the river floodplain is now covered with mud. The waterhole in the foreground has been scoured in the floodplain because of confinement of the flow through the narrow neck between adjacent bedrock outcrops

Transporting a drilling rig across the reef at low tide on Cocos (Keeling) Islands to reach the least accessible islands



included further diamond drilling, in collaboration with the Australian Construction Services Water Resource Survey of the atoll, as well as seismic refraction and vibrocoring.

The atoll, an Australian Territory, is of particular interest because it is the only atoll that Charles Darwin ever visited. Darwin formulated an important theory on coral atoll development. He hypothesised that if a tropical volcanic island subsided, coral reefs would form initially as fringing reefs, then as barrier reefs, and finally, as the volcanic mass subsided below the sea and reef growth continued, as a coral atoll.

Drilling results from the most recent fieldwork on Cocos confirm Darwin's



Augering and coring on the least accessible parts of the Mary River plains, beside one of the rapidly expanding tidal creeks. Dr Colin Woodroffe (right) is being assisted by a ranger from the Conservation Commission of the Northern Territory

hypothesis. Although the volcanic basement has not been reached, an older limestone (radiometrically-dated to the last interglacial) has been encountered at a depth of 8-15 m at many points around the atoll, supporting the idea that the atoll is gradually subsiding. The rate of subsidence, however, is imperceptibly slow except over geological time scales.

Present research is directed towards determining the modern patterns of reef growth and sediment production. Drilling has been achieved on some of the least accessible islands on the atoll. The large drill rig has been moved by barge to the remotest leeward island and towed across several kilometres of reef flat at low tide to gain access to the most windward island.

When cores from these drillholes have been examined and when surface sediment samples and vibrocores from the lagoon have been analysed by Scott Smithers as part of his Honours thesis, a much more detailed picture of the processes presently operating on coral atolls will be obtained. These results have particular application to the management of atolls, especially in relation to

concern about environmental change resulting from the 'greenhouse effect'.

In a recent paper in *Nature*, Dr Woodroffe and Professor McLean build on the subtle balance between coral growth and sea level. They demonstrate that certain flat-topped massive corals termed microatolls respond to year-by-year changes in the upper limit to coral growth, and that from the annual banding of the coral skeleton it is possible to reconstruct changes in sea level over recent decades.

Coral atolls, scattered in the middle of the world's largest oceans, offer a particularly valuable opportunity to monitor global sea-level change, away from continental margins. Unlike those continental margins, these remote islands generally do not suffer from the complications of tectonic uplift, glacial-isostatic readjustment to melting or recently-melted ice sheets, or flexure due to the rigidity of continental crust. They obviously represent an important vantage point from which to get a perspective on the widely-anticipated global sea-level rise that is predicted as a response to 'greenhouse warming'.

Tropical estuaries

Research on tropical estuaries forms an important component of this research program. In late 1989, Dr Woodroffe together with Kevin Mills and Dr David Knighton (a Visiting Fellow with the Department, from the University of Sheffield) undertook fieldwork on the Mary River plains in the Northern Territory. The project, in collaboration with and funded by the Conservation Commission of the Northern Territory, is aimed at reconstructing the chronology of environmental change that has led to the widespread intrusion of saltwater into the attractive freshwater wetlands of the area.

Preliminary results, outlined in an initial report to the Commission, have identified the pattern of tidal creek extension and mapped the various environments on the plains. The creeks have extended extremely rapidly over the last 50 years, with widespread death of paperbark swamps.

However, Woodroffe, Mills and Knighton have shown from extensive drilling and augering that the freshwater wetlands of the

Mary River are all underlain by muds deposited under saltwater when the area was previously covered by mangroves. Radiocarbon dating is permitting a clearer definition of the history of environmental change over the last 6000 years.

Former tidal channels (palaeochannels), infilled with muds, can be discerned crossing the plains. The pattern of extension of modern tidal creeks quite clearly preferentially extends along palaeochannels. Thus, the past environments are directly influencing the direction of future change as parts of the plains revert to tidal influence.

This research is continuing and further fieldwork is planned in 1990. A post-doctoral researcher, Dr Monica Mulrennan, from University College, Dublin, has recently joined the team, on an Australian-European Awards Program Scholarship, to undertake further study of this fascinating river-estuarine system.

Fire and its impact on vegetation in Northern Australia

The impact of prehistoric Aboriginal burning on the Australian vegetation has been a matter of debate for several decades, but we still do not fully understand the extent to which vegetation patterns observed by the first non-Aboriginal invaders were an artefact of natural environmental conditions or human activity.

Vegetation sampling around Marralam Outstation, in the northwest of the Northern Territory, in 1989 showed that in most areas sampled there was a lack of diversity within the ground/shrub layer. Whether this is due to millions of years of poor soils, thousands of years of Aboriginal burning, or a hundred years of European grazing is a question that Dr Lesley Head and Ms Toni O'Neill are attempting to answer. Recent vegetation changes will be compared with the longer term history provided by pollen preserved in swamp cores from the same area. Thus they hope to be able to provide constructive recommendations for more efficient and well-informed fire management policy across northwestern Australia.

Knowledge of the impact of past changes is fundamental to well-planned fire management strategies. Part of the problem has been to mesh two very different scales of analysis: contemporary ecological studies that focus on the impact of fire over several years or decades and fossil pollen and charcoal analysis that usually infers change over thousands of years. In an attempt to remedy this problem this project is drawing

on two further lines of evidence: local Aboriginal knowledge and satellite data.

In northern Australia both Aborigines and pastoralists regularly use fire, providing an opportunity to compare their effects. Aborigines returning to their traditional country as part of the outstation movement use fire for hunting, access and to 'clean up the country', while white pastoralists have a concern for bushfire prevention and use aerial incendiaries to ignite control burns.

Remote sensing provides an important tool in this work thanks to the very large areas involved. Unburnt areas, those recently burnt and those regenerating after fire have specific spectral signatures on satellite imagery. Preliminary work using Landsat Thematic Mapper images (1988) has shown that different burn intensities can be accurately mapped at various stages of regeneration.

The Landsat 5 satellite currently in operation carries on board two sensors. One of them, the Multi Spectral Scanner (MSS) scans a swathe 185km wide on each orbit. The orbits change slightly each day so that each area on earth is imaged every 16 days. The ground resolution of MSS is 80 metres. The second scanner on board is the Thematic Mapper (TM), which also scans a 185km swathe every 16 days. The advantage of TM imagery is that the ground resolution is 30 metres, so that even quite small fires can be delineated. Another important advantage is that the TM sensor records over a wide range of the spectrum, from the visible blue part through to the thermal infrared. It is the combination of infrared channels which has been found to be particularly useful in discriminating burns of different ages, vegetation growing on different soil types and areas where there is a range of ages in the regenerating vegetation.

Detailed work to compare the patterns of Aboriginal and pastoral fires on both TM and the lower resolution Multi Spectral Scanner imagery will be used to determine



Landsat Thematic Mapper image from September 1988. The impact of a large wildfire is visible on the left, with a mosaic of smaller fires along the creek

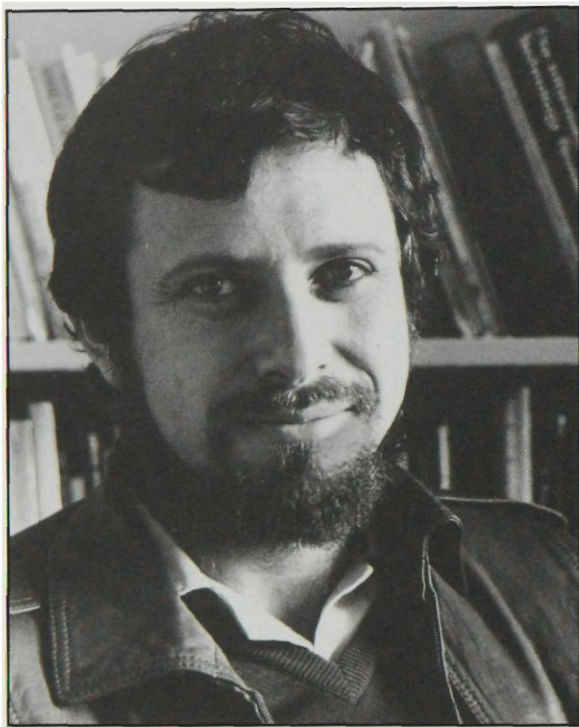
whether they are distinguishable in shape, size, point of origin and intensity. This detailed monitoring should also allow identification of other ignition sources, such as lightning and tourist campfires.

Aboriginal people and pastoralists have helped in the interpretation and dating of some of the fire patterns on the 1988 imagery, enabling the identification of major differences in their use of fire. Control burns cover very large areas and are concentrated in the early dry season, whereas Aboriginal fires are concentrated around the outstation and show a pattern of smaller but more frequent fires throughout the dry season.

Comparison of the early and late dry season images also shows that recovery of vegetation seems to be very rapid, some fire scars disappearing within a season. This contrasts with arid areas of central Australia, where fire scars are visible on satellite imagery for a number of years.

Interpretation of the satellite imagery is dependent on detailed fieldwork. This has included interviews with older Aboriginal people and pastoralists about the use of fire and how it has changed over time. Current burning practices are being observed and burned areas mapped at times that coincide with the satellite overpass. Vegetation surveys have been designed to cover a range of soil types. Within each soil type, areas that have experienced different times or type of burn are being sampled. The process will be repeated at different seasons over a number of years.

Science and technology are such pervasive influences in society that they often are treated as if they were effectively invisible. But we are at a moment in human history where we can scarcely afford to treat them in this way. In a world which, through changes in technology, is becoming increasingly integrated, maintaining both the economic viability of nations and the long-term resilience of the natural environment requires us to be clever about how we manage the development of science and technology.



Professor Jim Falk

Over the past decade Wollongong University has built up the largest concentration of researchers in the southern hemisphere working on the analysis of science and technology in their social context. In 1990 the corresponding four research programs, comprising some 18 researchers from within the University, have been integrated to form a 'combined program' in science and technology analysis, among other things attracting over \$900,000 to the University in external contracts and research grants.

The relevant researchers are drawn from the Centre for Technology and Social Change (TASC), the Department of Science and Technology Studies (STS), Sociology, and several other departments. Their collective mission is to research the nature, dynamics, impact and management of science and

technology in their social context.

Collectively the issues which are being addressed range over a challengingly wide area. Examples include: what can or should be done about the danger of global warming due to human-caused changes to the 'greenhouse effect'? What needs to be done to ensure that Australian research keeps Australia competitive in an increasingly competitive world? What policy issues are raised by changes in the technology of reproduction? How do scientific controversies arise, and how can they be resolved?

What are the historical mechanisms which lead to the types of science and technology which have arisen in the West? And what type of technology management is needed if we are to increase the sustainability and viability of industrial development in Australia?

This 'STA' activity is attracting cooperation from a range of academics who were not previously involved with the programs. For example, one project involves the participation of nine academics, drawn from the Departments of Management and Business Systems as well as from STS.

The STA research is developing at several levels. The first is as an entity in its own right. One highlight of this combined activity has been the National STA Seminars, a series of major meetings co-ordinated by Professor Ron Johnston and held in Canberra for national science officials. As this series develops

it is expected that some will lead to papers which can be published in the STA Research in Progress series, the first of which are currently being readied for publication.

Within STA there is a range of research groupings. Researchers can and do move freely between these.

Inevitably, policy guidance is an important output and objective of much of the work carried out within STA. Some of the current activities directed towards this end are:

Strategic research

This develops primarily from work being carried out by researchers based in the Centre for Technology and Social Change (TASC). In total it has produced 23, primarily externally funded, projects in the

areas of Resource and Environment, Technology Strategy, Research Policy, Education, International Science and Technology, Technology Policy, and Technological Change in the Finance and Banking Sectors.

One major study has been carried out for the National Board of Employment, Education and Training (NBEET). It looks at the impact of technological change on the workplace. Under contract from the Skills Formation Council, it investigated the impact of new 'fusion technologies' (computer integration of electronics, mechanics and hydraulics) on industrial relations, training and work organisation in a range of Australian enterprises. Areas studied include textiles, avionics, motor-vehicle repair, whitegoods, fabricated products, engineering products, steel and sanitary products.

New manufacturing technology integrates by collapsing previously distinct trade skills and it gives greater transparency to work through the technology's central monitoring capacity. It also produces greater psychological integration by putting greater emphasis on teamwork and competition. The study found that crucial productivity gains available from the new technologies are significantly hindered in large Australian manufacturing plants through their failure to redesign work around the new production concepts. The motive was to avoid demarcation disputes between unions and white-collar and blue-collar functions. This in turn hindered the development of training programs dealing with the new production concepts. A Bulli plant, David Brown Gears, was a significant exception to this pattern. It had achieved integration through a single union agreement with the AMWU.

A second study, 'Strategic Alliances in the Internationalisation of Australian Industry', funded by the Department of Industry Technology and Commerce (DITAC), investigated the ways in which Australian industry is internationalising – developing and exporting goods and services for international markets. It found that the process is just beginning. Australians have become international consumers but, outside of a few primary commodities and a handful of manufacturing firms, have remained parochial producers. Improving competitiveness and increasing exports is a central objective of government policy, particularly science and technology policy.

For the past three years Ron Johnston, Don Scott-Kemmis and Terry Darling of TASC, supported by the Department of Industry,

Technology and Commerce, have been engaged in a program of technology policy research. The program has resulted in five major reports identifying the dimensions of the challenge for effective science and technology policies. Change is under way in Australian industry but government has a critical role to play in stimulating and supporting restructuring.

Science, Technology and Gender

One important activity is to put together new areas of data which will provide a sound basis for future research. For example, the fact that many women still face difficult barriers in considering science and technology as possible career choices constitutes a significant national problem. Australia cannot afford to waste talent because of outmoded gender bias in its social structure. This and related issues are being addressed by Dr Evelleen Richards, who is assembling a Gender Science and Technology Database.

The Technology Monitor

It is important for both government and industry to know just what new innovations are in the pipeline in Australia and internationally. Dr Stewart Russell has now completed the first phase of development of 'Technology Monitor Australia', a computer database, analysis and retrieval system, with associated information services, on new technologies and their employment implications. Discussions are taking place with state and federal government departments on the second phase which will involve a pilot offering of direct access to the database so that it may be evaluated by potential users. The feasibility of extending this project to New Zealand is now being investigated under a contract with the New Zealand Department of Scientific and Industrial Research.

An Advanced Manufacturing Bibliographic Database

In parallel with the development of the Technology Monitor, a pilot database has been completed on the specific topic of flexible specialisation in manufacturing. It has been used as the basis for a bibliography – of nearly 300 items – that has now been distributed widely. In the process, an extensive international list of contacts has been compiled. This project has provided useful experience and has demonstrated a demand for such a database sufficient to justify a major project. Dr Richard Badham,

currently researching in West Germany under the auspices of a Von Humboldt fellowship, is preparing a proposal for external funding to be pursued on his return to Australia.

Sustainable development

The question of how science and technology are to be directed in a world which is becoming increasingly aware of their environmental impact is an important one. In November 1989 Penguin published *The Greenhouse Challenge: What is to be done?*, by Professor Jim Falk and research student Andrew Brownlow. The book has been enthusiastically received, winning a 'Highly Commended' for its literary merit from the National Literary Awards of the Australian Fellowship of Authors. Some 8,000 copies have already been sold in Australia and the USA and negotiations are under way to translate it into Italian.

Professors Jim Falk and Ron Johnston, Dr Stewart Russell, Dr Brian Martin, Mr Don Scott Kemis and Dr Shantha Liyanage are now initiating a major collaborative study in the area of Policy Tools for Sustainable Development. The intention of this study is to turn technology policy tools to the development of new environmentally sensitive technologies.

One example of the application of these tools is provided by the Assessment of the National Energy Resource Development and Demonstration Council, which has already been completed under the supervision of Professor Johnston.

Information Technology and Organisations

Co-ordinated by Professor Stephen Hill, this research concentrates on examining the relationships between technological change and organisational culture and design. Its particular focus is on information technologies and the manner in which these change the communication system and thus the core processes from which culture is produced. The organisation culture research is being done in the insurance and banking industries – as these most fundamentally depend on information technologies for their whole

organisation business; but the theoretical work is generalised through exploration of culture/technology relationships in whole societies and through history.

Over the past year, and in keeping with the aims of the project, a comprehensive literature search has been completed on organisation culture theories and methods; collaborative work has been established with Dr Trevor Williams (Department of Management) on work design, culture and technology; and, based on preliminary field work, a research instrument (the 'Audit of Technology and Culture', ATAC) has been



Ms Rebecca Albury

developed and tested. Most work has been devoted to development and test of theory. In particular, it has been found that the same theory applied to organisations could equally well be applied to national cultures and their technological infrastructures and choices.

This work has already resulted in significant collaboration outside the original group of researchers, resulting in, among other things, the book, *Organisation and Information Technology*, edited by Mr Stan Aungles with contributions from researchers from a spread of university departments.

Continued overleaf

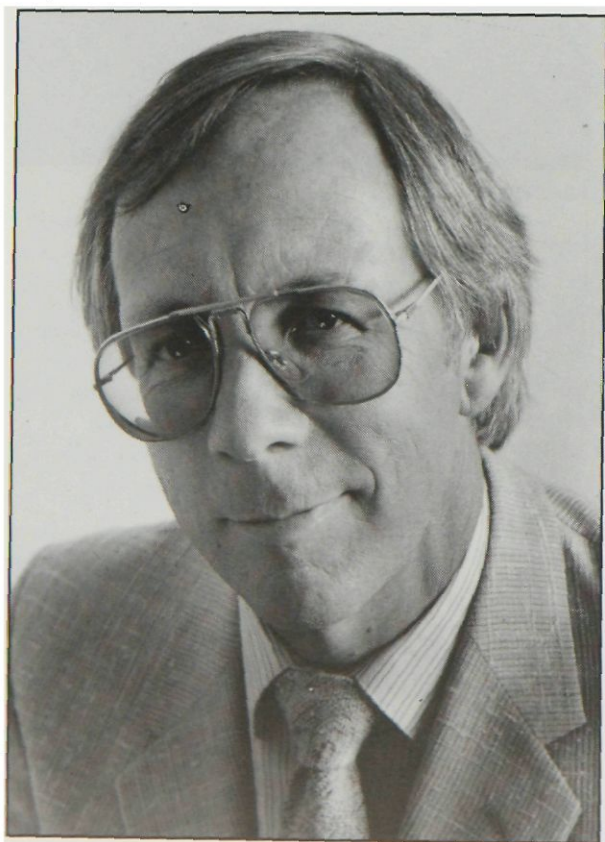
Expert Systems

So called 'artificial intelligence' technology is one area of development in computer software that is attracting great interest internationally. The first product of this area to reach widespread commercial application is the 'expert system', a form of programming designed to emulate certain decision-making processes normally undertaken by skilled workers.

Professor Jim Falk and Mr Stan Aungles are continuing their two-year, Australian Research Council-funded study of expert systems. Issues of particular interest are the criteria which lead to success and failure when they are deployed, and the relationship between the development of expert systems and the structure of the organisations into which they are introduced.

In 1989 the research the focus was on the development of expert systems technologies in Australia – through in-depth telephone interviews with key researchers, face-to-face interviews and administration of a questionnaire at two major international expert systems conferences (Melbourne and Hyderabad). In 1990 the research assumes more of an international dimension when Professor Falk moves to California for two months to carry out a comparative study in

Professor Ron Johnston



conjunction with the Silicon Valley Research Group at the University of California at Santa Cruz. This visit is funded by the University of California under a Pacific Exchange Research Fellowship.

Scientific Controversy

Scientific controversy is a central feature of modern industrial society. It is important not only because of the vitality of the issues which are often at stake, but also because studying scientific controversy tells us a good deal about how science and technology develop, and how their development can be shaped.

Considerable effort has been put into integrating a series of studies, applying controversy analysis to debates about biomedical claims and the risks of various health and environmentally sensitive technologies. Here the challenge has been to develop a coherent and critical theoretical framework for analysis and integration of the individual projects. In order to achieve this a series of collective workshops and seminars about the theoretical and methodological issues involved was organised over 1989.

Contributing to this process, Dr Evelleen Richards, Dr Pam Scott and Dr Brian Martin have continued their comparative investigations into contemporary scientific controversies. In the three main controversies they have been studying – vitamin C and cancer, the Australian Animal Health Laboratory and fluoridation respectively – they have found that they, as researchers, become quickly involved in the controversy themselves, whatever their intentions. As soon as they undertake interviews or publish articles, they have found that their work is taken up by the various parties to the controversy and becomes part of it.

This itself raises important research questions. Dr Richards gave a paper on behalf of the team on the topic of researchers being 'captives of controversy' at the 1990 conference of the Society for Social Studies of Science (4S), held in California. Dr Richards has been elected to the board of 4S.

Health and Biomedical Technology

There is a productive interplay between this more theoretical work and its application to the formation of policy. Thus, for example, Ms Rebecca Albury's work on the controversy surrounding reproductive technology has led to her appointment as a member of the federal government's National Bioethics Consultative Committee (NBCC). She has already co-authored (with Professor Max Charlesworth) an important issue paper and draft report on Surrogate Motherhood for the NBCC.

Road Informatics

One area of research which may prove fruitful is to examine the areas in which technological possibilities exist but which have not yet been widely exploited. What factors hold back these technological developments? One area is that of road informatics.

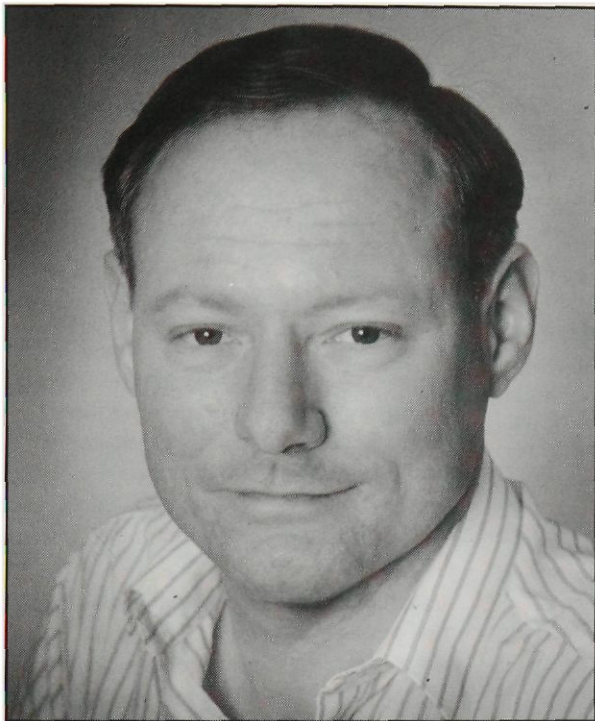
Traffic planners are interested in possibilities for applying computers and communications technologies to road transportation in order to reduce congestion, increase economic efficiency and prevent crime. Technologies are available today, for example, to target a car or truck, and relay the information to central computers for monitoring truck drivers, charging for road use or speeding traffic flow. Dr Pam Scott (Faculty of Informatics) and Dr Brian Martin (Department of STS) are investigating the social and policy implications of these new technologies, such as on-board computers, electronic number plates and automatic route-guidance systems, for a variety of groups, including traffic authorities, fleet managers and drivers. There are various issues potentially of public concern, such as privacy and surveillance. As well as dealing with social impacts of 'road transport informatics', Drs Scott and Martin have used their analysis to test competing theories of technology.

Food Irradiation

The technology of food irradiation, while in limited use abroad, is at present under a moratorium in Australia while the federal government investigates the highly controversial issues surrounding it, concerning efficacy, need, hazards and likely social and economic impacts. Significant lobbies for and against adoption of the technique have already developed.

Dr Richard Joseph and Dr Stewart Russell are collaborating on exploring the construc-

tion and evolution of the food irradiation debate in Australia. Dr Joseph's objective is to analyse how a major scientific/technical controversy is handled by the Commonwealth bureaucracy, and to explore innovative structures and procedures for dealing with this and similar issues in the future. Dr Russell aims to contribute to a theoretical framework for analysing knowledge claims in terms of social interests.



Dr Terry Stokes

Critical studies in the History and Socio-politics of Technology

The field addressed by STA is a developing one, and it is crucial to maintain a vigorous program of theoretical development, to underpin the more applied areas of work. In the past year, one central area of development has been in the history and sociology of science and technology.

New Sociology of Technology

One particular focus has been the examination of the so-called 'new' history and sociology of technology, which has grown up under the influence of the history and sociology of science.

During 1989 and 1990 members of STA participated in a series of discussions and seminars concerned with the analysis and criticism of leading theoretical models in the new history and sociology of technology. These activities led to the organising of a special session at the recent annual confer-

ence of the Australasian Association for the History, Philosophy and Social Studies of Science, dealing with the 'de-construction' of the work of Bruno Latour, who at the moment is perhaps the most prominent figure in this area.

Dr Pam Scott, Associate Professor John Schuster, Dr Stewart Russell and Mr Mark Rix, a PhD student in the Department of STS, presented key papers in what turned out to be a contentious and illuminating discussion. These, together with other related papers by STA members, are to be published shortly as the first issues of a new STA Working Paper series.

Historical Archaeology of Australian Technology

Also in the technology studies area, one of the most pleasing achievements has been the burst of field work activity and publication by Mr Brian Rogers on the historical archaeology of Australian technology. Simultaneously, Professor Stephen Hill's work on the history and sociology of technology and culture in Australia reached a major nodal point with the publication of his widely reviewed and well received book *The Tragedy of Technology*.

Professor Hill's work in this area is continuing with ARC funding, including research assistance from Mr David Shaw, who is also pursuing doctoral research on the historical sociology of technology under the joint supervision of Associate Professor John Schuster and Professor Hill.

History, Sociology and Anthropology of Science

There has also been considerable work in the history and sociology of science, fostered in particular by the separate and combined efforts of Dr Eveleen Richards, Associate Professor John Schuster and Dr Terry Stokes.

This year Dr Richards has produced an extremely impressive set of research papers on aspects of the social history of evolutionary biology in 19th century Britain, which are the fruits of several years of research. Her international standing in this area was underscored in 1989 through invitations to

be a featured speaker at two important conferences, one at Harvard University on Ideology in the Life Sciences and one at the University of Edinburgh. She has also been awarded a prestigious Wellcome Trust Grant for travel to Britain to carry out further archival research in this area.

Dr Richards and Associate Professor Schuster combined on an important and contentious paper criticising certain aspects of feminist critiques of science. This paper was originally featured at the first Joint Meeting of the US and UK History of Science Societies at Manchester in July 1988. It has been published in *Social Studies of Science*, complemented by a rejoinder from Professor Evelyn Fox Keller (the main focus of their critique) and a reply by Associate Professor Schuster and Dr Richards.

Associate Professor Schuster has also completed with Mr Graeme Watchirs an innovative study aimed at revising the traditional historiographical understandings, deriving from Thomas Kuhn and Gaston Bachelard, of the origins of experimental scientific fields.

The paper has been accepted as the opening piece in H E Legrand (ed) *Experimental Inquiries* to be published by Reidel. In addition, Associate Professor Schuster's paper on 'The Rhetorical Functions of Cartesian Method: Reclaiming Descartes for the History of Science', originally an invited, featured paper at the San Jose Conference Celebrating the 350th Anniversary of the Publication of Descartes' *Discours de la methode*, has been selected for inclusion in the volume of selected, revised contributions to the Conference. This volume, edited by Professor S Voss, will be published by Cambridge University Press, and will include contributions by the leading international Cartesian scholars.

Finally, 1989 saw the publication of the well received book *Life Among the Scientists: An Anthropological Study of An Australian Scientific Community* (Melbourne: Oxford University Press), whose co-authors – Dr Terry Stokes (a member of STA) together with outside collaborators, Mr David Turnbull, Professor Max Charlesworth and Dr Lyndsay Farrall of Deakin University – chose the unusual device of writing in the first person. The scientific community concerned was the prestigious Walter and Eliza Hall Institute of Medical Research whose work Dr Stokes and his colleagues interpret in a way recognisable to the scientists concerned and illuminating to a general public, including but not restricted to students of social science.



A PhD student in the Department of Mathematics, Antoinette Tordesillas is the recipient of a scholarship from BHP. She is seen here at BHP Coated Products Division where she is engaged in research into mathematical modelling for the roller coating process

There are two trends in science which have been steadily building up during the '80s and their consequences for industry will impact throughout the '90s and beyond. The first is the rapid growth in modern computing capacity and the second is the drift away from science, engineering and mathematics and the consequent lack of skilled personnel who are capable of exploiting computing power for the benefit of industry. These trends are not restricted to Australia but no country can afford not to exploit fully developments in modern computing facilities. The Engineering and Industrial Mathematics Research Program aims at utilising Applied Mathematics combined with Computing to accurately model sophisticated engineering and industrial processes.

The Program has been successful in attracting significant funding with recent awards from the Australian Research Council and the National Teaching Company Scheme. Funds from the Australian Research Council include a prestigious three-year Research Fellowship to examine the flow behaviour of mould powder in the continuous caster used in the production of steel. This project is in association with Dr Paul Flint of the BHP Central Research Laboratories at Newcastle. Mr Yong-Hong Wu has recently been appointed to the position and he joins the Department of Mathematics after completing an outstanding PhD thesis in the Department of Civil and Mining Engineering. The recent award

from the National Teaching Company Scheme is in association with Dr Keith Enever of the BHP Division of Coated Products at Port Kembla and provides funds for a graduate to work in industry for two years on a specific scientific project.

Other work which is partly funded by and is in collaboration with BHP Coated Products Division and which will lead to the design of improved roller coaters is currently being undertaken by Antoinette Tordesillas for her PhD. Contact between solid bodies which have surface layers with differing elastic properties occurs

in several types of industrial machinery. An important example is in the manufacture of Colorbond steel, where rubber-covered rolls in contact with each other are used to apply a thin film of paint with great precision. So far, roller coating remains something of an arcane art. A mathematical model is being developed to improve our understanding of the underlying principles of this coating process. Of major interest in this analysis are the stresses and deformations arising at the region of contact. This type of contact problem does not permit an analytical solution in closed form and consequently a three-dimensional numerical model is currently being developed.

Research in cavitation, underwater explosions and vortex sheets is currently under investigation by Dr Wee-King Soh of the Department of Mechanical Engineering and Mr John Best of the Materials Research Laboratories, who is on secondment at the University to undertake research for his PhD.

The phenomenon of cavitation is a well known fluid mechanics problem in engineering. The formation of tiny vapour bubbles in hydraulic machinery or pipes is known to generate undesirable vibrations and noises and eventually cause premature failure over an operation period measured in days. The physics of this phenomenon is a complicated one: it is an unsteady flow with an ill-defined initial condition. It is because of this complexity that it attracted the collaboration between Applied Mathemati-

cians and Engineers in Wollongong. Currently Dr Wee-King Soh is undertaking detailed experimentation in this area and over the years, by means of varied research funding, he has built up the necessary equipment for the project. Essentially, the equipment consists of a cavitation bubble chamber which uses high voltage discharge through electrodes for the generation of a cavitation bubble. A NAC-10 high-speed camera, which is capable of recording up to 20,000 half frames per second, is used to capture a sequence of images of bubble distortion for analysis.

Research into understanding underwater explosions is being pursued from both theoretical and experimental perspectives and it is clear from this investigation that close bonds must be forged between experiment and theory in order that a physical phenomenon may be completely understood. There are two principal damage-causing mechanisms associated with an underwater explosion. Upon detonation, a shock wave propagates into the water and its impact upon marine vessels is a celebrated damage causing agent. Also observed is the creation of a large bubble in the water, a bubble that contains the gaseous remains of the detonation.

Research into underwater explosive effects thus proceeds with parallel projects directed towards gaining a greater understanding of the motion of the shock wave and the bubble. Studies in shock dynamics are concerned with developing the mathematical formalisation describing the motion of the shock and implementing the equations developed into a computer model that determines the motion of the shock wave as it propagates around various geometric target shapes. Investigation of the motion of oscillating bubbles has revealed many subtle and curious behaviours. Jetting phenomena are a familiar characteristic of bubble collapse but studies of the fluid dynamical problem of bubble collapse has revealed a rich class of behaviours, including the phenomenon of bubble rebound, where the compression of the nebulous bubble

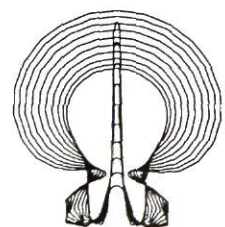
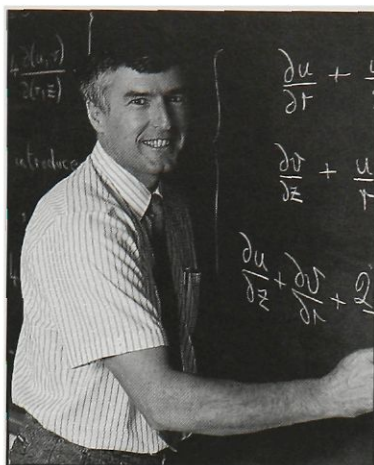


Figure 1

contents upon collapse forces the bubble to re-expand. When the forces acting upon the bubble are nearly balanced, intriguing behaviour such as that illustrated in figure 1 is predicted. It is postulated that in this example the bubble breaks into a number of different parts, each with a complex and, as yet, not understood structure. John Best received the 1990 Sir Thomas Cherry prize awarded for the best student seminar at the annual Australian Applied Mathematics Conference for his presentation of these ideas.

This phenomenon is also being investigated experimentally by Dr Wee-King Soh and the Underwater Weapon & Countermeasure Systems Division of the Defence Science & Technology Organization (DSTO), is forming a Tertiary Institution Research Agreement (TIRA) with the University. A proposed project on a scale model study of underwater explosion is being considered for funding.

The preliminary work has shown that it is feasible to carry out a scale model study on the behaviour of an exploding bubble. Initially, the project will concern the investigation on the magnitude of the momentum and the energy dissipated by



The Program Co-ordinator is Professor James Hill

the exploding bubble. Work is under way to fulfil a contract from the Underwater Weapon & Countermeasure Systems Division, DSTO, to build a decompression chamber, over one cubic metre in volume, for use in this scale-model study.

Dr Soh is also involved in vortex sheet techniques for flow separation and studies have been carried out on the flow around

sharp edges such as wings and bilge keels, the wake of aircraft and the unsteady forces of a cylinder, representing a bluff body. The current interest is centered on the effect of the secondary flow separation on the shedding of vorticity and resonance in the flow over a flat plate. This research is in collaboration with the Division of Building, Construction and Engineering, CSIRO.

Other work currently being undertaken in the research program involves applications of microwave energy, ocean currents on the North-west Shelf of Australia and the eruption of volcanoes. Theoretical analysis of important industrial processes involving microwave heating of materials has been undertaken. This analysis is difficult owing to the temperature dependence of the material properties, which in turn affects the absorption of microwave energy. Criteria have been obtained for when the heating process becomes unstable, leading to the development of regions of very high temperature (hot-spots). These hot-spots can be either desirable or undesirable, depending on the application. The effect on the microwave field of the material being heated is being investigated and has been found to lead to the generation of harmonics of the input microwave radiation.

There are oil and gas drilling platforms which are situated on the North-west shelf of Australia. In particular, a few platforms are situated on the continental shelf edge. Those drilling platforms situated on the edge of the continental shelf experience more prevalent structural damage than other drilling platforms. One possible reason is that large amplitude waves are generated by tides on the edge of the continental shelf. The waves which are generated decay rapidly towards shore. Analytic and numerical methods are being developed to study the mechanism of the generation of these large amplitude waves by way of perturbation methods using the semi-diurnal tide as the forcing mechanism.

Finally, another process that has been investigated mathematically is the eruption of volcanoes. It has been shown that a simple model of the flow of magma in the Earth's mantle leads to the formation of local regions of high magma concentration. These regions rise to the Earth's surface and cause volcano eruptions.

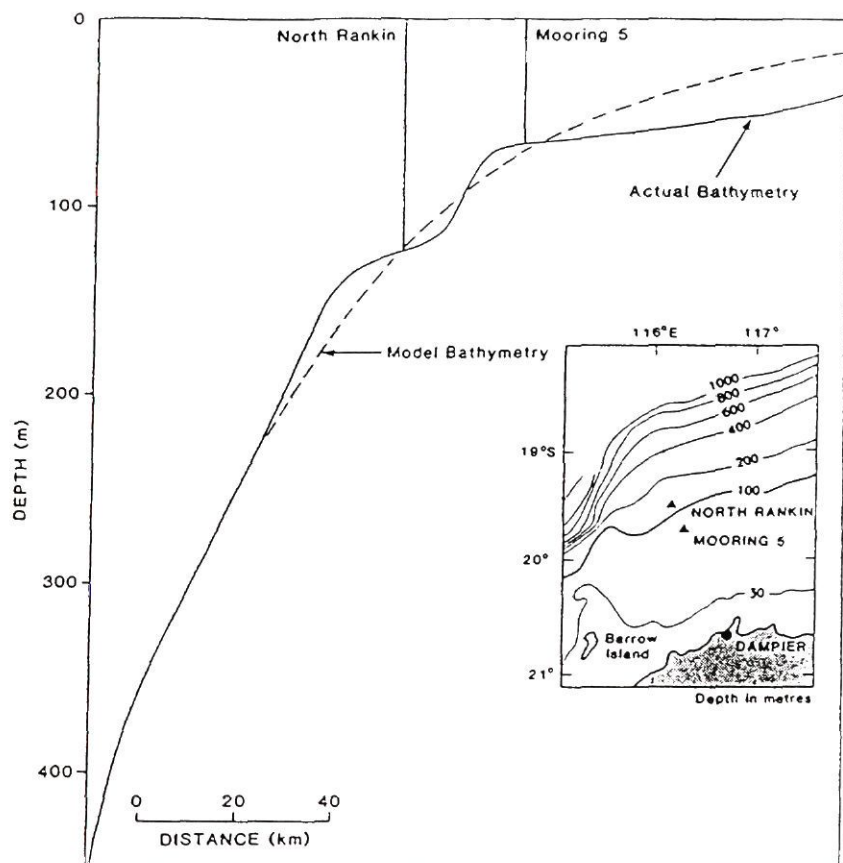
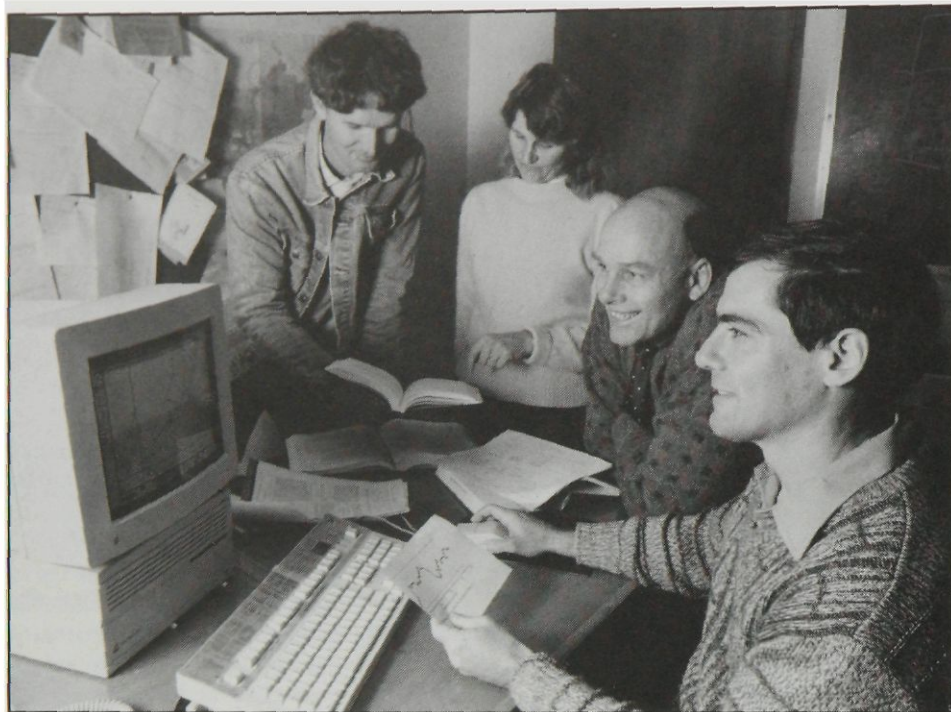


Figure 2. Shape of North-west Shelf



Professor David Griffiths is second from the right. With him are, from the left, postgraduate research students Bernard Ellem, Lynn Morris and, on the right, Dr Ross Sparks

Statistics as a discipline is concerned with collecting, storing and interpreting information. It relates, as such, to all fields of human endeavour. This breadth of application is reflected in the activities of the Applied Statistics Research Program. Current activities of the program involve development of relevant mathematical theory and application to problems in diverse areas including engineering, education, economics and epidemiology. Some of the project areas of the research program are:

Quality Management

Several developments have taken place in the area of quality management. Dr Ross Sparks has developed new techniques of control charting for multivariate data. In the case of bivariate data, elliptical control limits can be used as analogues of standard univariate techniques such as Shewhart, CUSUM and exponentially weighted moving average charts. Through the use of principal components and similar statistical procedures for reducing dimensionality, Dr Sparks has also extended these techniques to situations where three or more variables are to be simultaneously controlled. A complementary descriptive procedure for displaying information regarding shifts away from target values for means (and for covariance structures), which is a simple application of

Gabriel's correlation biplot, has been developed.

Dr Shahab Ghahreman has developed a robust CUSUM method of control charting based on the empirical probability integral transform. This non-parametric approach has been demonstrated to out-perform currently used control-charting methods when applied to skewed and other non-normal distributions.

Dr Ghahreman and Professor David Griffiths are also developing efficient software for improving standard kernel methods of density estimation. The purpose of such methods is to develop reliable procedures for describing and estimating the shape of distributions. These procedures refine such simple data-based procedures as the histogram to provide shape estimates without making parametric assumptions regarding the form of the probability distribution from which a data sample is drawn. Data-based methods of estimation such as this are the basis of the modern computer-intensive and non-parametric approach to statistical inference and can be applied widely beyond the context of quality control which is the focus of this research.

Professor Griffiths has also been responsible through his involvement with Standards Australia for extensive development of new Statistical Quality Control standards for Australian industry.

Econometric Modelling

In the area of econometric modelling, Associate Professor Tran Van Hoa is working on the theoretical development of improved Stein estimators for linear models. These estimators have been studied extensively by econometricians and statisticians over the past 20 years. Professor Hoa's theoretical research is aimed at discovering properties of these estimators for various non-standard models. He is also applying the theoretical results to simultaneous-equation models for the output growth of major OECD countries. As yet, the effort in this application has been devoted to acquisition of the OECD data bases and preparation of these data preliminary to the use of improved Stein estimators.

Dr Sparks, in collaboration with Professor John Affleck-Graves (Notre Dame) and Professor Graham Barr (Cape Town) has applied statistical model selection criteria to the choice among the Capital Asset Pricing Model, the Market Adjusted Model and the Single Factor Model as predictive models for price fluctuations on the Stock Exchange.

Decision Theory

Problems involving collaborative decision making arise regularly in most areas of human activity whether in business, domestic or social areas. Statistical decision theory is concerned with creating a formal setting for such problems and finding mathematically optimal solutions. Most of the theory relates to models in which it is assumed that there is a single decision maker.

Dr Chandra Gulati is collaborating with Professor Prem Goel (Ohio State University) on statistical models for decision making teams with a variety of voting rules and differing assumptions regarding the costs of acquiring information and the value to the team of that information.

Raw Material Processing

Dr Pamela Davy is working with Mr Tan-Hui Yang on the statistical image analysis of raw materials. This has important industrial applications in the area of mineral processing. In order to assess the viability of new ore bodies, and to optimise the processing of existing ones, a critical factor is the manner in which the ore texture affects fracture during crushing and grinding. In modelling the breakage of heterogeneous materials, it is mathematically convenient to assume that fracture occurs independently of the underlying texture. However, this assump-

tion is commonly violated in Australian mining operations. There is a need to develop methods of quantifying non-random breakage from image data and to investigate its effects upon subsequent processing. This research project involves collaboration with CSIRO Division of Mineral and Process Engineering, and Mt Isa Mines Ltd.

Beach Dynamics

Associate Professor Des Clarke has continued his statistical studies of beach dynamics. Before 1980, long-term beach erosion studies were mainly confined to an analysis of the annual winter-summer cycle as related to the annual wave regime.

Studies at Warilla beach, NSW, have established that the interannual variability is dominated by a quasi-biennial oscillation, which was previously unknown, followed by a 3-year to 3.5-year oscillation identifiable with the meteorological Southern Oscillation. The Southern Oscillation is the name given to the mean monthly sea-level-pressure differences between Tahiti and Darwin. Examination of daily synoptic weather charts for Australia spanning 26 years has established that the weather system intensities also fluctuate with a quasi-biennial oscillation, again, previously unknown. These have been linked with erosion on Warilla beach with a correlation coefficient of 0.49. Allowing for the strong persistence in both data sets, a significant correlation is obtained above the value of 0.21.

Previous researchers have correlated beach changes with weather at a coefficient value of 0.1. Hayden (USA) has demonstrated that prediction with skill is attainable for cyclone frequencies on the eastern coast of USA. The studies here represent a parallel study made over relatively small regions of the Australian coast, where beach variability data are of reasonable duration. In ongoing research, a number of autoregressive models has been tested for prediction of the Southern Oscillation and several improvements have been made to predictive performance.

Consulting and Collaboration

Members of this research program are also associated through their applied statistics research with several other programs. Further, through the Statistical Consulting Service led by Dr Ken Russell and set up in 1989, the program's activities are extended to the whole University research community (as well as to external clients in industry, commerce and the public sector).



Researchers Kyle Bruce, left, and Dr Chris Nyland

The changing shape of the Australian labour market in recent years has created a demand for more information about specific labour market groups at both national and regional level. Much of the work of the Labour Market Analysis group over the past year has been designed to meet these demands. The fact that several projects have been sponsored by government bodies such as the Department of Employment, Education and Training, the Office of Labour Market Adjustment (OLMA), the Bureau of Immigration Research and the South Coast Employment Development Project, indicates both the growing demand for this research and the increased ability to supply it.

John Mangan's work on modelling the regional employment situation in the Illawarra took an important step forward with the development of a software package for OLMA. This enables researchers to gain instant access to data on the Illawarra labour market. Cross tabulations can be easily made to provide information on particular labour-market groups in the region. Further work for OLMA will adapt the program for use in other regional labour markets.

The Bureau of Immigration Research has commissioned the Centre for Work and Labour Market Studies (chief researcher John Mangan) to investigate the experience of recent migrants in the labour market. This study, to be carried out in Sydney, Melbourne and Wollongong, focuses on the

groups with the second-highest levels of unemployment in Australia. The labour market situation of women migrants will be given particular attention in the study.

Women's work is also the focus for Don Lewis and Chris Nyland. They are examining reasons for occupational segregation in the workforce which lead to a sexual division of labour. They examine contributions from the history of economic thought as well as extensively analysing census data on the occupation of employed people. This will lead to establishment of a database that will make it possible to analyse the relationship between gender-based physical differences and occupational segregation on other labour-market outcomes such as earnings, incomes and hours of work.

The measurement of 'shadow wages' for inclusion in cost-benefit studies to assess the wider community impact of natural resources projects is being carried out by Dodo Thampapillai and Charles Harvie. This aims to capture non-market measurements so as to obtain estimates of true economic costs generated by natural resource developments. The inclusion of labour costs in these estimates adds a new dimension to the analysis of an area of major policy concern.

Wider labour-market policy impacts are assessed in the work of Robert Castle, examining the impact of regulation and deregulation on the Australian labour market. Recent work has focused on the impact of deregulation on public-sector

labour and the ways in which award restructuring might develop within the public sector. This work has been presented to the Industries Commission in Canberra as well as at other conferences looking at award restructuring and microeconomic reform.

Di Kelly's project on workplace industrial relations in the steel industry looks at the ways in which the workplace affects the development of work practices. The Industrial Relations Commission is currently moving towards more industry, enterprise and workplace bargaining within guidelines set by the Accord, and hence the definition of the workplace and its relationship to the enterprise and industry are essential for understanding how work is defined and regulated.

Disadvantaged workforce groups such as Aborigines, unmarried mothers and migrant workers continue to receive attention in the program. In particular, regional aspects of the problems facing these groups are being analysed.

Don Lewis is using data from the Australian Longitudinal Survey to measure the number and length of interruptions that women have during their careers and the impact these interruptions have on their earnings and career progression. Empirical estimates suggest that such interruptions are an important reason for both the earnings gap between men and women and occupational segregation.

Don Lewis is also studying the transition between study at TAFE and study at university. In particular he is evaluating the performance of university students who have been granted advanced standing on the basis of TAFE certificates. These projects are funded by DEET, and the Longitudinal Survey is also funded by the Australian National University.

Overall, the program is attempting to provide empirical and theoretical analysis of a wide range of Australian labour market problems. The main emphasis has been regional employment and disadvantaged groups but more attention is now being given to broader policy issues. The aim is to provide a greater understanding of how the labour market affects different groups in the Australian workforce.

The major causes of chronic ill health and death in Australia, whatever the age group, have their roots in social and behavioural circumstances. Certain groups, eg the elderly and lower socio-economic groups, are more prone to illness; others through their behaviour such as smoking, lack of exercise, or careless driving put themselves at increased risk. This means that social and psychological factors are fundamental to initiatives designed to prevent disease or to promote health.

These are the overriding aims of this research group which includes community health practitioners, planners and conceptualisers, nurses, nutritionists, psychologists, sociologists and demographers. The group has drawn up an agenda which will focus on these issues in most of our continuing projects:

1. basic descriptive information about health problems;
2. the fundamental psychosocial processes underlying these issues;
3. health services currently available for these problems;
4. equity of such delivery (which can vary according to the economic status, culture, gender and sexual preferences of patients);
5. evaluation of health services delivery;
6. analysis and development of health care policies;
7. analysis and development of health promotion policies.

Terminal care services

This project, which has already attracted funding from the New South Wales Cancer Council, is focusing first on who is using which of the range of terminal care services available in the Illawarra, and then monitoring that supportive process as it occurs for patients, relatives and service staff (Professor Christine Ewan, Associate Professor Linda Viney, Dr Beverly Walker and Ms Jan Pincombe). Additional psychotherapeutic intervention of meditation and relaxation training is being examined (Dr Saroja Srinivasan). The equity of service delivery is being monitored by economic status and also by culture (Dr Nigel Mackay). The evaluation of the services is in terms of the quality of life of patients, relatives and staff, as well as cost benefit analyses.

Policy analysis is occurring in terms of those policies underlying the development of a palliative care service to supplement

existing services within the Illawarra region (Dr Stephanie Short). At the more fundamental level the group are testing a model of psychologically 'healthy' dying, which should be of considerable use for health professionals, patients and families. The current focus of this project is on patients with cancer, but it is to be extended to deal with the full range of causes of death.

Counselling for psychosocial reactions to AIDS

This long term project, in which Associate Professor Viney and Dr Walker are chiefly involved, has been designed to develop and trial psychotherapeutic interventions for people who are affected by AIDS. It has been conducted in Sydney, Melbourne and Canberra, as well as Wollongong. Data collection is finally finishing, and data analysis has begun. Much of the team work this year has focused on the refining of the interventions, with first attempts to report them so that they can be used by other AIDS counsellors.

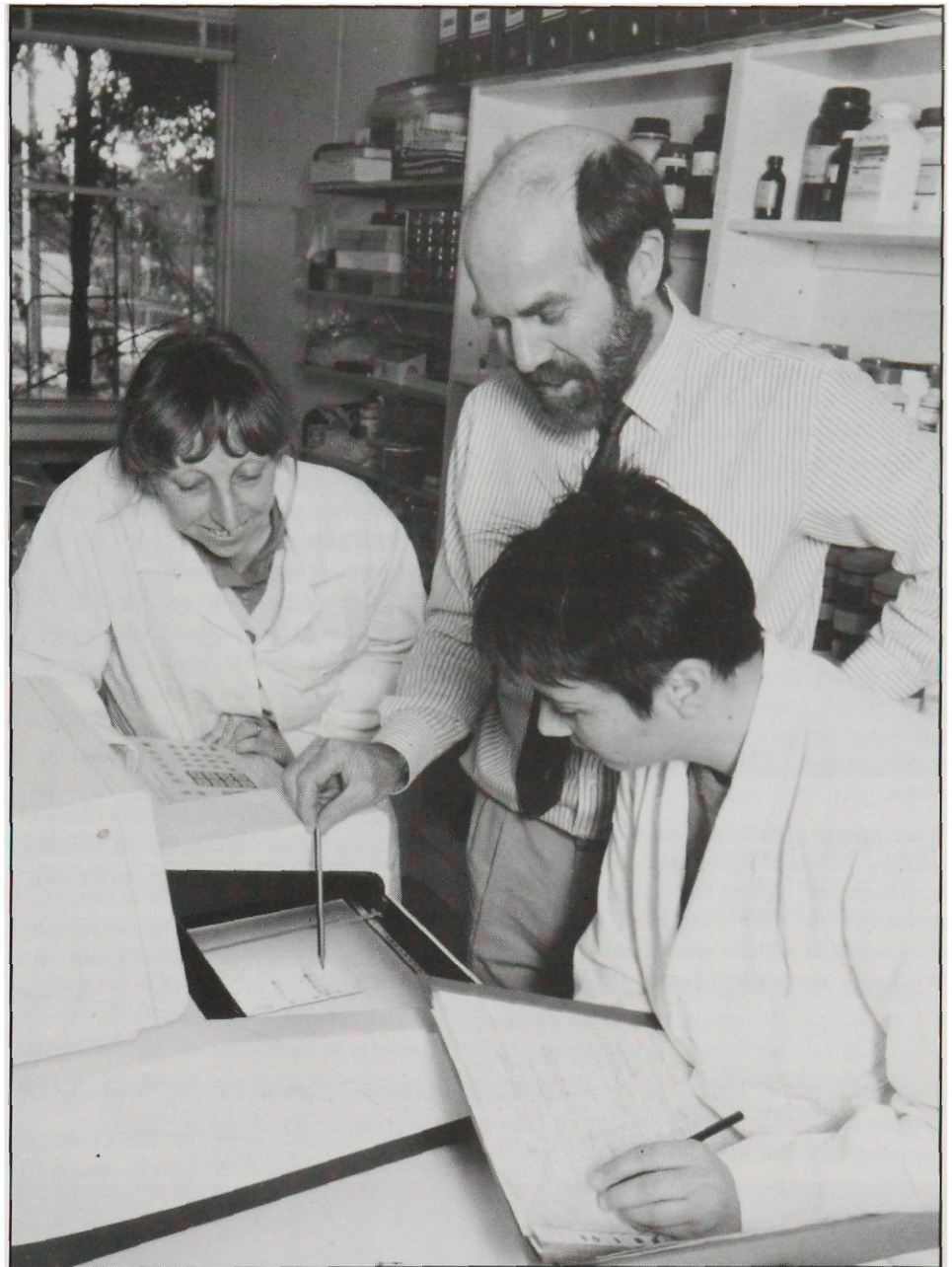
The same issues are dealt with. For example, who needs counselling services? Many of the voluntary carers of people in the later stages of AIDS have proved to be in as much need as those who were HIV positive. A range of individual and group interventions are being written up. This team is coming to advocate a form of AIDS counselling which uses the concept of narrative reconstruction, the value of patients learning to recognize that they can choose to retell their own life stories, even when those stories must include illness-related events. The equity issue here has been one of sexual preference, since many people currently developing AIDS in Australia are members of male homosexual communities; and their continued empowerment in dealing with the AIDS has been one of the goals of the program. Evaluation of the psychological affects of such psychotherapeutic intervention additional to other treatments is being carried out in terms of quality of life and perceived use of social supports. Health services care policy about such additional interventions is also being targeted. And at the fundamental level of underlying personal processes, a model of psychological reaction to illness developed and tested initially with people with other illnesses is being re-tested with people affected by AIDS.

Public health

The Public Health group within the program (Professor Dennis Calvert, Professor Christine Ewan and colleagues) is the newest development within the program. They are defining several fields of interest and seeking funds for these fields. The 'new public health' approach which relates public health to a wide range of environmental and social concerns (ranging from jobs and job satisfaction through to social isolation and bus services) provides the framework for the group.

An increasingly important area of public health concerns the allocation of resources in our health system. For instance, we lack information on the costs and effectiveness of various strategies for management of patients where, for instance, home care or nursing home care is a viable option to hospital care. Studies in other centres have focused on the definition of diagnosis related groups within hospitals, and the ways in which this concept can be used for resource allocation. Studies on patient management outside hospital and the costs and effectiveness of various resource allocation strategies should lead to better and more equitable allocation of resources in health and ultimately to a healthier community.

The Better Health Commission defined better nutrition as a major health requirement in Australia. An example of a nutrition program is one to lower blood cholesterol levels in the community, and thus the rate of premature heart attacks. Programs may focus on specific topics, such as the prevention of osteoporosis in later life or the prevention of iron deficiency, or they may be more general. There are difficulties in mounting programs for better nutrition. Costs, real and perceived, the beliefs and habits of the community, and factors relating to the accessibility, the educational level and the socio-economic status of the target community must all be considered. Discussions are under way on intervention and assessment programs.



Professor Dennis Calvert in his laboratory with his assistants Christine Contasos, left, and Karin Garrety

In order to deal with public health and formulate policies the health status of the population in relation to other indices must be known (where they live, what their houses and jobs are like, what financial, social and educational resources do they have, and so on).

In conjunction with the Department of Health, the University is establishing a Public Health Unit which will monitor health statistics in the Illawarra, develop new indices of health status and other relevant factors, and assess the effectiveness of health-related interventions.

As a basis for these activities, fundamental information on the way people live in the

Illawarra is required. The establishment of a large-scale cohort study in the Illawarra with the National Centre for Epidemiology and Public Health in Canberra is currently being explored.

Finally, the Illawarra has been a pilot in Australia for the Healthy Cities project. This project has been defined as an attempt to develop intersectoral concern for health and to put health on the agenda of many social agencies, and in these terms the project in the Illawarra has been very successful. Evaluation is taking place in 1990. The continuation of the Healthy Cities project has been assured, but decisions on strategies for its development will follow evaluation.

It is now widely acknowledged that the development of new (advanced) materials technology is a vital component of Australia's drive towards an export-competitive manufacturing industry. Research and development of advanced materials has been a significant activity of members of the Department of Materials Engineering for over ten years. Early research on shape memory alloys and glassy metals has been complemented more recently by investigations in the fields of ceramics, polymers and composites, particularly composites produced by surface engineering processes such as ceramic coating of metals and zinc alloy galvanising of steel. These activities have been co-ordinated under the Advanced Materials and Surface Engineering Program, with the common purpose of materials development and evaluation of structure-property-performance relationships.

The Program is multi-faceted and three projects have been selected for discussion in this report: rapidly solidified metals, metal matrix composites and shape memory alloys.

When certain metallic alloys are rapidly solidified, the usual liquid-to-solid atomic rearrangement leading to a crystalline structure in the solid is suppressed and the alloy solidifies with an amorphous or glassy structure – essentially the same atomic

arrangement that existed in the liquid phase. This difference in structure results in properties very different from those in the conventionally produced material. Research in the Department of Materials Engineering under the direction of Dr Gordon Delamore is focused on the superior soft magnetic properties of certain glassy iron-based alloys, currently in production for electrical power transformer applications where their low core losses compared to the conventional silicon steels make them commercially attractive. The intrinsically good properties of these alloys may be still further improved by heat treatment. For use in low-frequency applications, it is important that the heat treatment does not result in crystallisation or the advantages of the glassy state are lost. In high-frequency applications, on the other hand, the properties may be enhanced by a small amount of crystallisation which results in a refinement of the magnetic domain size, more than offsetting the deleterious increases in coercivity and hysteresis loss which are produced by the crystallisation. The work consists of a detailed study of the crystallisation kinetics of a range of iron and cobalt-based alloys with the aim of devising optimum heat treatment schedules for each alloy and application.

Metal matrix composites, based on aluminium, are prime candidates in the world-

wide demand for high strength, light-weight, corrosion- and temperature-resistant materials. In particular, metal matrix composites of aluminium and silicon carbide show outstanding potential as structural materials for applications such as components for aircraft, superfast trains and turbine and internal-combustion engines. These materials offer advantages over organic matrix composites in relation to thermal resistance, environmental stability, formability and design flexibility; and over traditional metallic alloys in terms of strength-to-weight ratio and elastic stiffness.

The elevated temperature behaviour of aluminium-silicon carbide composites has recently received attention because of the prospect of potential applications as compressor blades in gas-turbine engines. Research into the high temperature strength and stability of these materials is of considerable technological importance and Dr Tara Chandra is leading a project concerned with the high-temperature behaviour of aluminium-silicon carbide composites. The principal aim of this work is to determine the effect of high-temperature exposure on strength and on the integrity of the interfacial bond between the metallic matrix and the ceramic particles. Hot mechanical testing of these composites is also planned to elucidate their response both to hot working and creep conditions.

'Shape memory behaviour' describes some unusual mechanical properties exhibited by certain classes of alloys. The outstanding property is the ability to recover very large strains – up to 16 per cent strain, compared to a typical limit of about 0.1 per cent in most metals. If the strain is recovered immediately on stress removal, the effect is known as superelasticity; whereas, if moderate heating is required to activate the recovery, the phenomenon is called shape memory effect (SME). The former effect is associated with the highest recoverable strains, while SME is normally limited to about 7 per cent strain recovery.

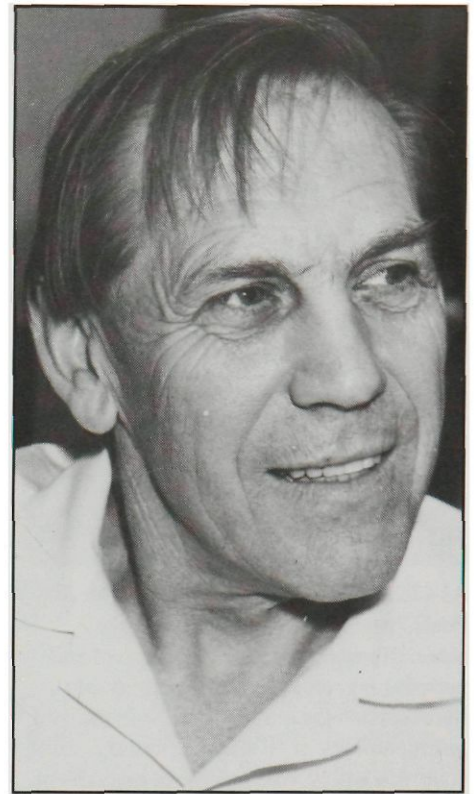
Shape memory alloy applications are usually based on one or more of the following functions: *free recovery of strain*, causing motion; *constrained recovery*, applying a force; *actuation*, sensing temperature and doing work; and *superelastic recovery*, releasing stored elastic strain. Commercial applications include heat shrinkable couplings, rivets and connectors (constrained recovery); automatic sprinklers, temperature control devices and thermal overload systems (actuation); and orthodontal archwires, surgical location hooks and implant devices (superelastic and/or constrained recovery).

Associate Professor Druce Dunne and Dr Gordon Delamore examine an alloy compositional analysis obtained from an x-ray energy dispersive spectrometer attached to a Hitachi Scanning Electron Microscope in the Department of Materials Engineering





Left: Dr Tara Chandra heads the research project concerned with high-temperature behaviour of aluminium-silicon carbide composites



Associate Professor Noel Kennon has a long association with Associate Professor Druce Dunne in research into the behaviour of shape memory alloys

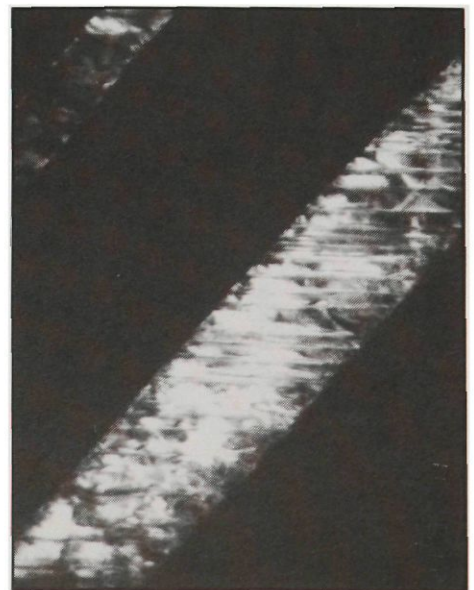
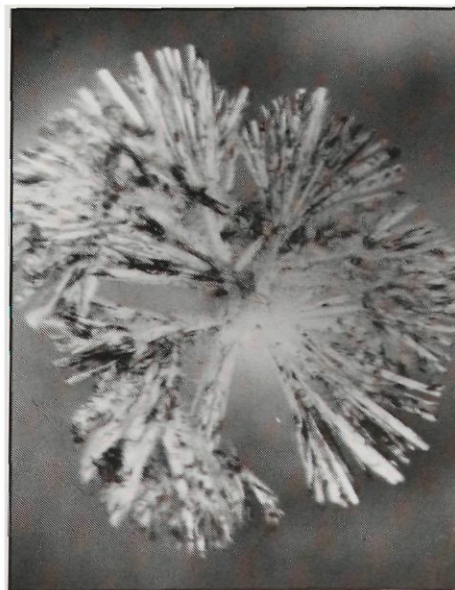
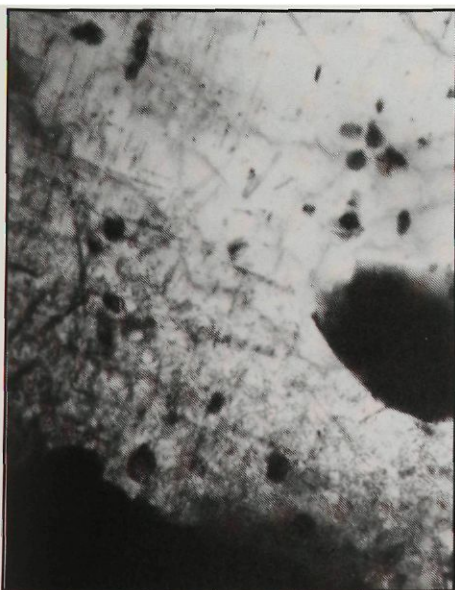
By far the best alloys so far developed are the Nitinol group which are based on about 50 atomic per cent each of nickel and titanium. These alloys are expensive to produce in appropriate forms and less costly alternatives such as copper- and iron-based alloys are being sought. Towards this end, fundamental studies of crystallographic relationships in copper-based shape memory alloys are in progress under the supervision of Associate Professors Druce Dunne and Noel Kennon. The aim is to elucidate the mechanism of shape memory

behaviour and thereby provide guiding principles for the optimisation of alloy composition and processing treatments. Additional work in collaboration with Dr Gordon Delamore involves the application of the melt spinning, rapid solidification, technique to the production of shape memory alloys in the form of thin strip. Rapid solidification leads to grain refinement, which can be beneficial to shape memory capacity, as well as modifying the degree of structural order. Grain refinement and structural modification have been

demonstrated in a commercial copper-based shape memory alloy and evaluation of the effect on shape memory capacity is in progress.

All these projects are based on the development and/or evaluation of the structures and properties of the materials being investigated and are interesting and significant both from a fundamental viewpoint and in their potential for commercial exploitation.

Transmission electron micrographs of (left) aluminium silicon carbide composite material showing coarse carbide particle (dark) with a high defect density at the particle-matrix interface, x 10k; (middle) spherulite in annealed cobalt-silicon-boron metallic glass, x 5k; (right) twinned martensite plate in thermolastic iron-platinum shape memory alloy, x 100k



Members of the Fossil Fuels Program see Australia's energy requirements being maintained at a relatively high level well into the 21st century, with both coal and petroleum continuing to be essential for Australia's immediate and long-term energy requirements. Closely allied to this will be the maintenance of steaming and coking coal exports, as the Australian economy relies heavily on these commodities to overcome balance of payments problems. A significant increase in oil prices or a change in government policy could see a shift towards alternative sources of liquid hydrocarbons, in which case oil shale may again be prospective.

As a leader in fossil fuels research, the Fossil Fuels Program has evolved a diverse research program encompassing coal and petroleum geology, organic petrography, hydrocarbon generation, geochemistry and sedimentology of oil shales, ground control and mine safety, coke, resource assessment and quality control.

The Program welcomes Professor Raghu Singh, recently appointed head of the mining section of the Department of Civil and Mining Engineering, as a member of the research team. His experience in the mining industry and in academe will bring additional expertise and increase the effectiveness of the Program's activities.

In February, the International Commission for Coal Petrology (ICCP) held its annual meeting at the University of Wollongong and program members were pleased to be associated with this activity. Mr Aivars Depers and Professor Cook were two of the organisers and much of the success of the meeting can be credited to them. The commission has several working parties which continually review the directions and applications and uses of coal petrology as related to the working parties. Members of the Program participate in and assist with the organisation of round robin exercises and discussion. Such activities ensure that the participants are well informed about leading research techniques and applications of petrology to coal and petroleum generation studies.

A welcome addition to the Fossil Fuels Program is a new Leitz MPV microscope with photometer. This sophisticated equipment was delivered in February and additional parts will be ordered later in the year to complete the purchase. The photometer data are directly input to a computer with programs that allow reflectance and fluorescence spectral data to be output via graphics or tabulated copy. The new facilities will be beneficial to the Program and both researchers and postgraduate students will benefit from their use.

Thick-seam Mining

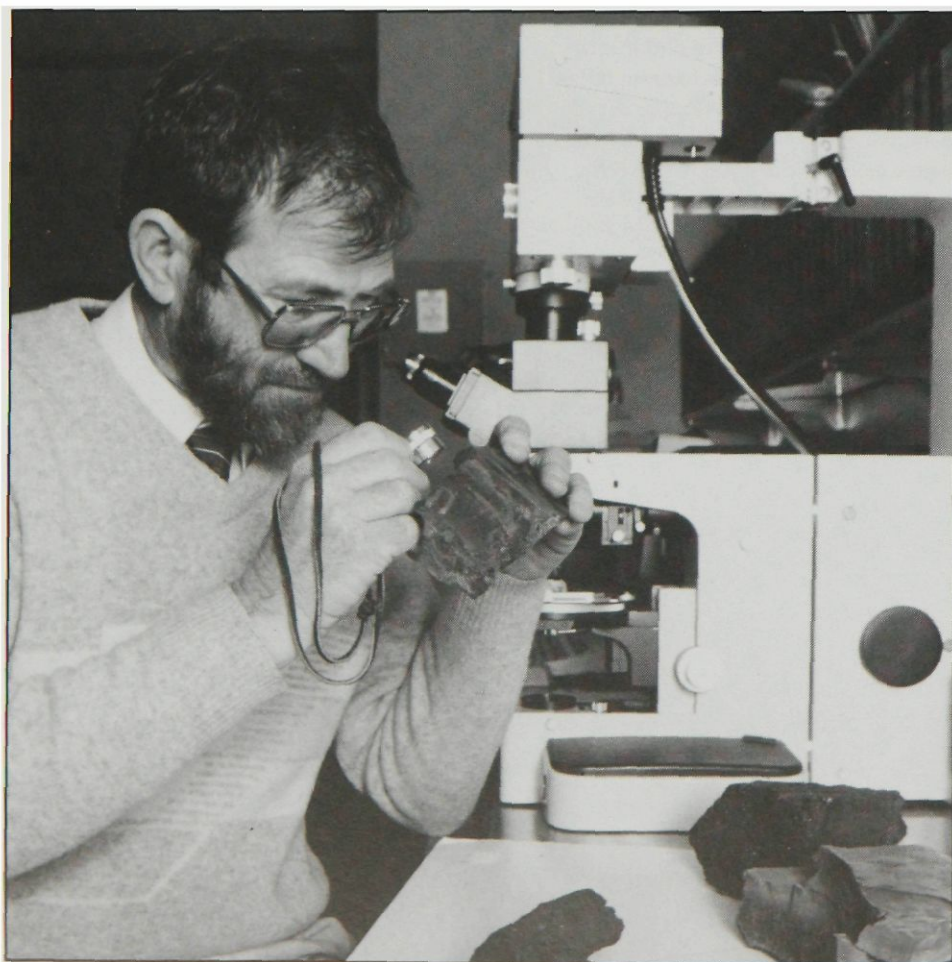
This project continued ongoing research into mine safety, gas in coals and the integration of the classical approaches to support determination to coal seams. A new initiative in 1990 is a project on longwall dust extraction. This work is designed to reduce dust hazards at longwall mining faces and therefore to improve mine safety and the health of the miners. This project has received financial support from the Joint Coal Board and several areas for additional support are being canvassed. The project is expected to continue for three years and at least one postgraduate student is being sought for the project. As the project expands, priority will be given to the development of longwall dust extraction systems leading to improvements in the efficiency and safety of longwall mining activities.

In October 1989, a two-day workshop on colliery safety and computer systems was held at the Department of Civil and Mining Engineering. Members of the program contributed to the organisation of the workshop and presented several stimulating and practical papers on mine safety and the application of computers to the mining industry. Details of this workshop, including the availability of the proceedings volume, are available from Dr Ernest Baafi or Dr Najdat Aziz (Department of Civil and Mining Engineering).

Student activities continue to be fostered by project members and theses recently submitted or about to be submitted relate to the application of expert systems to mine gas analysis and the development of drilling strategies using geostatistics.

Dr Baafi has also been writing and testing an algorithm which can be used to evaluate a deposit using geostatistical techniques. Codes for personal computers have been developed and tested using drillhole data.

Leader of the Fossil Fuels Program, Dr Adrian Hutton, has been joined by Professor Raghu Nath Singh – and a new Leitz MPV microscope with photometer



Sedimentology and Stratigraphy of Coal Sequences

The major area of research in this project for the past three years has been a revision of the geology, stratigraphy and coal resources of the southern Sydney basin, a study that was funded by NERDDP (National Energy Research Development Program). This study has been completed and the final report submitted. The recommended revisions to the stratigraphy of the southern Sydney Basin not only provide a more workable system but also will allow meaningful correlations with the Western Coalfield.

Results of the study were presented at a one-day workshop which was held at the University of Wollongong on February 15, prior to the ICCP meeting. The workshop was attended by approximately 40 researchers and 13 papers were presented. Topics included gas in coal seams, stratigraphy, structural geology, environments of deposition and the use of trace elements to distinguish roof and floor rocks of the Bulli seam.

The program contributions were presented by industry, academe and government research institutions. An extended abstract of the workshop will be issued as one of the abstract series of the Geological Society of Australia. Following the workshop was a three-day excursion to the Western and Southern Coalfields which included an examination of drill core and outcrop and visits to scenic and historical places of interest.

Details of the NERDDP study and workshop or copies of the report, excursion guides and workshop abstracts are available from Dr Adrian Hutton or Dr Brian Jones (Department of Geology).

Two theses which are nearing completion are closely allied to and augment the NERDDP-funded study. The first is a PhD study which is undertaking a more detailed study of the environments of deposition of the various coal measures units and the second, an MSc study, details the properties of the Bulli seam and the influence of the environments of deposition and structure on coal quality.

As a result of the study, several interesting aspects of the southern Sydney Basin geology will be investigated further. Two areas of special interest are the use of geological logs to determine facies types and associated mining conditions and the second is the application of sequence stratigraphy the better to understand the distribution and

formation of the complete Sydney Basin sequence. The program expects one honours student to begin studies using core and data from one mining company in the latter part of 1990 and several other honours and postgraduate topics are available for interested students.

Three Indonesian students are working on coal-related research topics specifically designed to provide input to the growing coal industry in Indonesia. One study is integrating knowledge gained from early mining activities in the Ombilin, Bukit Asam and Sengatta mines to statistical reserves estimates, while another study focuses on the properties and uses of chars derived from Indonesian coals. A third project is assessing the Banko coal of southern Sumatera as a fuel for the Suralaya steam power electric generating plant.

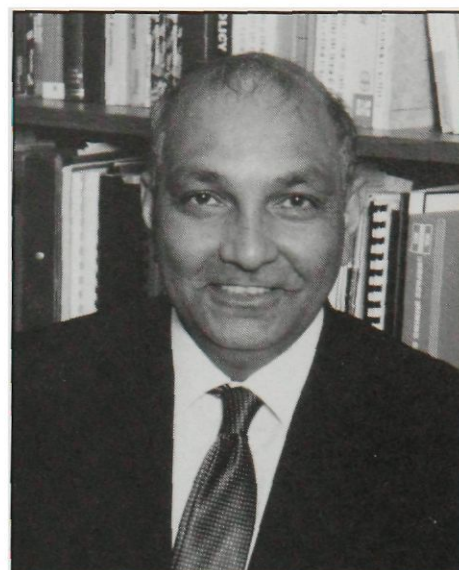
Dr Leonie Jones has established rock physics laboratory facilities and has undertaken preliminary measurements of elastic wave velocities in coal samples from the Illawarra. She has obtained an ARC (Australian Research Council) grant for investigating the dynamic and static elastic properties of coal under pressure. Such laboratory studies provide a fundamental basis for interpreting in-seam seismic studies in coal mines and for analysing the results of surface seismic reflection surveys over coal measures and petroleum-bearing basins.

Oil Shale Studies

Studies on the characterisation of oil shales continued with collaborative work between Dr Adrian Hutton and Dr David French (CSIRO Division of Exploration Geoscience). Main areas of interest related to the mineralogy of the Stuart and Condor deposits and interesting aspects of the geochemistry of the carbonate phases are being prepared for publication. A PhD thesis on the geochemistry of oil shales is nearing completion.

Petroleum Studies

In 1989, collaborative research, comparing the petroleum potential of Korean offshore basins with that of the Gippsland Basin, was initiated following the visit of Dr Kim Hong Yul, a Wollongong graduate. Funding was obtained from the Korean Ministry of Science and Technology and plans were under way to bring KIER staff to Wollongong for training. This project has been suspended following the sudden death of Dr Kim although negotiations are continuing to determine if the project will continue with other Korean personnel.



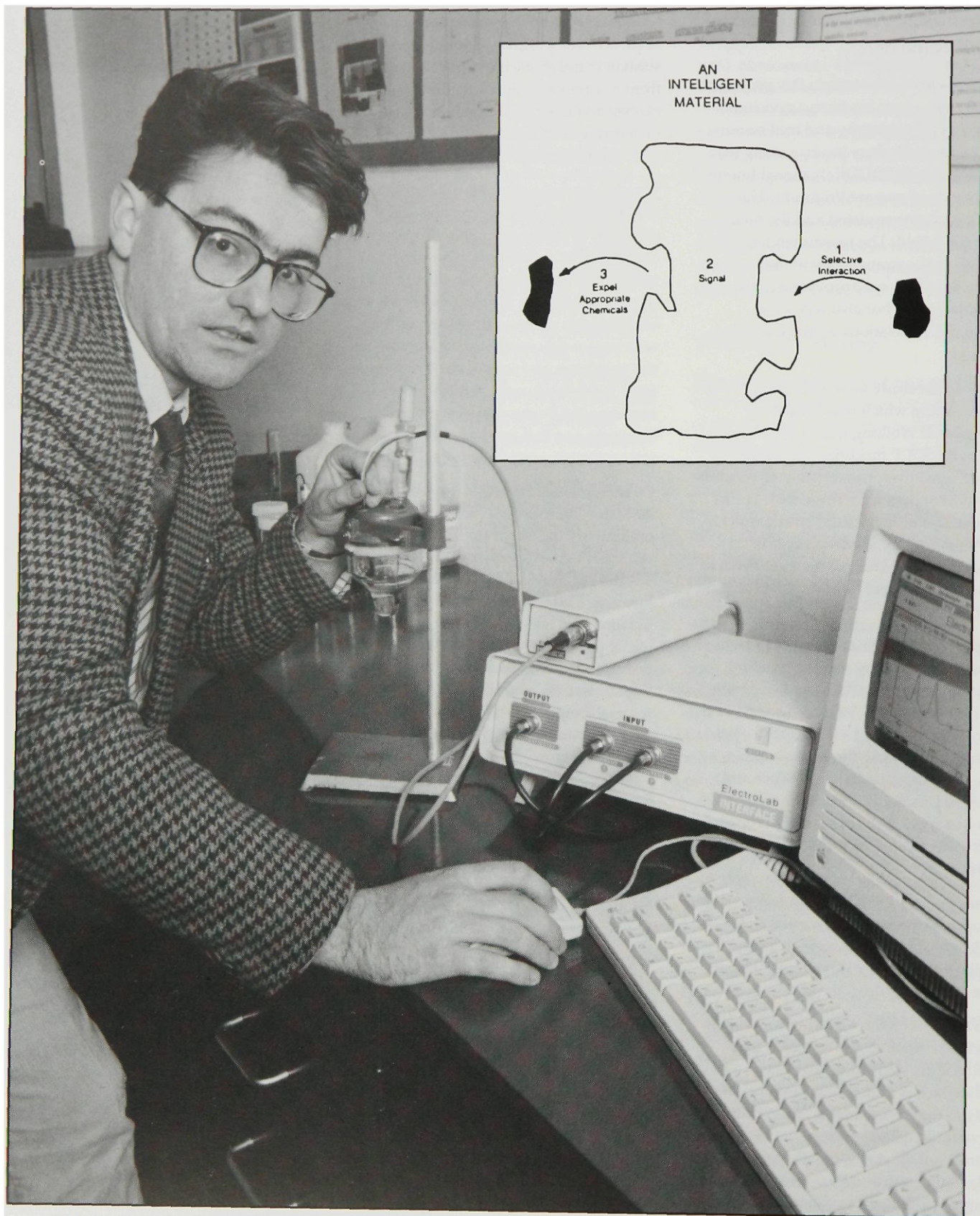
Professor Raghu Nath Singh

Professor Cook attended the meeting of the Australian Korean Business Cooperation Committee in Leura and presented a paper. Professor Cook also presented papers at an Australian Mineral Foundation seminar and at the CSIRO conference, Macerals 89.

A strong contingent of overseas postgraduate students is working in the petroleum-related projects with a bias towards South-east Asian basins. Several projects are assessing the coal and petroleum geology of Indonesian basins such as the Kutei, Pasir, Barito, South Sumatera, Melawi and Ketungau Basins. These studies are examining the relationships between the coals and hydrocarbon generation in Tertiary sequences. Techniques used include vitrinite reflectance, fluorescence studies of the liptinite components and geochemistry. After completion of their studies, the students will return to their home countries where they will be at the forefront of research and exploration.

INTELLIGENT MATERIALS

Co-ordinator: Professor G G Wallace, tel. 27 0504



Since 1985 Professor Gordon Wallace has been conducting research (which has attracted substantial grants) into intelligent materials – which may be defined as solids having unique chemical and/or physical properties which make them capable of operating as sensors

During 1989-1990 the Intelligent Materials Research Program (IMRP) has concentrated efforts in the area of environmental monitoring and control – an area which we all must agree requires urgent scientific attention. Intelligent materials have a great deal to offer this discipline, both in the short and the longer term. In the shorter term new chemical sensing systems which enable analyses to be carried out on-site and in the field are being developed. This research, of course, provides information which may be used to identify environmental problems – immediately – as they occur. Appropriate action can consequently be taken.

In the medium-to-longer term intelligent polymeric coatings, capable of detecting and remedying environmental problems without any operator intervention, will be produced.

Sensors

The general concept in this area is that a polymer can be designed to respond to specific pollutants in the environment while minimising the response to other species present. This enables response for very low level pollutants to be obtained even in complicated matrices.

Polymer materials have been developed which are capable of detecting heavy metals in water, organo-metals, chloramines, precious metals and even proteins. In addition, protective polymer caps which prevent pH probes from fouling during environmental-monitoring operations have been developed. The technology is also capable of sensing the presence of major pollutants such as phosphates, nitrates and pesticides – although a range of developmental work must be completed in this area.

Laboratory tests have already confirmed the feasibility of a legionella monitor and this concept could be extended to many other areas.

In most cases the lack of satisfactory sensor systems which can provide immediate information is the main reason for an inability to monitor, respond and control an environment. This generic technology overcomes these problems.

Instrumentation

In the course of the development of these new chemical sensors, a range of instruments have been developed by the Intelligent Materials Research Program. These include the ELECTROLAB system which

was launched as a commercial product in early 1990. The system is a laboratory-based electrochemical analyser capable of detecting environmental pollutants. (*Photo*) This system is extremely powerful, and capable of generating unique electrochemical wave forms and current sampling routines.

Another instrument under development is a low cost Water Quality Monitor (WQM). This hand-held device will quantitatively measure heavy metals in the part-per-billion and part-per-million ranges. The need and demand for such an instrument in potable water and trade waste effluent is enormous.

The longer-term objective is the development of a family tree of products based on the WQM concept.

In collaboration with others, the University researchers have also developed a device for continuous sampling and monitoring a specific range of chemicals in a process or effluent stream. During 1990 the chemical process necessary to allow use of this device for determination of metal ions in a process stream was developed. The system is now being field tested by The Australian Manganese Company.

This device represents a breakthrough in its ability to sample and quantitatively measure process in effluent stream constituents without continuous operator attendance.

Separations

Polymers can be engineered on a molecular basis to respond to selective environments. This permits the development of a range of polymers that can selectively separate component species with a high degree of discrimination.

There are two main application areas. The first is analytical systems, in which the principle can be applied to the development of new chromatographic columns and stationary spheres for determination of environmental pollutants. Selective analysis of components may then be achieved because of the enhanced discrimination or separation of the components. A system developed during 1989 has been used to achieve purification of even such complicated molecules as proteins.

The second application area involves mass separation or purification of effluent streams. Laboratory trials have already shown that gold and selected heavy metals can be successfully removed from aqueous solutions. One of the unique features of this technology is that the electrochemical nature

of the polymer allows components to be selectively captured and released, thus greatly simplifying conventional process extraction and purification.

Controlled release

The unique feature of the technology for controlled release is the ability to trigger release and to obtain a defined release profile. Controlled release profiles have been engineered and manipulated to respond to concentration, time or rate of release. A further degree of intelligence has been built into the polymer so that release does not take place until a minimum threshold limit is reached. For example, during 1989, materials capable of releasing complexing agents which can detoxify heavy metal pollutants were developed. These materials respond to an electrical signal which triggers and controls the rate of release of the detoxifying agent.

For environmental and process control situations the advantages of controlled release by intelligent polymers are obvious.

Typical cost advantages from this approach include reduced reagent consumption, effluent concentration control and predictable quality control of the process.

Integrated materials

The following integrated systems which can monitor and respond have been ear-marked for development by the Intelligent Materials Research Program.

- * Heavy metal detection and treatment.
- * Precious metal detection and treatment.
- * Bacteria monitoring and treatment.
- * Corrosion detection and treatment.

The individual components of these systems have been developed and a program to integrate these properties into a single material has been put in place.

Many chemicals and biochemicals have marked physiological activity, which may be either beneficial, as with drugs and normal body function, or detrimental as with environmental toxins. Understanding the behaviour of such molecules and the factors controlling their biological reactivity is therefore of fundamental importance, and has major implications in areas ranging from the pharmaceutical industry to environmental impact studies.

The Bioactive Molecules Research Program brings together overlapping research interests in the Departments of Chemistry and Biology involving the synthesis, characterisation, and testing of such pharmacologically and physiologically active molecules. This interdisciplinary approach has led to valuable cross-fertilisation of ideas, and has permitted a more comprehensive range of techniques and skills to be brought to bear on specific problems. For example, cell culture techniques from Biology have extended the scope of projects initially based in Chemistry involving the biosynthesis of pharmaceuticals.

The research activities have been focused into five related areas, involving an overall research group of some 30 personnel including nine academic staff. One major focus is the production of new or improved drugs either via novel synthetic routes or via their isolation from marine or terrestrial organisms and plants. An important element in this work is the elucidation at the molecular level of the basis of the physiological action of such molecules, as in a study of the mode of action of neurotransmitters such as dopamine in the brain. Another focus is the development of quantitative methods for the analysis of volatile organic and inorganic toxins in the environment.

These projects have attracted very substantial external funding over the past year, totalling some \$320,000 including \$60,000 from industry. A highlight was major support from the Australian Research Council and the Ramaciotti Foundation which, together with important contributions from the University of Wollongong, has permitted the purchase of a state-of-the-art, high-field 400 MHz nuclear magnetic resonance spectrometer. This instrument will markedly enhance our ability to elucidate the structure of bioactive molecules including quite large biochemicals. It will also be of major benefit to related Programs such as the Macromolecules

Research Program, as well as providing a resource for the region.

Recognition of the research strength of the Program in mass spectrometric analytical work is evidenced by the University of Wollongong being chosen as the venue in February 1990 for what was a highly successful 12th Annual Australian and New Zealand Conference on Mass Spectrometry.

Other significant developments in each of the major research projects during the year are outlined below.

Asymmetric Synthesis of Pharmaceuticals

Some 40 per cent of drugs exist in two mirror image (enantiomeric) forms, which frequently have quite different biological effects. A high proportion of such drugs are currently administered as a mixture of these two mirror image forms, only one of which has the desired physiological function. This has led in some instances to very serious medical problems, the most notorious of which was the case of the drug thalidomide in which one of the mirror forms led to serious birth defects.

There is thus an urgent need to develop methods for the production of bioactive molecules such as drugs in only the one (desired) mirror form.

The research group of Professor Kane-Maguire and Dr Stephen Pyne in the Department of Chemistry is exploring two approaches to such asymmetric synthesis. One route employs chiral organic sulphur reagents as intermediates; this has been successfully exploited in the total asymmetric synthesis of several pharmacologically-active alkaloids, including a highly efficient direct route to cardiovascular drugs. A major recent breakthrough has been the demonstration that chiral organometallic compounds based on iron and chromium can act as very efficient reagents in the preparation of amines of high enantiomeric purity (greater than 90 per cent one mirror form). These reactions have the potential to be converted into commercially significant catalytic processes, and are being currently extended to the asymmetric synthesis of amino acids.

Bioactive Metabolites from Microorganisms and Plants

Projects with significance for the agricultural industry are being carried out in the Departments of Biology and Chemistry into bioactive metabolites from micro-organisms and plants.

Antibodies produced from isolates from citrus infected with dieback (cf. greening disease) have been used by a group under Professor Helen Garnett, in Biology, to develop a diagnostic procedure based on the dot-spot technique. They are now being utilised to determine the main immunogenic proteins in a variety of isolates. Pulse field gel electrophoresis techniques are demonstrating that many of the isolates have identical chromosomes, while others are slight variants.

The toxic molecules produced by isolates of *Erwinia sp.*, which are pathogenic to cassava, have also now been shown to be complex polysaccharides (sugars). Tissue culture techniques have been shown to be more reliable for evaluating bacterial toxins present than current methods.

Natural products from tropical forest plants are recognised as a major potential source of new potent drugs. An ADAB-sponsored group in the Chemistry Department, led by Dr Roger Truscott and Dr Mary Garson, has isolated and structurally characterised several bioactive alkaloids from rainforest species such as *Ipomea sp.* and *Talauma sp.*, which are being tested for anti-microbial behaviour.

A major international project, funded by the Australian Centre for International Agricultural Research and overseen by Dr Truscott, has led to the development of a simple analysis for the toxic glucosinolate chemicals in rape seed. An instrument called a TRU GLU BLU meter has been developed. It is currently being marketed in conjunction with a local company for use by groups involved in the breeding of superior rape strains.

Drugs from Marine Organisms

Marine flora and fauna are also an important and largely untapped source of new and unusual bioactive molecules, including those with potential as anti-tumour and anti-AIDS agents. The group led by Dr Mary Garson in Organic Chemistry has made considerable progress in isolating and elucidating the structures of novel metabolites from various marine pulmonates and sponges from both the Illawarra region and the Great Barrier Reef, in particular *Siphonaria virgulata*, *Lanthella flabelliformis* and *Cacospongia*.

Experiments aimed at establishing possible common biosynthetic origins with pharmaceutically significant metabolites such as erythromycin (used for example against legionella bacteria) are in progress. Interna-

tional recognition of the significance of this work is evidenced by Dr Garson being invited to present a lecture at the prestigious Gordon Conference on Marine Chemistry in 1989.

An important development has been a collaborative project with Dr Ross Lilley of the Department of Biology involving the aquaculture of selected marine algae with the aim of producing commercial quantities of bioactive molecules. Cultures of *Dunaliella* from salt lakes in Australia have been successfully established in the new algal growth chamber at Campus East. These species accumulate *b*-carotene, a precursor of Vitamin A. Growth of *Dunaliella* cells immobilised in plastic films, to facilitate harvesting, has been demonstrated. Joint facilities in the Departments of Biology and Chemistry have also been employed to set up antibiotic and cytotoxicity screens for crude extracts from both these algae and marine pulmonates and sponges.

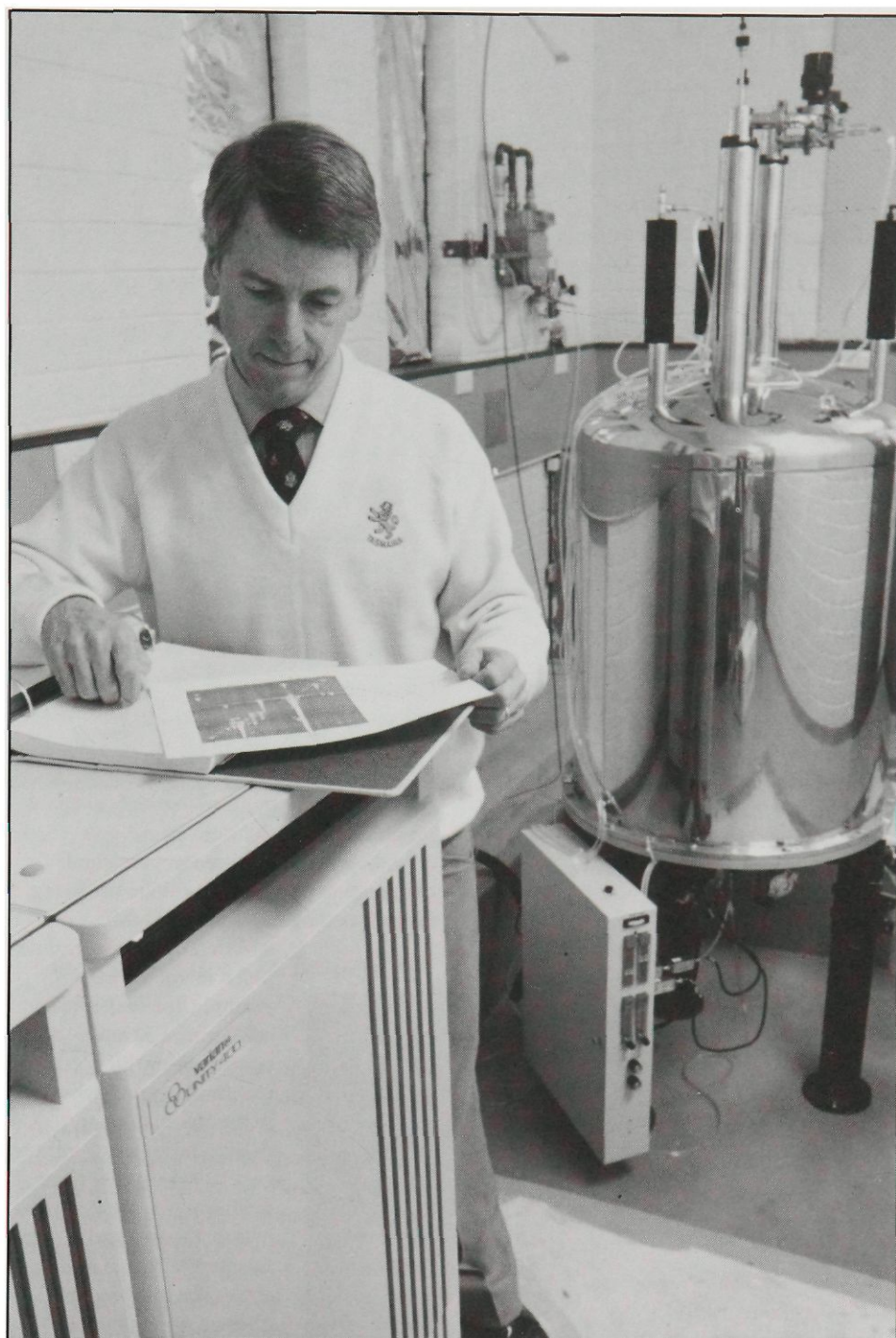
Respirable Toxins

Two major research projects led by Dr John Ellis and Dr Philip Crisp in Analytical/Environmental Chemistry, are investigating improved methods for the identification and quantitative determination of volatile organic toxins in the environment.

A collaborative project with the CSIRO has shown the main metabolites of algae responsible for musty odours and toxicity in drinking water are geosmin and methylisoborneol. These compounds have now been successfully labelled with deuterium atoms, for use as standards in the analysis of these compounds by gas chromatography/mass spectrometry methods.

Polycyclic aromatic hydrocarbon (PAH) emissions from coke ovens are recognised as an important health issue. A three year BHP-supported project has made major progress in developing a portable sampling device that could be worn in the work place. It has already been shown to work on model systems, and tests have now begun on real situations in coke oven environments.

In another environmental study, a method has also been developed for separating and analysing each of the selenium compounds present in the air-borne selenium emissions from copper smelters, and it is now being extended to lower selenium concentrations.



Professor Leon Kane-Maguire

Neurotransmitter-Receptor Site Interactions

Associate Professor Peter Burton in the Department of Chemistry has completed the development of a new basic theory of brain and learning. This will provide the general framework for considering the basis of selective action of neurotransmitters and their agonists, especially noradrenaline/clonidine and dopamine/apomorphine. The hypothesis that quantum dynamic selectivity of action is involved in these processes is currently being investigated.

More than 30 staff and research students from the Departments of Biology, Chemistry and Public Health and Nutrition are undertaking a number of complementary research projects focusing on the structure, function, synthesis and detection of biologically important macromolecules.

Macromolecules and Disease

Cataracts

Cataracts are a major pathological condition of the lens. The objective of one of the research programs is to understand, at the molecular level, the processes which underly modification of lens proteins by small molecular weight reactive chemicals such as catechols and o-aminophenols which bind to certain amino acids found in proteins. The aim is to identify characteristic molecules which result from such interactions so that they can be used as markers. A role for calcium induced opacification and proteolysis of lens has also been demonstrated, a site specific cleavage of spectrin being involved. Another project aimed at understanding cataracts is the investigation of the confirmation of selection of eye lens crystalline proteins utilising NMR spectrometry.



Professor Helen Garnett

Osteoporosis

The recently installed Varian Unity 400 NMR Spectrometer will be used to determine the structure of small proteins at a resolution comparable to that only available previously in a solid state from X-ray crystallography. The conformation and dynamics of a variety of proteins are being investigated by multi-nuclear NMR

spectroscopy and computational methods. For example, the structure of calcitonin, a 32 amino acid polypeptide with potent calcium lowering activity in the blood, is being determined under a variety of solvated conditions to delineate structural regions in both the free and membrane bound molecule. The information gleaned will enable the design of synthetic calcitonin analogues with improved potency for potential use as therapeutic agents in the treatment of osteoporosis.

Atherosclerosis

Attention has been given over the past year to developing assay procedures for low density

lipoproteins (LTP). Monoclonal antibodies were developed and attempts made to utilize these in ELISA systems. This research has suggested that antigenic epitopes on LTP are conformationally dependent on the presence of other factors such as lipid and albumin. This finding has important implications for development of a reliable sensitive assay for LTP. Another protein, human plasma lipid transfer inhibitor protein (LTIP) has been purified and antisera developed. This protein is found to inhibit the transfer of cholesterol from low density lipoproteins to high density lipoproteins. Analysis of this inhibitory protein have found that it is the same as human apolipoprotein D. The significance of these findings are currently under investigation. Overall the research contributes further to our knowledge of coronary heart disease and attempts to develop indicator systems to monitor these conditions.

Human cytomegalovirus

Human cytomegalovirus, a member of the *Herpes* group of viruses passes across the placenta, inducing foetal abnormalities and is found in lesions in myocarditis and atherosclerosis. Infection of immunocompromised persons, including organ transplant recipients and HIV infected persons, leads to severe and often fatal disease. Research undertaken at Wollongong demonstrates that viral infection can be enhanced by trypsin treatment of susceptible cells suggesting that proteolytic enzymes released *in vivo* may potentiate infection. Virus infection is reduced by pretreating susceptible cells with inhibitors of glycoprotein synthesis and the carbohydrate-binding compound, wheatgerm agglutinin, suggesting that specific glycoproteins are involved in the attachment and/or penetration of the virus. Attempts to identify the macromolecules involved in this critical event are under way, the research facilitating the development of antiviral drugs in the future.

Another study on HCMV pathogenesis has shown that the virus glycoproteins gB and gH are inserted into the plasma membrane of infected cells. gB has been considered as a candidate for a recombinant vaccine to HCMV. However, our research shows that monoclonal antibodies to gB also react with proteins in the membranes of normal cells, suggesting that a recombinant vaccine based



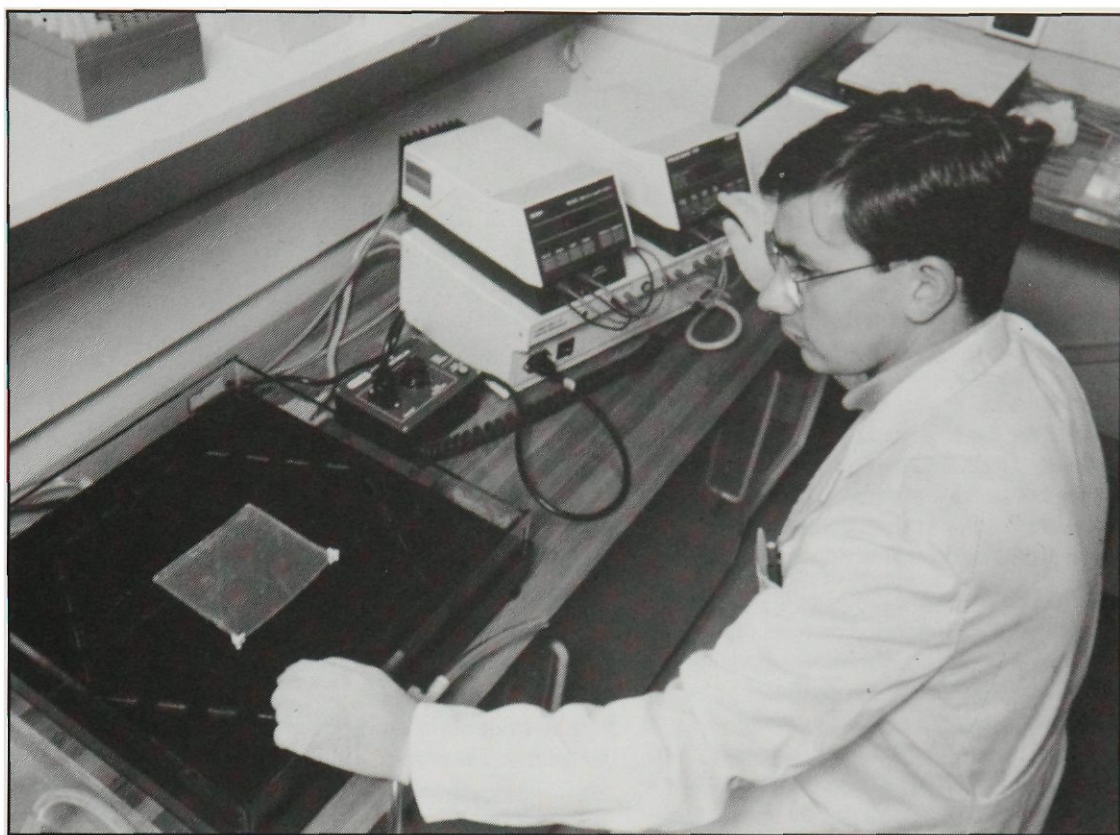
PhD student Pilar Roig is seen pipetting out proteins extracted from cell membranes in order to undertake protein electrophoresis to assist in the identification of HCMV receptor

on this protein may induce antibodies which would result in autoimmune disease. Some of the symptoms of severe cytomegalovirus infection are immunopathological and this research suggests that HCMV infection could result in the production of antibodies against the normal host cells.

Immunosuppression of cell mediated immunity is a common complication of HCMV infection. Although few blood monocytes support virus replication, there is an alteration in cytokine production, these molecules regulating the reactivity of lymphocytes and other important cells in the immune response. HCMV challenge of monocytes causes a transient increase in tumour necrosis factor and interleukin 1 and a decrease in a novel T cell activating substance. The infected population also releases an inhibitor that specifically suppresses T cell replication. The site of action of the inhibitor and the novel T cell activating substance are currently being determined. These factors could prove to be important immunomodulators of therapeutic benefit and attempts will be made to clone the genes for these molecules.

Multi Copper Enzymes

Copper proteins play an important role in metabolism. Detailed analysis of the role of the metal atoms has been complicated by the complexity of the molecules. A valuable approach is the design of smaller model compounds in which the environment about the metal mimics that believed to be present in the native metaloprotein. Multi copper oxidases are believed to contain a trinuclear copper cluster at the active site of the protein. The cluster consists of two essentially identical copper atoms and a third slightly different copper atom. Model copper trinuclear clusters have been synthesised and are currently being characterised by a variety of experimental techniques including elemental analysis, mass spectrometry, magnetic susceptibility measurements visible and infra-red spectra and x-ray crystallography.



In the Department of Biology, Gonzalo Hortelano Hap is at a pulse-field gel electrophoresis apparatus to separate out DNA fragments in order to identify genes involved in the pathogenic processes

Macromolecules and Biological Productivity

Algae

Attempts to express foreign genes in the alga *Dunaliella*, which is grown in salt lakes in Australia to produce b-carotene, have been unsuccessful although the DNA was successfully introduced. This suggests that there is either an unusual codon bias or a requirement for a promoter with little or no specific overlap for the higher plant promoter used in the transformation study. The possibility of unusual codon bias is under investigation. A mutant of *Dunaliella* deficient in its production of the enzyme carbonic anhydrase has been developed and the possibility of complementation experiments on this mutant is being investigated. Studies to determine how *Dunaliella* resists sudden changes in salinity continue. We have confirmed that regulation of cellular glycerol content is essential to the extraordinary ability of this organism to grow in salt concentrations that rapidly kill other algae and plants. The ability of *Dunaliella* to vary the glycerol content to balance the external salinity is due to regulation of the enzymes of glycerol metabolism and a putative regulator has been identified. Experiments to isolate it are under way. By determining

how *Dunaliella* resists salinity we hope to pave the way for a better understanding of how higher plants are affected by salinity and how in fact they may be manipulated so that their relatively poor resistance to salt may be improved.

Myxomatosis

Myxoma virus was introduced in the early 1950s to control the explosion in the rabbit population in Australia. Despite its early success, the virus in the wild now appears to be less virulent and the rabbit population is escalating with a concurrent increase in soil erosion. The question being asked is 'can *Myxoma* be made more effective in its ability to control the rabbits?'

There are several strategies but each requires that the pathogenesis of *Myxoma* be understood and any strain variability be elucidated. Research on the pathobiology of *Myxoma* is currently being undertaken at Wollongong in collaboration with CSIRO Wildlife and Ecology. Particular attention is being paid to the effect of the virus on the immune system and determination of antigenic viral proteins. Preliminary results suggest that the major protein are very similar in size to those of the related vaccinia virus.

The past 12 months have seen current major projects on concrete and steel structures and new projects on personal computer applications and composite structures making good progress and a major project on the damping characteristics of concrete structures being planned.

Punching Shear Strength of Flat Plates with Spandrel Beams

This long-term project has entered its productive stage. Started in 1987, it is conducted by Associate Professor Yew-Chaye Loo and Mr Masood Falamaki, with support from the Australian Research Council and local construction industry.

A reinforced-concrete, flat-plate floor system consists of slabs supported by rows of columns only. Beams, if they are provided, are constructed around the perimeter of each floor – they are referred to as the spandrel beams. The flat-plate system for multi-storey buildings is popular in most countries including Australia, but the punching-shear phenomenon of flat plates with spandrel beams is not yet fully understood. Apart from the new Australian Standard AS3600-1988, no other code of practice for concrete structures provides guidelines for the design of the connections between the slab, columns and the spandrel beam.

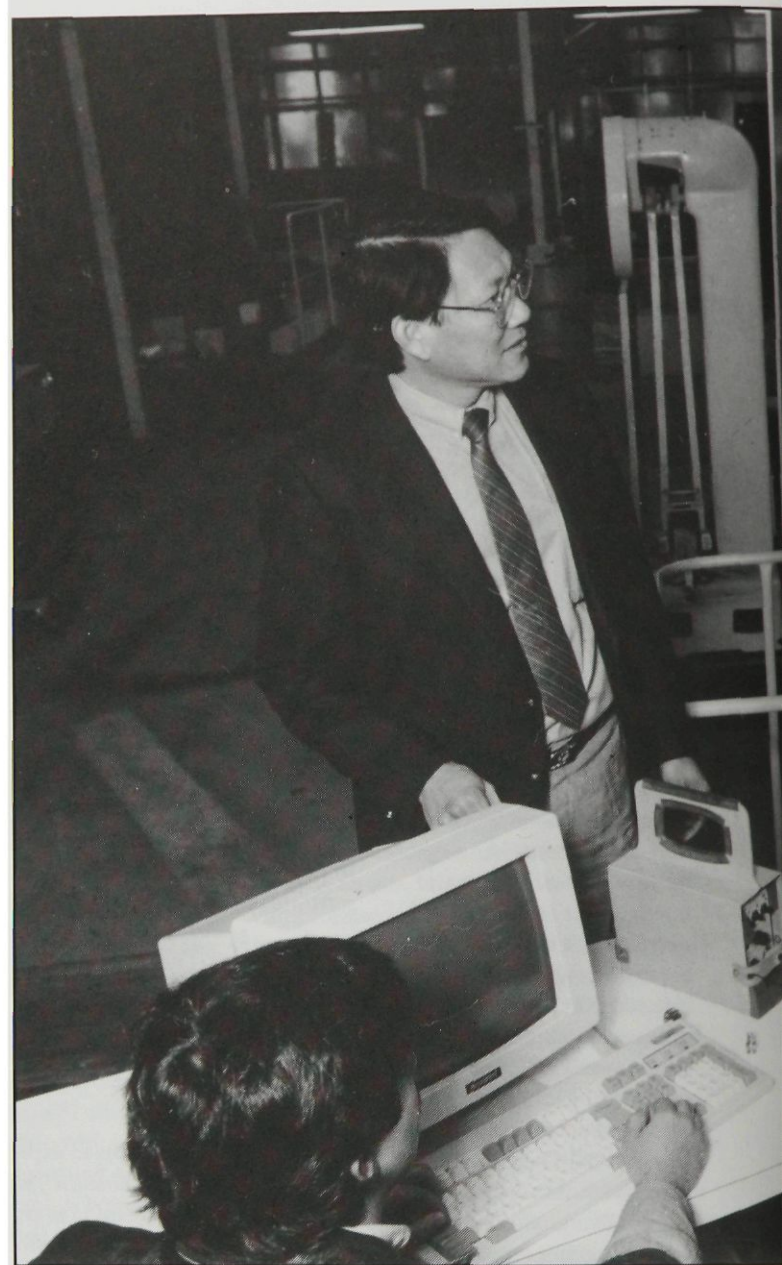
A pilot study at Wollongong has indicated that the analytical procedure adopted in AS3600-1988 could lead to unsafe practice. A total of eight half-scale models (each weighing over five tonnes) have so far been built and tested to destruction. Results have all but confirmed the inadequacy of the recommendation of AS3600-1988. The experimental work is continuing and a new analytical procedure has been developed.

Full-scale Tests of Semi-rigid Joints for Steel Frames Under Dynamic Loading

The first preliminary findings of this project were reported by Dr Richard Kohoutek at conferences and seminars in the US, West Germany and France during last year. Considerable interest was shown by overseas researchers, resulting in an invitation to attend the International Workshop to be held in the US in 1991, and to organise an International Workshop in Wollongong.

In addition to strong support given by the industry (including BHP, Vipac, Australian Welding Research Association, Aeronautical

Semi-rigid joint testing: in the picture Dr Richard Kohoutek (far right) shows Associate Professor Yew Chaye Loo the location of an accelerometer on the full-size semi-rigid joint specimen in readiness for testing. The project is supported by industry and this year it has received also a \$50,000 grant from the Australian Research Council



Research Laboratories, Transfield, Minenco, Mannesmann Demag, V/Line, Newsteel, Bunge Steel and VSL totalling \$60,000), the project has this year received \$50,000 from the Australian Research Council.

The first batch of 26 joints was dynamically tested in Melbourne and will now undergo further tests in collaboration with Professor N.W. Murray of Melbourne's Monash University. The second batch of 16 joints tested at the University of Wollongong this year is the topic of two BE and one PhD theses at Wollongong.

Unconventional Composite Beams

Composite steel and concrete beams have been used in floor construction for a long

time. The conventional composite beam does not utilise the steel fully, as in most cases the steel sections are understressed. Researchers in structural engineering are searching for better and more efficient forms of composite beams. These involve lowering the centre of gravity of the steel section, which in turn necessitates the use of new sectional shapes.

A pilot study has been conducted by Dr Yen Wen Wong. Two new types of the so-called unconventional composite beams were tested. A paper was presented in an international conference and quite a number of researchers in the field have shown their strong interests and support.

This year ten additional beams will be



tested. They will be used to study the behaviour of alternative shear connectors.

A 'Shell' for Computer-Aided-Instruction

The traditional mode of instruction in engineering in a tertiary institution has been mainly by lectures supplemented by tutorial and laboratory classes. Yet outside the classroom a major information revolution is taking place. To meet the challenge of educating engineers for the 1990s and beyond, the need for a fundamental re-evaluation of the curriculum and the mode of instruction is generally recognised. And this is where the inexpensive but sophisti-

cated personal computers can come into the classroom and play an important role in education.

Computer-aided instruction (CAI) which encompasses CAT (computer-assisted teaching) and CEL (computer-enhanced learning) is a relatively new educational technique which holds great promise for the educators at all levels of contemporary education. The advent of the personal computer has led to numerous advances in learning theory concerning CAI. For engineering education it is therefore timely to design a CAI system which is as adaptable as possible, since the technology and education environment change with time. Associate Professor Loo believes that an

effective approach is to develop a general-purpose 'shell' (in the form of a special-purpose language) for CAI system with independent modules, each designed to achieve a maximum level of portability.

This project is conducted by Mr Chian-Chee Choo, a PhD degree candidate under the direction of Associate Professor Loo. The proposed CAI 'shell' which is written in C-language, will be initially designed for use in civil and mining engineering instruction. The entire membership of the Program will thus be involved in the application and evaluation of the system with Dr Ian Porter, the only mining engineer in the group, catering for the mining aspects.

Damping Characteristics of Concrete Structures

The refinement of the ultimate strength theory, coupled with the development of high-strength concrete, has led to the use of more slender reinforced-concrete structures in civil-engineering projects. This renders the traditional static-load structural design inadequate and perhaps even unsafe. There is a need for dynamic analysis, particularly for wind and earthquake loads which the structure will experience. The recent Newcastle earthquake disaster has further underlined the importance of analysis and design for dynamic loads.

The response of a structure under forced vibration due to dynamic loadings depends largely on its damping characteristics, i.e., the mechanism and the ability to dissipate the energy imparted to the system. Thus, if a structure possesses considerable damping capacity, the vibration will be less and the dynamic stresses in the structure will be reduced, thereby improving the dynamic characteristics of the structure. Obviously, the converse is also true.

In view of this, the accurate determination of damping characteristics is essential in modern structural design. Yet important knowledge concerning damping, especially of reinforced concrete structures, is still lacking.

Conducted by Associate Professor Loo, Dr Kohoutek, Dr Max Lowrey and Dr Denis Montgomery, this project involves the experimental and theoretical determination of the damping characteristics of plain concrete and reinforced concrete beams and frames. Emphasis will be placed on high strength concretes of up to 100 MPa. The research is expected to provide authoritative results. It will also benefit the Australian construction industry.

\$500,000 Research Commitment to Improve Bulk Solids Storage, Handling and Processing

Bulk solids represent a vast range of 'everyday' materials ranging from raw materials in the mining industry, eg, iron ore, coal, gold ore, agricultural products including grains, meals and brans to delicate products in food industry such as granulated coffee, milk powder, soft-drink flavouring, flour and pharmaceutical powders such as paracetamol. These materials need to be stored, handled and transported in a variety of industries. Pneumatic conveying through pipelines is being used and considered for an increasing number of such applications.

What actually happens to the bulk solids in the pipelines (in both flow behaviour and performance) is of major concern to the designer or potential user of pneumatic

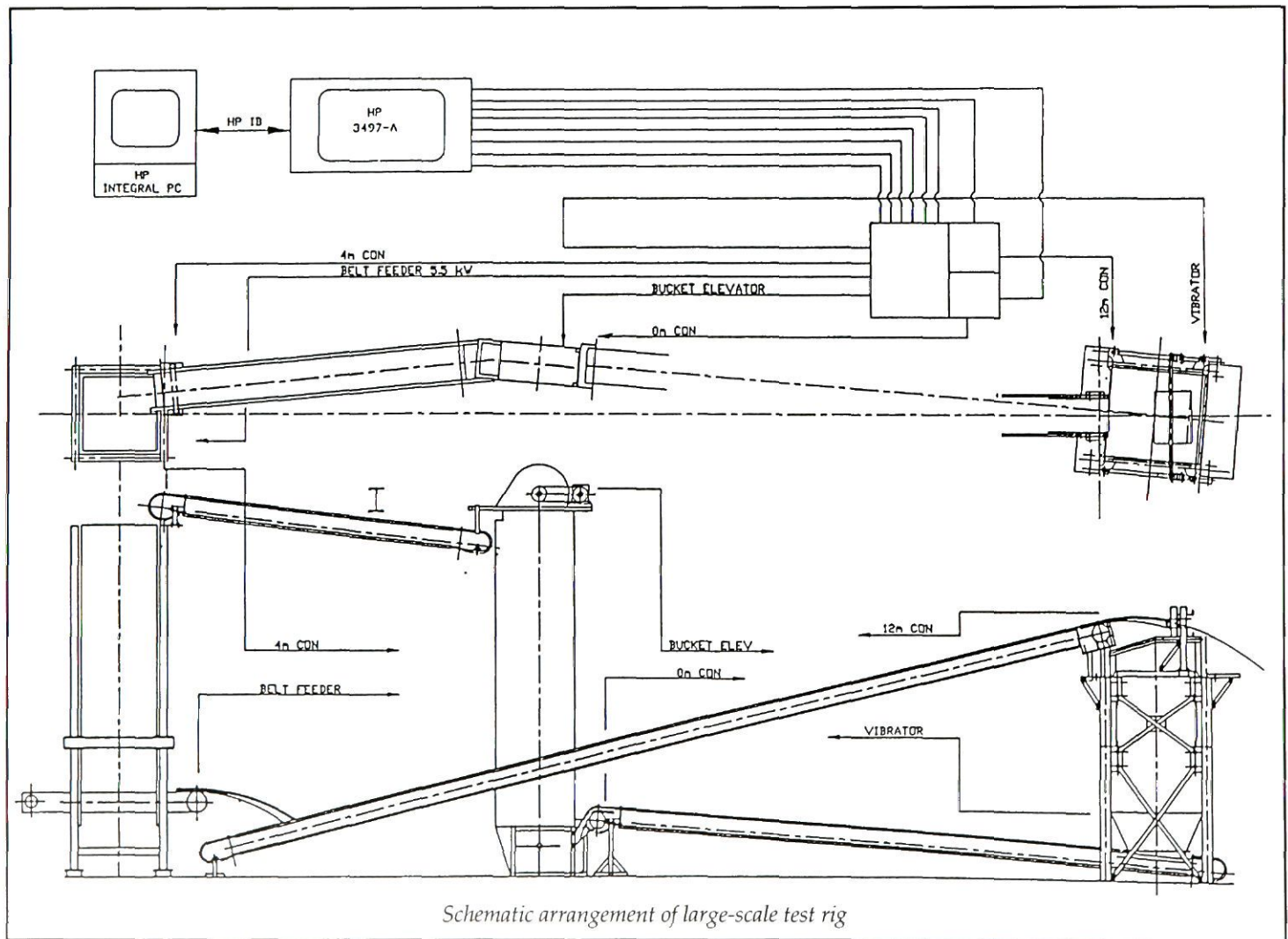
conveying systems and is dependent strongly on the material, its properties, the conveying rate, the transport velocity and the pipeline configuration. To attain reliable operation when handling a greater range of materials, and in more demanding applications, new hardware and design techniques are being developed.

Unfortunately, most of these developments are still based on experience and proprietary information/equipment (usually from companies located overseas). Moreover, a considerable amount of controversy still exists in certain areas (eg, design techniques, pressure drop due to pipes and bends, product classification, selecting the most suitable method or mode of transport for a particular material). The pneumatic conveying project associated with this Research Program is aimed at investigating these aspects and providing industry with the necessary information to design, select and trouble-shoot conveying systems.

Particular objectives include:

- the development of mathematical models to predict and scale-up operating conditions (including minimum transport behaviour) for dense-phase and low-velocity conveying,
- undertaking an extensive experimental program to develop and verify empirical correlations and design techniques for straight pipes and bends,
- the development of strategies to optimise stepped-diameter pipelines for more efficient long-distance transportation (up to 5km),
- further development of a PC-based design package for pneumatic conveying systems (ie, based on the results and developed strategies).

Considerable progress has been made in all areas of the project and the findings have already been used in several industrial applications (eg, 24 t^h-1 of pulverised brown



coal briquettes over a distance of 2km from Loy Yang A to B power stations operated by the State Electricity Commission of Victoria); the successful development at the University of Wollongong of new low-velocity technology to transport friable materials such as refined sugar, granulated coffee, milk powder, rice flakes and puffed grain.

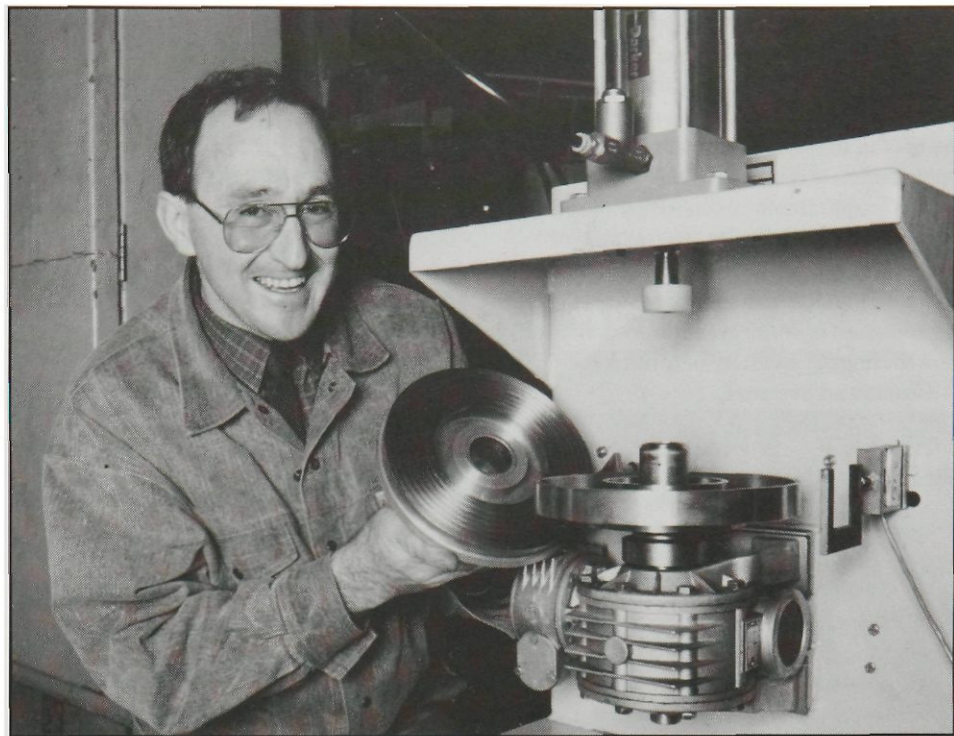
Currently, extensive test work is being carried out to compare the accuracy and sensitivity of two recently developed test-design (scale-up) procedures, including correlations to allow for bends. The long-distance test rig in the Bulk Solids Handling Laboratory with pipeline configurations ranging from 165 to 1200m is being used for this purpose. Parallel investigations are being undertaken into the development of similar procedures but for the low-velocity mode of transport, which has been found for certain materials to produce more complex and unexpected flow behaviour. A variety of pipe lengths and diameters again are being employed to generate the necessary data.

Mechanical conveying systems, eg, belt conveyors, chutes and bucket conveyors, still, however, handle the greatest tonnage of bulk solids. Within these systems the interface between the hopper and belt feeder and the reliable transfer of material between belts and down chutes is paramount. Research currently in progress to improve these system components includes the development of techniques to minimise problems associated with transfer chutes. Here, by use of the large scale test rig depicted on the facing page, solutions are being developed which:

- can cope with large elevation differences between belts
- minimise wear rates
- eliminate blockages
- can effectively handle the feeding of more than one belt
- can collect belt cleaner scrapings in an effective manner.

One of the principal ways in which it is intended to accomplish this is to design transfer chutes as small surge bins. Noting the techniques for bin design have been proved to be reliable and predictable. Application of these techniques to transfer chutes allows great scope to overcome many of the existing problems associated with traditional designs. Further activity has identified the application of, and proper design requirements for, high-speed feeders.

One concentrated activity researched in the past 12 months has been the development of



Dr Arnold McLean

a greater understanding of the variation of coal stockpile densities. In particular this research, supervised by Professor Nick Standish, seeks to identify the relationship between mean size, particle size distribution, moisture content, stockpile stack-out and formation stresses, stockpile shape, coal type and coal rank on coal stockpile density. This knowledge is paramount to the Australian black coal industry (work is currently in progress at a number of eastern seaboard coal loaders both in New South Wales and Queensland), where prediction of ship capacity, stockpile capacity and confirmation of ship surveyed tonnages is vital. Likewise at power stations, accurate prediction of stockpile content is mandatory for reliable operation. This importance is clearly evident by the \$300,000 funding gained for the project.

In regard to the design of safe storage devices for bulk solids, further progress was made on the development of the Australian Standard for the 'Loads on Bulk Solids Containers'. Publication of this Code is now imminent. Furthermore, the awareness that container operation practice significantly determines container loads, the need for operator safety and knowledge of recent farm tragedies resulted in the publication of Australian Standard AS 3773 - 1990 'Bulk Solids Containers - Safety Requirements'. This Code incorporated a number of significant research findings from this program. Current developments to improve

silos safety include the evaluation of loads in containers fitted with anti-dynamic tubes and eccentric discharge points and the content generated loads in extremely squat silos storing coarse agricultural grains. The particular thrust of the latter research is to prevent silo collapses typified by recent silo collapses in Sydney (see pictures).

Research also continued into the measurement and prediction of powder properties. One application of this work has been the development of a low-cost method to granulate fine coal. This work, which utilises the pilot scale fine coal combined beneficiation and granulation plant located outside the Bulk Solids Handling Laboratory, has successfully produced stable high-quality granulated product from a local coal-preparation plant waste refuse slurry.

Observed advantages of the granulated product include low dust emission during handling, high strength, good flowability and resistance to water break down and good abrasion resistance. In addition, the developed progress also generates significant progress benefits including improved froth flotation yields, improved dewatering, high fine-coal carbon recovery and low product ash contents and reduced tailing disposal requirements. The developed progress also has the potential to use waste residential oil and paper. In view of these benefits this progress should gain widespread application in the local coal industry.

The Education Policy Program has since its inception in 1988 made a significant contribution to the development of education policies in Australia and overseas. This contribution is reflected in the number of quality publications generated by the Program's researchers in 1989, as well as several invited keynote addresses at national and international conferences and the presentation of some preliminary activities and findings at a variety of forums in Australia and overseas.

The main aim of the Education Policy Program continues to be the development of an integration of policy-focused and policy-orientated research and postgraduate offerings in education. This represents an area in which there is a growing need and demand and currently not enough supply in Australia. The Program's first year of implementation was principally one of entrepreneurship and construction rather than completion of research work, although a small number of initial Program projects have been completed or are nearing completion. Several of the research activities have involved co-operation with other units both within and outside the University and systematic links with government and external professional agencies have also been established and/or strengthened during 1989.

A highlight of the Program's achievements in 1989 was the organisation of a National Conference on Education Policy.

Professor Carla Fasano, co-ordinator of the Program, in conjunction with invited Professor Bob Winder, Former Director General of the NSW Department of Education, were principal organisers and keynote speakers at the National Conference held in Sydney, from July 5 to 7. Entitled 'Education Policy in Australia - The Shifting Balance of Power and Accountability', the Conference brought together participants from a variety of fields including senior executive officers from State and Commonwealth Government agencies, business, unions, and parents organisations, as well as academia and the media.

The Conference's main aim was to clarify the changing patterns of policy decisions within and across educational agencies as well as at the interface between government, business, industry and the community. The proceedings are presently being produced by Professors Fasano and Winder as an academic book. Similar presentations by the Program's researchers internationally as well as nationally ensured that the Program achieved high visibility in 1989-90.

Another major achievement of the Program is the National Study on Performance Indicators in Higher Education, commissioned by the Commonwealth Department of Employment, Education and Training. This project is chaired by Professor Russell Linke. It builds on the work of the AVCC/ACDP Working Party on Performance Indicators and aims at developing and evaluating a range of indicators which cover

teaching, research and other professional services of academic staff in higher education institutions.

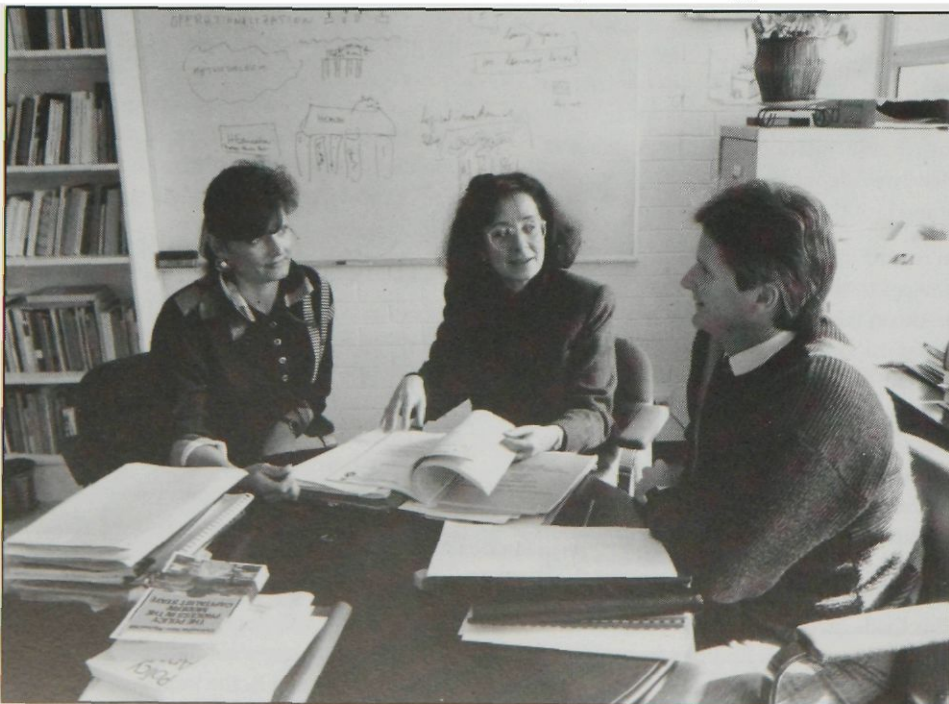
The Program also includes studies on human resource development and education in the South Pacific region. In 1989 these studies resulted in Professor Ken Gannicott, in conjunction with Professor C.D. Throsby from Macquarie University, submitting a report on their project 'Human Resources Development in the South Pacific'. The report provides a critical assessment of current educational policies in the South Pacific and their relationship with the economic development of the region. It will prove extremely useful to AIDAB in the formulation of appropriate Australian aid policies in the South Pacific. As an offshoot of this work, Professor Gannicott was invited by the World Bank to give a presentation on financial aspects of education and health policy at the University of the South Pacific, Fiji, in June 1989. Further field work was undertaken by Gannicott and Throsby in Indonesia during May and June 1989 analysing the impact of World Bank lending for education in Indonesia.

Other policy-focused research in the second year of operation included projects on technology policies for schools and technology literacy in higher education, involving Dr Barry Harper and Professor Fasano. Analysis of different aspects of these policies over the past ten years have been presented in invited keynote addresses at international conferences in Japan and New Zealand in August and September 1989, as well as a national conference in Canberra in November 1989. Dr Arthur Smith, currently Head of the Aboriginal Education Unit, University of Wollongong, is continuing his research into the structure of the newly released Aboriginal education policy and its impact at both federal and state levels.

Preliminary work has also started on a number of policy-focused research projects, including music education policy in Australia as it relates to the primary school system, involving Ms Nita Temmerman; NSW policies for physical education in primary schools, involving Ms Tonia Gray and Dr John Patterson; craft design and technology in teacher education, involving Mr Ian Brown, and teachers' understanding of education policy processes and ability to cope with change, involving Dr John Patterson and Mr Gregg Rowland.

In a more applied vein, policy orientated research includes several school Health Education projects. After successful completion of an evaluation of the NSW

Researchers Professor Carla Fasano (middle), Tonia Gray (left) and Gregg Rowland



Cancer Council's Cancer Education Resource Kit, members of the physical and health education section Mr Michael Hatton, Ms Yvonne Kerr, Ms Roslyn Westbrook and Dr John Patterson have been commissioned by the NSW Cancer Council to evaluate the document 'Cancer Education: A Resource for Science Teachers'. Almost 700 government and non-government schools will be involved in the evaluation, which will investigate utilisation patterns of the resource and analyse the contribution the document makes to cancer education at the secondary level.

Other projects underway in the related discipline of physical education include Mr R G Wilmshire's establishment of a test battery to identify gifted performers. The provision of educational opportunities for gifted students is a current concern of the NSW Department of Education. Another project being conducted is that by Dr Paul Webb, involving an evaluation of the National Coaching Accreditation Scheme. At this stage a data base on the 1500 Australian coaches has been created and the survey instrument designed and piloted with the survey being scheduled in 1990. This project is fully funded by the Australian Touch Association.

Continuing progress is also being made by Ms Ros Westbrook and Dr John Patterson into an investigation into the perceived acceptability and credibility of school health education and by Ms Yvonne Kerr and Dr John Patterson into a longitudinal investigation of adolescent health behaviour.

Other policy-orientated research is taking place in the area of information technology in education, including projects related to the areas of science, mathematics and early childhood education Dr Barry Harper and Professor Carla Fasano are engaged in a project on learning strategies in science education which focuses on the use of interactive multi-media combined with authoring systems to enhance learning.

Ms Allison Elliott in conjunction with Mr Neil Hall has recently completed a project 'Exploring Computer Based Activities for Young Children with Developmental Delays'. Continuing research being conducted by Elliott and Hall includes a study of the relationship between cognitive and affective dimensions of individual difference and young children's interactive behaviours in selected computer-based learning environments and a DEET funded study of the facilitation of mathematical learning in early intervention programs.

In 1989-90, two projects dominated the work of the Labour History Program. These were a history of the New South Wales Labour

Council, written by Associate Professor Ray Markey, and a History of the Labor Party in New South Wales, written by Associate Professor Turner of the University of Sydney and Professor James Hagan.

Both histories mark anniversaries, and both will be published in 1991. In that year, the Labour Council will celebrate its 120th Anniversary, and the Labor Party in New South Wales its centenary.

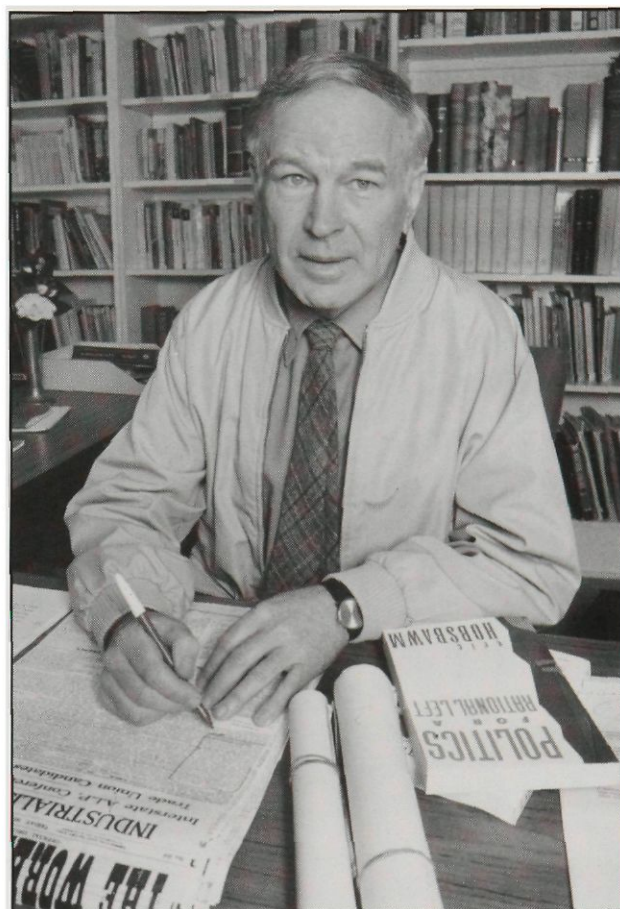
The intermingling of the history of the Labour Council with that of the Labor Party allows some unusual opportunities for economical and fruitful cooperation in research. The Labour Council created the Labor Party, and the relationship between the trade unions and the parliamentary party is a continuing theme for study in the history of both. Thus sources studied for one can be used for information about the latter, and both benefit from the dialogue that ensues.

These projects fit well with a conference of labour historians that the program members have organised for next October. The year 1990 marks the centenary of the Maritime Strike, the event that led the Labour Council to decide that it should form a political party to contest the next elections. The strike also had other long-term effects, in that it led to an interest in compulsory arbitration which resulted in its adoption for the settlement of industrial disputes. Historians from all parts of Australia, and New Zealand, will come together to discuss one of the most important events in Australian labour history, and they will publish a selection of their papers.

The Maritime Strike was part of a social upheaval in which people who then began to think of themselves as Australians challenged much of the conventional wisdom of British Victorianism. Josie Castle, together with Dr Helen Pringle, have begun to study images of women as depicted in the press of the time to determine ways in

which attitudes to women changed under pressure of these circumstances. Again, their study is able to make use of material researched for each of the major histories.

The Program also took over a history of education in New South Wales which concentrated on the way in which schools have prepared their pupils for the world of work. With the assistance of Robert Hood, Professor Hagan completed the study in mid-1989, and it is now with the Depart-



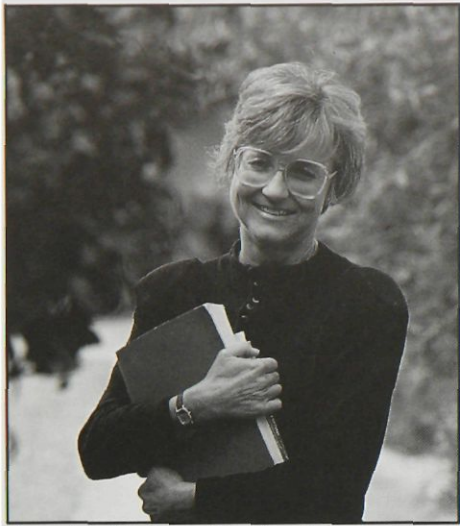
Professor James Hagan

ment of Education, which funded it. Next year, the emphasis of the Program will shift more to projects started in the past few months.

Andrew Wells is working on the History of the Australian Communist Party; Chris Nyland on male/female wage differentials; Rob Castle on Aboriginal labour; Glenn Mitchell on the history of the Building Workers' Industrial Union; Winifred Mitchell on the history of the South Coast Trades and Labour Council; and Ken Hale on aspects of industrial law and industrial elections. All in all, the Program is making a major contribution to Australian labour history.

EQUITY IN EDUCATION: LINKING IN TO EDUCATION AND INDUSTRY

Co-ordinator: Associate Professor N J Kyle, tel. 27 0374



Associate Professor Noeline Kyle

If we can do it so can you...' This is the philosophy of the student role models employed by the Secondary Schools Link Project located under the Equity in Education Research Program. In 1989, 20 University of Wollongong students took part in a Department of Employment, Education and Training-funded project designed to tell secondary school students in the Illawarra how tertiary education could benefit them.

The student role models came from different disciplines, different social backgrounds and different family and social groups. They had one thing in common, however - a commitment to the equity issues framing the project. After a number of intensive training sessions, planned and organised by the research team, the students were able to provide relevant information about their own degrees and support services at the University of Wollongong.

The 'Secondary Schools Link Program' targeted students from non-English-speaking backgrounds, Aboriginal students, students from lower socio-economic backgrounds and young women, to encourage their enrolment in non-traditional fields of study. The student role models were chosen to fit within these categories in order to maximise their impact on disadvantaged groups. They were great ambassadors for the University, playing a key role in the success of the project and the positive responses that emerged from participating schools.

The success of the project owes much of its success also to the participation of the Aboriginal Education Unit, the schools liaison officer at the University, participating schools and the members of the research team, Associate Professor N J Kyle, Ms G Tapp, Ms J James, Mr S Darcy and Dr E Booth.

General impressions from the school visits were positive. Interviews with careers advisors produced a list of factors considered encouraging or discouraging for students in their choice of senior school or tertiary study. Preliminary analysis suggests that the dominating influence on students staying on at senior school are related to career and job prospects. Financial factors and parental influence rated highly, too. Discouraging factors were dominated by school-related elements, including dislike of school, workload, pressure of study, difficulty of courses, lack of alternatives to academic courses and lack of subject choice. Low self-esteem and lack of self-confidence were also important in discouraging wider options.

Careers advisers and teachers at the targeted schools have told the project team that the school visits and presentations by the student role models have had a positive effect on school pupils. Post-visit surveys of the students indicate an increased awareness of the option of higher education and a new willingness to consider it. A detailed evaluation report is being prepared for distribution to the University, participating schools, DEET, careers advisers, regional office and interested individuals.

Outcomes from the successful implementation of the Link Program in 1989 include allocation of \$21,000 from the Higher Education Equity Fund to continue the program in 1990. Two conference papers are planned around the empirical and theoretical issues involved: to the AARE Conference (Sydney) and the New Zealand ARE (Auckland). DEET funding of \$31,000 for a project *Evaluations and Investigations Program* to evaluate all Link Programs in Australian Universities funded under the Higher Education Equity Fund from 1989 has been awarded to a team headed by Professor R C King and Associate Professor N J Kyle. Several articles are in preparation focusing on the concept of role-modelling, link programs and equity issues for the 1990s.

Encouraging female entry into non-traditional employment and training

Linking research activity with education systems, industry, schools and the wider community has been an important element in the program's success in achieving a high level of credibility with educational professionals, industry personnel and community organisations. For example, BHP Steel Slab & Plate Products Division provided \$15,000 to support research into a DEET-funded project examining non-traditional work and training for young women in the Illawarra.

The project to encourage female entry into non-traditional study and work had the immediate aim of producing a set of recommendations specifically aimed at breaking down the barriers which restrict women and girls to a narrow range of work and study options. It is also producing a system of ideas and conceptual frameworks which analyse the nature and causes of women's marginalisation at work and in school and which tackle some of the more difficult questions outlined above. The study was published in a report in late May 1990. An outcome of the project has been the development of a close and productive

relationship with industry in the Illawarra. Associate Professor Kyle, BHP Slab and Plate Products Division (Selection Department) and a federal funding body are currently discussing the production of an information package about engineering as a career for young women, to trial in selected Illawarra secondary schools. This new relationship with industry will focus on implementing key recommendations from our report which highlight the lack of specific information being received by young women about career opportunities in industry (this funding is supported by research elsewhere in Australian universities). Conference papers and articles are in preparation arising out of the empirical and theoretical aspects of the research.

General research activity and scholarship

Senior members of the Program continue to maintain a high profile in international scholarship. Professor King, former president of the Australian Psychological Society was Chairman of the XXIV International Congress of Psychology in 1988. He was Chairman of the Publications Board that produced (December 1989) nine volumes of refereed papers in psychology published by Elsevier Science Publishers (North Holland). He also edited one of these volumes, on social applications and issues in psychology.

Associate Professor Kyle has refereed articles in international journals in 1988 and 1989. While on study leave from December 1989 to March 1990, she presented papers at Cambridge University, London University, the University of Sussex, the University of Edinburgh and the Southbank Polytechnic. Her fifth book is completed and has been lodged with a publisher. Associate Professor Kyle fulfilled a visiting professorship with the University of Auckland in June where she contributed seminars on her research focusing on writing the lives of women teachers and feminist theory, women leaders in education, gender equity in Australia and recent trends in Australian history of education to staff, visiting professors and postgraduate students in the Department of Education.

Continuing projects under the program include research into women and non-traditional study at the University of Wollongong, interdisciplinary approaches to representations of the self in history; cognition and disability; gender and gymnastics; and high achieving girls in mathematics and science. Considerable research activity, refereed publications,

conference presentations and seminar papers have resulted from these continuing projects.

New projects include a study to encourage women to enter higher degree programs at the University of Wollongong; a history of women teachers in NSW; a project 'Write for Kids: Write with Kids' funded by the International Literacy Project, women and honours degrees; exploring computer based activities for young children with developmental delays, computers and early childhood; socio-economic status and HSC results; and women and educational administration.

In October 1990 a conference is planned around the theme of 'Women and Higher Education in the 1990s'. Keynote speakers will be Dr Jane Kenway and Dr Jill Blackmore of Deakin University, who are currently involved in a DEET-funded project on gender reform in schools. The conference will feature two forums, one on traditional and the other on non-traditional disciplines for women. The situation of women academics within newly amalgamated institutions, restructuring, performance evaluation and changes to research funding will be discussed.

The present research and scholarship within the program have been specifically located within the Australian education system and have provided valuable recommendations for policy change in the areas of retention rates, careers advice to girls and boys, subject choice at secondary school, non-traditional study and improvement of links between the school and disadvantaged groups. The research has built a solid base of empirical data as well as exploring theoretical issues underpinning equity issues in education. The value of the research has been recognised by other Faculties on campus, schools, DEET, international bodies and industry.

The 1990 projects aim to expand the theoretical and empirical aspects of the research already achieved, increase our links to national and international education policy and scholarship and contribute to a better understanding of the theory and practice surrounding the schooling of disadvantaged groups.

The response of the human body to external stress imposed by work or recreation is the focus of the Exercise, Stress and Fitness research program. Stress can be chronic or acute, physiological, psychological or mechanical in nature, and in all forms will influence the body's capacity to perform physical work. A collaborative program of research, currently under way into the human body's responses to a variety of different forms of stress, involves three University departments: Human Movement Science, Mechanical Engineering and Psychology. Research interests are focused into four projects.

Exercise and Heat Stress

The Australian climate places a premium on an understanding of the human body's capacity to function efficiently in a hot environment. Many man-made and natural industrial settings expose workers to varying extremes of hot dry and hot humid conditions and participation in vigorous physical recreation under these conditions is being called into question.

The early stages of this project examined the general physiological and psychological effects of climatic stress as well as the specificity of acclimatisation to heat stress. Areas examined included muscle fatigue in female workers in a simulated work environment, physiological and perceptual responses to prolonged activity under thermal stress and thermoregulatory and cardiovascular adaptations during activity following brief acclimatisation in male and female populations.

In an attempt to broaden our understanding of human responses to thermal stress, the current direction of research being undertaken by Drs Karen Chad and Mark Anshel focuses on children and adolescent responses to hot, humid conditions. Of particular interest is their perception of physical effort during exercise in this environment. From this, it is hoped to develop a set of guidelines for safe participation and acclimatisation in a thermally stressful climate.

Exercise and Load Stress

The original program of research into safety aspects of rugby union scrummaging has been completed and recommendations for law changes and coaching strategies have been submitted to the Australian Rugby Union. The loads experienced by front-row players during a total of 25 different scrummaging configurations were examined. Combinations ranged from the pre-1930s 2-3-2 combination suggested by some administrators to the modern 3-4-1 'power' scrum that has been responsible for most serious cervical spinal injuries. A continuum of player abilities were assessed, from club level to the Australian national team. Further research is continuing into the development of an on-field assessment procedure to measure impact forces in all forms of contact sport.

In addition to measuring the external loads placed on the human body, a further area of research is aimed at determining the internal responses of human articular structures to externally applied loads. At present Ms Julie Steele and Dr Animesh Basu are assessing a three-dimensional computer model of the human knee joint, developed using finite element analysis with the MSC/NASTRAM and GRAFTEK software packages. In a further attempt to represent accurately the shape of an articular surface and to locate precisely the attachments of structures acting across the joint, Drs Elios Siores, Peter Milburn and Professor Tony Parker are modifying existing medical ultrasound technology to give real-time three-dimensional kinematic data of the knee joint morphology. Accurate descriptive data are necessary for the formulation of a reliable model to represent the dynamic, 'real-life' situation.

Exercise and Rehabilitation

The purpose of this on-going project is to ascertain the effects of aerobic strength-conditioning and cognitive strategies on pain tolerance. In a series of three studies coordinated by Drs Mark Anshel and Graham Ward, the association of pain

tolerance with selected personality traits, gender and pain location is being examined and correlated with physiological parameters.

Practical applications of this research may improve fitness levels and pain tolerance of workers, as well as athletes. As a consequence, work attendance, productivity and satisfaction may also be improved. This is also particularly relevant for athletes who participate in contact sports. It is also hoped to determine whether males and females differ with respect to pain tolerance and their use of cognitive strategies to attenuate discomfort.

Any evidence of a strong relationship between selected personality traits and pain tolerance may allow employers and coaches to predict the ability of individuals to tolerate physical discomfort and, consequently, offer approaches (for example, exercise and work programs) that will favourably affect their performance and productivity. Furthermore, it is hoped this strategy will give some insight into the persistence and attrition rates among participants in exercise and rehabilitation programs.

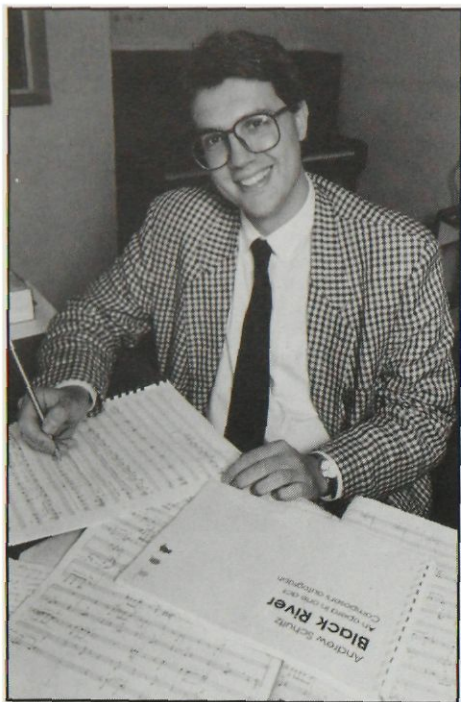
Exercise and Corporate Health and Fitness

The focus of this research project, headed by Mr Owen Curtis, has been on determining the effectiveness and efficiency in human and financial terms of a Rehabilitation Program Model implemented by BHP Slab and Plate Products. Having developed a set of indicators related to productivity and with access to computer data bases related to specific aspects of human resources, the team has started experimental implementation of an algorithm that may be used for enhancement of effectiveness and efficiency within the steelworks.

Consultation with Occupational Health and Safety personnel at BHP has opened the way for initiating a survey of selected staff with a view to determining lifestyle indicators which may interact with productivity indicators.



Dr Peter Milburn of the Faculty of Health and Behavioural Sciences records the levels of stress imposed by the bending and muscular effort involved in the everyday task of making a bed



Dr Andrew Schultz

This program is concerned with several areas of the visual and performing arts in Australia. Dr Shepherd is continuing work on the Project, *Constraints on Interpretation in Music Theatre Production*. Since the initial identification of constraints and their nature, through the study of two productions within the School of Creative Arts, the focus of the work has moved to an examination of the processes followed to negotiate these constraints, particularly in the realisation of new works.

The most recent work under investigation has been a new music theatre piece for children, *Harmony*, by program member(s) Andrew Ford (composer), and Graham Pitts (writer), commissioned by the Tasmanian Symphony Orchestra and the Salamanca Theatre Company. At the time of final rehearsals and first performances of the piece, the composer, script-writer, designer, director, musical director and others involved in the production were interviewed. These interviews, along with observation of the product, are the basis for determining the ways that an original concept has undergone change by the time of first public presentation.

A second piece, *Whispers*, by Andrew Ford (composer) and Rodney Hall (writer), commissioned by the Seymour Group, Sydney, is being used as a continuation of the investigation.

One of the major constraints identified in the early study, and which production teams have to negotiate, is the accepted or expected style of a piece, often built through its performance history. This has led Peter Shepherd and David Vance to look at changes in interpretation in second and subsequent productions of new works.

The first to be treated in this way is the new opera, *Black River*, by Andrew Schultz (composer), a member of this research group, and Julianne Schultz (librettist). This work gained the Sounds Australian critics' award for Best Performance of an Australian Opera or Music Theatre Work in 1989. The first performance was by the Metropolitan Opera Company and the Seymour Group, Sydney, in November 1989, and the second season will be at the Victorian Performing Arts Centre, Melbourne in November 1990.

In their research towards production of an *Annotated Anthology of Australian Music*, Dr Andrew Schultz and David Vance have had valuable assistance from the Victorian State Library, the ABC Federal Music Library and the Australian Music Centre in Sydney.

A fascinating area to emerge from the project is an investigation of the documentation and transcription of Aboriginal music as found in 19th and early 20th century sources. It offers a significantly different mode of perception of this music and provides an interesting comparison with the later work of ethnomusicologists.

Some valuable work is being undertaken on the influence of the literary movement known as the Jindyworobaks as it affects the search for a national identity in Australian music. Particular reference to the music of Clive Douglas and others is providing a useful perspective on how composers seek to represent their notions of nationhood.

Work has started on annotation and analysis of specific scores. Some of the material has been used as a six-part radio program, presented by David Vance on ABC-FM in August 1989. From this script, the critical evaluation of four Australian string quartets (including one by Andrew Ford, a member of this team), is published as part of a compact disc produced by the ABC.

In his work on aspects of *Musical Performance in Australia*, Andrew Ford has conducted interviews with some outstanding performers and composers, including David Harrington of the Kronos Quartet and the composers Richard Rodney Bennett and Sir Michael Tippett. The Kronos interview was written up as a profile for *Australian Society*, and the interview with Tippett became an article for the *Sydney Morning Herald*.

Another major task was an interview with composer Richard Meale. Two things make this significant. One is that Meale generally does not allow interviews; the other is Meale's place in Australian music, as someone who has been composing for 30 years, whose work has undergone a major stylistic change in recent times.

The ways in which artists perceive their own work processes are the continuing focus of Sue Rowley's research project. Recognising the financial disincentives to working in the arts industry, artists' commitment to their work seems eccentric. It is not obvious why artists should maintain an on-going commitment to their work in a society which appears not to value artistic work highly. The modernist myths of slightly deranged, romantic outcasts, or confrontational avant-gardes, seem as outdated as the stereotypes of the mad scientist or the absent-minded professor.

When artists speak of their work, they construct a form of autobiography, selecting some elements of their lives and their work,



Prominent among the researchers into Contemporary Arts in Australia are from left, Mr Ian McGrath, Dr Peter Shepherd, Head of the School of Creative Arts in 1989, and, at the piano, Mr David Vance, the noted conductor and teacher

but of course discarding others. In doing this, they formulate a more or less coherent account of their own artistic processes, and although this account is a construct, it can tell us much about what it means to be an artist today.

This project is complemented by a number of doctoral research projects which, though diverse in their empirical investigations, draw on and contribute to the development of methodological and theoretical ap-

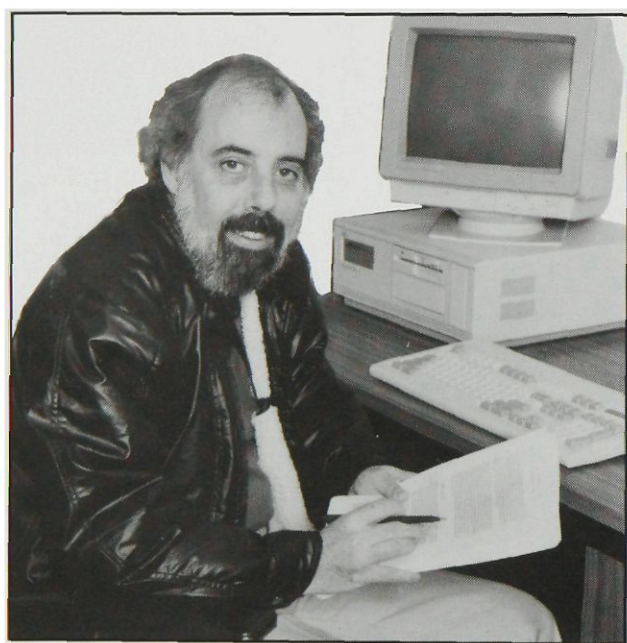
proaches that underpin the project. Adrian Guthrie is undertaking a study of the development of avant-garde theatre in Australia, Deborah Hart is writing a biography of artist John Olsen and Pat Hoffie contributes through her debates on regionalism in the arts and her research on artists in regional areas.

Ian McGrath is engaged in research in the area of lighting for the stage and concerns two particular aspects of contemporary

work. His study is concerned with recent directions taken by 'sound and light' shows and the manner in which they have been documented. He is also involved in the systematic collection of details of available lighting and sound equipment for a comprehensive review of the equipment, without the biases of the sales brochure. The emphasis is on devising computer-generated graphics, which clearly illustrate the principles of available instruments.

The program is developing research-based knowledge of relationships between overall strategy development, competitive advantage and organisational change in the areas of operations, finance, technology and human resources in organisations.

The main aims are to promote interdisciplinary understanding of relationships between these areas, assist organisations to meet present and emerging challenges, and provide postgraduate opportunities in both disciplinary and interdisciplinary organisational research.



Program Co-ordinator Dr Trevor Williams

The program currently supports seven projects.

1. Competitive advantage through operations and manufacturing, where the main research activity is a collaborative international study of small firm strategy in Australia and Britain (Prof J Lowe, Mr J Flanagan).
2. First mover advantage and competitive advantage, which is addressing the research problem of how actually to identify first movers through a pilot study of the financial and pharmaceutical leasing industries.
3. Strategic evaluation of human resource development, which is researching relationships between new technology, work design and human resource development in the Australian public

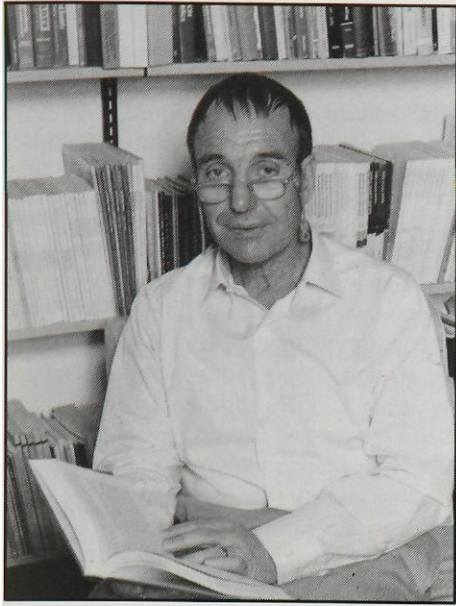
service (Dr T Williams), and inter-organisational networks through a study of employee rehabilitation (Mr M Zanko).

4. Corporate strategy and capital structure, where the conventional approach to explain financial structuring by reference to external market forces is being broadened to examine the importance of strategic positioning as a further factor influencing financial structuring, through a study of 500 firms and the development of a regression model (Mr A Naughton).
5. Inter-organisational marketing, which is researching the buying behaviour of organisations purchasing from other organisations, initially through a study of 253 private and public sector organisations and the development of a causal path model for further testing in subsequent studies (Dr P Dawes and Mr P Patterson).
6. Corporate culture and strategic change, where an extensive literature survey on organisation structure and organisational norms has been completed and a longitudinal study of a NSW Government department is planned to begin in 1990 (Mr R Horne and Dr M Jabri).
7. Information systems development in organisations, which is researching the interactions between the discipline of information systems, systems methodologies, and organisations at all levels of systems initiation, production and usage (Assoc Prof G Winley, Dr S Little, Dr L Y Shue, Mr R Clarke, Mr R McGregor, Ms H Hasan).

During 1989-90 a seminar series provided a focus for interaction between the projects and the presentation and discussion of research in progress. To date 12 working papers have been presented by researchers and postgraduate students to multidisciplinary audiences which have included interested people from outside the program, and 46 publications have been produced which relate directly to the program.

The initial research tasks of reviewing literature, establishing databases and creating appropriate conditions for longer-term research are well advanced in all projects. In some projects there has been significant progress with data collection and analysis, modelling and theoretical-perceptual development.

Specific highlights of this first full year of the program have been publication of the initial inter-organisational marketing study, which has attracted widespread interest, invitations to several of the researchers to present their work at national and international conferences, and the inclusion of a paper from the new technology and work design study in an international collection of distinguished papers on socio-technical research.



we call science. The same principle applies to other domains of knowledge and thinking. How does one 'get control' over the range of language forms that are needed for high quality thinking and knowing? This is one of the questions which will keep some members of the program busy for the next year or two.

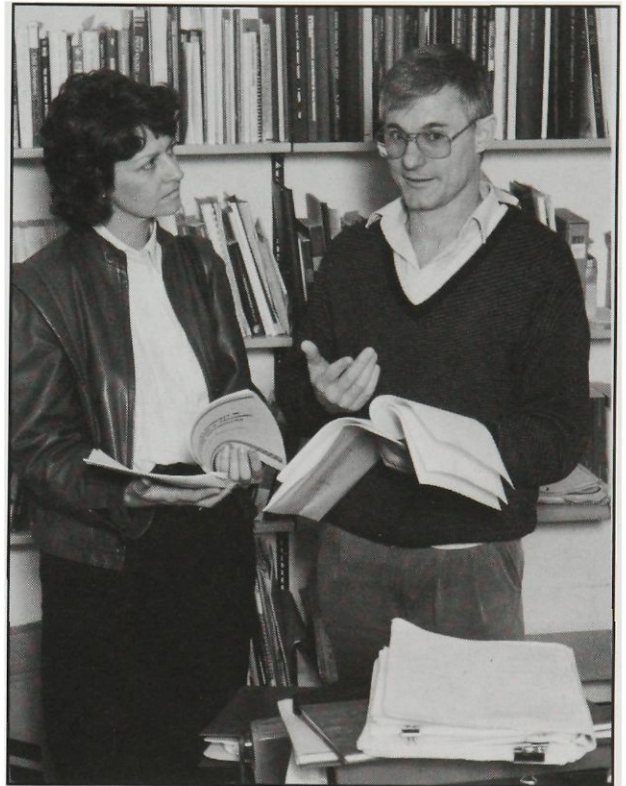
The program also has a teacher development focus. One outcome of the research over the past year has been the development, trialling, and evaluation of an in-service program which helps secondary teachers, from all discipline areas, be more effective teachers of the reading and writing skills and knowledge which their respective subject areas demand of students.

This inservice program is designated the Secondary Literacy Inservice Course (or SLIC). Since its publication in late 1989, this course has been purchased by so many schools that it has already gone into a third print. It has, moreover, attracted overseas interest. The New York State Department of Education has adopted it and has purchased a licence to print and sell the course to the secondary schools for which it is responsible. Some members of the team recently spent three weeks in New York State training co-ordinators to run SLIC. The probability of other states in the USA purchasing a licence to use the SLIC program is high.

One consequence of SLIC's success has been a commission to develop and trial an intensive literacy inservice program for American teachers in grades 4 to 8. This project, which has been entitled 'Frameworks', is a cooperative venture with the Wayne-Fingerlakes school district in New York State. The budget for the first year is in excess of \$100,000. Similar budgets are predicted for future years. When completed, this program will have the potential to generate a steady income for the Centre's future research and development plans. Moreover, given the current rate of exchange, it has the potential for attracting postgraduate students from the USA.

A second major focus of the group's research has concerned reasons why some children fail to achieve a level of reading

ability compatible with their intelligence and achievement in other subjects. Such children constitute approximately from five to ten per cent of the school-age population and represent a large financial and emotional cost to the community. For some years a group of us has been concerned with how children who do learn to read easily and those who do not may differ in terms of visual information processing. Our results show that specifically-disabled readers differ from normal readers in that section of



In the upper picture is Associate Professor Brian Cambourne and, above, are Professor Bill Lovegrove and Ros Heinecke, who has worked on reading disability

In 1989 researchers who were part of the Applied Cognitive Studies Program initiated a unique, multidisciplinary research program which had as its major focus a number of aspects of literacy education for the 21st century. This program was unique, in the sense that the researchers instigated a range of research and development projects which employed both naturalistic and rationalistic research paradigms. In 1989 the members of the group were confident that by adopting such a broad approach they would ultimately be able to develop new insights and theories into the teaching and learning of literacy in Australian schools. In 1990, officially the International Year of Literacy, there is evidence that this confidence was well placed.

One of the broad questions which the program set out to answer was, 'What kind of literacy is appropriate for Australian school graduates in the 21st century?' Data which have been collected over the past year has revealed some interesting aspects to this question. It has become clear, for example, that the task of determining the kind of literacy needed for the 21st century is extremely value laden. Literacy, it seems, is like poverty in that it is a social concept.

One strong opinion that is emerging from current linguistic theory (and which the data collected by members of the project confirm), is that if Australia is to survive as a nation in the next century, the majority of its school graduates must be educated well beyond mere functional literacy. All that this means is that if one wants to understand science, think like a scientist, and ultimately come to learn and know science then one needs to have control over both the written and oral linguistic registers of the discipline

the visual system responsible for combining inputs from successive fixations while reading. The theory developed as a consequence has led to predictions about the modes of visual presentation of written material which should facilitate reading in normal and specifically-disabled readers respectively. We have tested this in 1989 and the results show clearly that quite different types of visual presentation are best for the two groups. This has clear implications for the way print should be set out on a page. During the next year these findings will be incorporated into a more comprehensive reading remediation program.

The results from these two approaches to research are individually encouraging and together will make a greater contribution than either approach alone.

The principal research project being undertaken in this program is the development of CASE (Computer-Assisted Software Engineering) tools to support the design and use of databases. The research group also supports the distribution of mathematical software in Australia, using the *netlib* distribution software and libraries from the Argonne National Laboratory, with equipment bought from an ARC grant. An investigation of compression techniques is in progress to support the introduction of an

optical disk archiving facility into the University computing centre.

IDDK Project

The IDDK (Intelligent Database Design Kit) project started in the Department of Computer Science in 1985. The project is concerned with the development of methodologies and integrated knowledge-based tools for the design of information systems, in particular those implemented with database technology. A number of staff

have been involved in the IDDK development since 1985. In 1989-90, the project development and/or teaching involved Leszek Maciaszek, Gary Stafford, Stein Krav, Jurek Korczak, Ian Gorton, and Phil Herring.

Two IDDK tools have so far been completed and are marketed to educational institutions and business organisations: (1) ERA-Edit – a hypersemantic data modelling and knowledge representation tool built on top of the conventional entity-relationship-attribute model, and (2) DFD-Edit – a data flow diagramming and function specifications tool. Several other tools exist in prototype versions and are expected to enrich the IDDK workbench (eg, REL-Derive – a converter from a hypersemantic ERA diagram to a relational database schema).

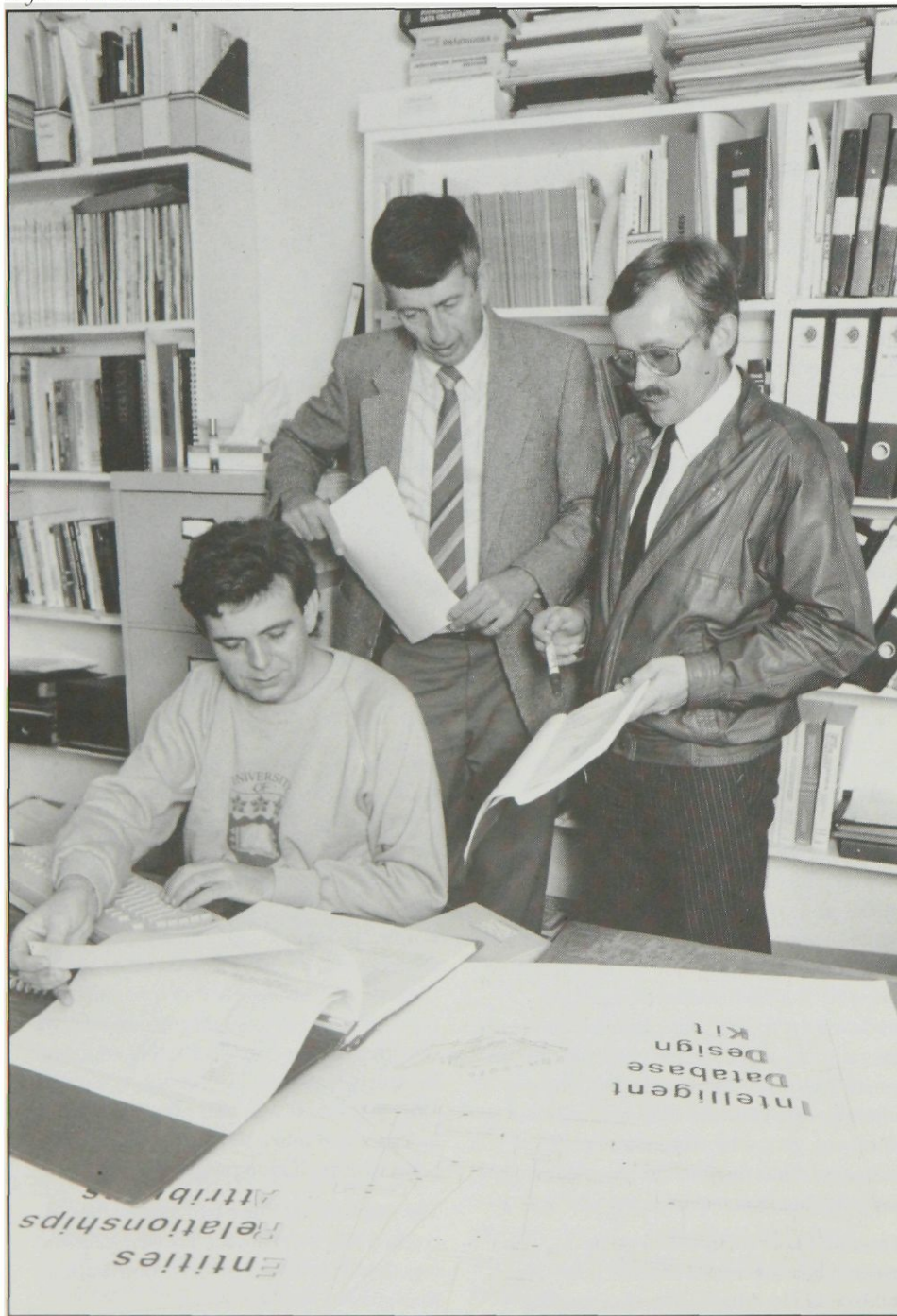
Simultaneously, new tools are being implemented, eg DOC-Edit – for document painting and document-flow specification, and FUN-Analyze – for business modeling (function analysis and view integration).

The IDDK software has been acclaimed for its innovative approach and new research insights. It is listed by Apple Computer Inc. in the international edition of 'Apple Engineering/Scientific Solutions Guide'. It has been demonstrated in many leading research centres in the USA and Europe and it was selected for presentation at the 11th International Conference on Software Engineering held in 1989 in Pittsburgh. The IDDK methodology has been described in the book Maciaszek, L A, *Database Design and Implementation*, Prentice-Hall, 1990, 383 pp. The Institute for International Research (I.I.R. Pty Ltd) has asked Dr Leszek Maciaszek, the principal IDDK investigator, to run a series of intensive three-day workshops based on the IDDK methodology in Australia and New Zealand during 1990.

The IDDK developers are exploring the possibilities of joint developments of the software with three large user organisations. One likely outcome of entering into partnerships is the porting of IDDK from Macintosh to SUN and IBM workstations.

Finally, DFD-Edit and ERA-Edit have been successfully used in teaching computer science and information systems courses both at Wollongong and at several other universities in Australia and overseas. Here, in the Department of Computer Science, the IDDK tools have been used in teaching CSCI-223, CSCI-235, CSCI-311, CSCI-315 and in the postgraduate program. Using the IDDK software for teaching results in direct savings to the Department which would otherwise need to buy expensive CASE software.

Standing are Associate Professor Greg Doherty and Dr Leszek Maciaszek. At the computer keyboard is Mr Stein Krav

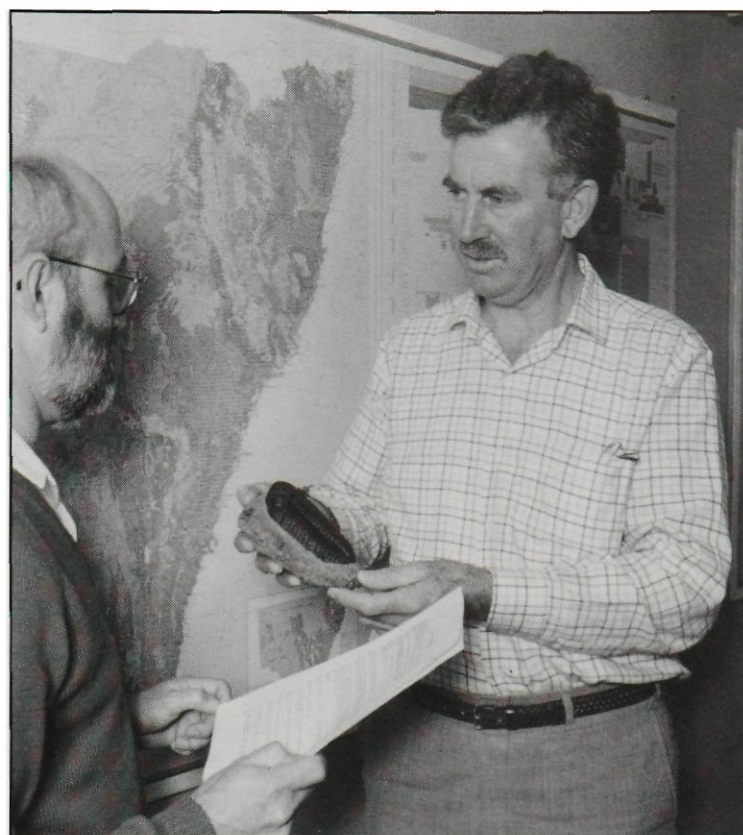


The purpose of this report is to provide information on the Tasmanides Program, under which studies of several aspects of the geology of the Tasman Fold Belt in NSW and Queensland are being carried out. In this research, the focus is on rocks deposited in an ancient island arc environment, similar to that which exists around the Pacific at present. Important mineral deposits occur in this island arc environment, and one of the aims is to contribute to the understanding of the genesis of these deposits. External funding has been received for various projects under the umbrella of this program. A number of publications stemming from this work are in press or in preparation.

A major instrumental advance made possible by program funding is the installation of the Siroqant analytical system for the X-Ray Diffraction unit, which allows identification and quantitative analysis of crystalline phases in rocks and other materials. Other software purchases have made it possible to automate the identification of minerals in rocks from XRD analyses, eliminating the laborious manual search previously used, and storing all data. Dr Bryan Chenhall has been co-author, with Professor Howard Worner and Jeff Jones (Microwave Applications Research Centre), of a paper presented at the Lehigh University Symposium on Franklin Ore Deposits. This paper dealt with the synthesis of Franklin-type minerals using microwave energy.

Research on the tectonic development of the northern New England Orogen has been carried out by Dr Chris Fergusson, Professor E C Leitch (UTS) and Associate Professor R A Henderson (JCUNQ); this is further supported by an ARC grant held jointly by these scientists. In 1989 a major component of field work was completed; this led to major discoveries in the Stanage Bay-Percy Islands district of the central Queensland coast. An important ophiolitic succession found on South Percy Island is thought to represent the oceanic basement to a Devonian island arc succession that was exhumed in a major earliest Permian extensional tectonic event. Complex deformation was recognised in the Carboniferous forearc succession at Stanage Bay including a nappe derived from the outboard eastern Shoalwater terrain during the climatic Hunter-Bowen Orogeny. Field work on several traverses along the eastern Bowen Basin and western New England Orogen to the west of Rockhampton yield regional cross-sections indicating that the

Associate Professor Tony Wright's research has been advanced by the installation of a siroqant analytical system for the X-Ray Diffraction unit as well as other items of significant software



New England Orogen was thrust westwards over a major east-dipping detachment during the climatic Hunter-Bowen Orogeny. Other work on this fold belt by Xie Qianli (Program Associate from the China University of Geosciences, Wuhan, PRC), is focusing on Late Devonian volcanic rocks from Keepit, NSW.

Dr Paul Carr, Associate Professor Brian Jones and Dr Chris Fergusson are studying the area known as the Wollondilly Tract, for which they are receiving support from the ARC. Several papers dealing with various aspects of this project were presented at the Geological Society of Australia Convention. One paper in press on the structure of the region (jointly with Fons VandenBerg, a Program Associate from the Geological Survey of Victoria), describes a major east-verging thrust system in the region. Brian Jones and Chris Fergusson are studying the Ordovician depositional environment and its regional significance with particular reference to 'contourites'. Paul Carr continues joint isotopic studies on the Marulan Batholith with Program Associate Dr Bruce Chappell (ANU) and Brian Jones. Paul also is editor for the Centre For Isotope Studies Report (an ARC-funded collabora-

tive venture between CSIRO and several universities). Professor Peter Coney (University of Arizona) was a Visiting Scholar in the Department of Geology during May and June and collaborated with Chris Fergusson in a study of the tectonic development of the Lachlan Fold Belt.

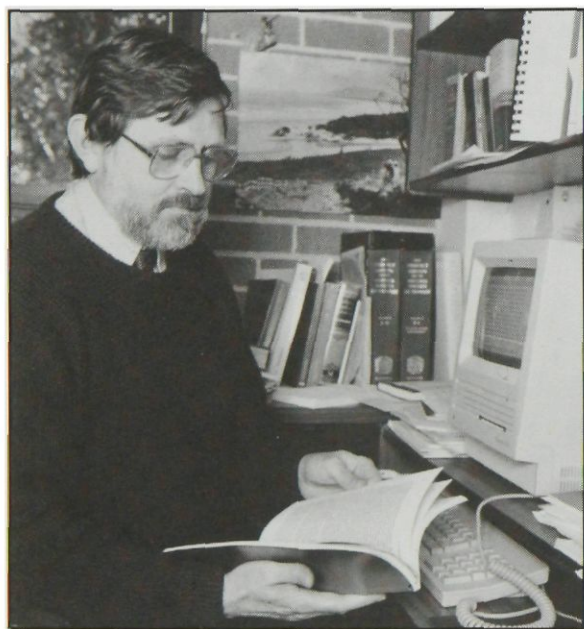
John Pemberton's studies of the Ordovician, Silurian and Devonian strata of the Cudgegong district are continuing, and he has published a major study of the stratigraphy and structure of the older rocks in the district. Associate Professor Tony Wright presented a joint paper on the brachiopod *Notoconchidium*, with Program associate Dr Mike Garratt, at the 2nd International Brachiopod Congress in Dunedin in February 1990, and this will be published in the congress proceedings. Dr Roger Cooper (New Zealand Geological Survey), a Visiting Scholar in May-June, studied New Zealand trilobites with Tony Wright, who is also carrying out studies of Devonian faunas of the Capertee High with ARC support. One of these studies, jointly with Jie-xin Yan, a Program associate from the China University of Geosciences, Wuhan, PRC, is concerned with Late Devonian brachiopods from New South Wales.

LITERATURE AND THE COLONIAL LEGACY

Co-ordinator: Associate Professor J M Wieland, tel. 27 0677

Post-colonial Literature is one of the major 'growth areas' in literary studies. Through the present Program, and through its relationship with the New Literatures Research Centre, the Department of English is gaining strength as a centre for Post-colonial studies.

The year under review has seen a consolidation in the research of the Program and a considerable publication output. The Program grant has enabled members not only to carry on their research, but also to travel to international conferences, to undertake research outside Australia and to organise a conference to promote the study of Post-colonial literatures. It has provided research support for publications and for



Associate Professor James Wieland

ongoing research projects such as James Wieland's and Paul Sharrad's bibliographies of Australian and South Asian and Pacific literatures. Through the interest generated by the Program, two post-graduate courses centred on Post-colonial literatures and cultural studies have been developed, and one has already taken its first enrolments.

The Program has been successful in its aim of generating publications in the area of the New Literatures. In the past year, Paul Sharrad has edited *New Literatures Review* and has been guest editor for *CRNLE*, and Bill McGaw has edited *SPAN*, all seminal journals in the field. McGaw and Sharrad have co-edited a volume of conference papers, to which Dorothy Jones and James Wieland contributed. Anne Cranny-Francis has collaborated with Terry Threadgold from the University of Technology, Sydney, in the founding of a new journal '*Social Semiotics*' and both James Wieland and

Dorothy Jones have contributed chapters to works on Australian literature. Dorothy Jones and Sue Gillett have published several articles on Australian women writers, and Paul Sharrad continues to publish extensively on Australian and Pacific writing.

In a relatively new area such as ours, conferences are important, not only as generators of publications, but also as centres for the exchange of ideas among academic critics and between critics and writers. (In the area of New Literatures, much of the writing is also new writing, where critics have the opportunity – seldom available to the critics of the past – to discuss critical ideas about a work with its author.) Several Program members have attended conferences overseas: Dorothy Jones

delivered a paper in Washington in December at the Modern Language Association Conference. James Wieland presented papers at both the 1989 Symposium on Literature in the Asia-Pacific Region held at the University of Singapore and the April 1990 EACLALS Conference in Lecce, Italy.

Paul Sharrad was invited to teach for a semester at undergraduate and postgraduate levels in 1989 at the East-West Center, University of Hawaii, where he also contributed to the University's Occasional Papers series and produced a monograph on Post-colonial writing. Program Associate Sharon Clarke was able to undertake a study trip to the United States, and in the course of her stay arranged an interview with writer Sumner

Locke-Elliot. Jane O'Halloran went to Singapore and Britain to work on Somerset Maugham, and Anne Cranny-Francis spent three weeks in the Philippines, interviewing women writers (after the fighting stopped and she was allowed out of her hotel room).

In January/February, Program members hosted and organised the annual conference of SPACLALS (South Pacific Association for Commonwealth Literature and Language Studies), which attracted delegates from Australia, the USA, Canada and the South Pacific. The Australia Council subsidised the attendance of Australian writers Jeff Guess, Margaret Scott and Nigel Krauth and Canadian writer Rachel Wyatt also attended with the assistance of a grant from the Canadian Government.

The assistance gained for Ms Wyatt's attendance at the SPACLALS Conference is evidence of the increasing support the Program is attracting. The Canadian

Government has expressed an ongoing interest in the Canadian component of the Program's research, in the work of Dorothy Jones and since July, Gerry Turcotte; and the New Zealand High Commission showed its support through a donation of a collection of books by New Zealand Writers.

In 1989, as chairman of SPACLALS, Bill McGaw administered the Commonwealth Writers' Prize, the major literary award in the field, which was awarded to New Zealand writer Janet Frame for her novel *The Carpathians*. In 1990 the Prize will be administered by Paul Sharrad.

The Program has been the immediate impetus for the development of a new Masters Course in Post-colonial Studies, beginning this year, in which several Program members are teaching. Another MA course in Cultural Studies is being developed by Program members in co-operation with members of the Department of Sociology and other member departments of the Faculty of Arts.

The publication this year of *Olga Masters: an Autumn Crocus*, edited by William McGaw and Paul Sharrad, is one of the landmarks of the program to date. The book brings together the papers presented at the Olga Masters Memorial Conference, hosted by the English Department and the New Literatures Research Centre.

The program has attracted several distinguished scholars to the University. Professor Bernard Hickey from the University of Lecce was Visiting Scholar in the Department for six weeks in 1989, and lectured on Post-colonial studies to undergraduate and postgraduate students. Professor Eddie Baugh, from the University of the West Indies, visited the Department for a month as DEET Visiting Professorial Fellow in Australia for 1989 and Ms Eva Ranaweera, Sri-Lankan novelist, poet and playwright, spent six weeks in November/December on a New Literatures Research Centre Fellowship, working on the screen adaptation of her novel *Sedona* with program member Dr Laleen Jayamanne.

Throughout 1989-90 Program members and associates have been involved in the New Literatures Research Centre's Seminar Series, chaired this year by Program Associate Jane O'Halloran. The series runs in conjunction with the English Department's Postgraduate Seminar Series and the parallel enables valuable cross-fertilisation in terms of speakers and ideas.

In 1990, the program gained three new members: Ms Sue Gillett, who took up a lectureship in the Department in February, Mr Gerry Turcotte, who accepted a lectureship in July, and Dr Gaetano Rando from the Department of Languages.

The Advanced Telecommunications Research Group combines the skills and talents of academics from the Departments of Electrical & Computer Engineering, Computer Sciences, Mathematics and the Centre for Information Technology Research. The Group's research is focused on technology that will enable tomorrow's telecommunication systems to be effective in terms of both cost and efficiency.

A number of services on the horizon that have the potential to revolutionise the way we work and live include video telephony, video conferencing and intelligent networks. The technology that will enable these services to become reality is the fast packet switched networks. The research group is actively working on problems associated with these services and technology in close co-operation with industry.

During 1989/1990 the Group's research effort concentrated on three areas: (1) fast packet switched networks and integrated services digital networks; (2) digital signal processing with particular emphasis on speech, image and video coding techniques; and (3) telecommunication policies and organisational problems. Specific projects are presented below.

Broadband Integrated Services Digital Network (BISDN)

These networks consist of optical data links (greater than 100 Mbps) which carry all services, such as voice, data and video. Information is packed into self-routing cells. The main research areas are congestion control investigation by both analytic and simulation means and transport layer protocol design for variable bit rate communication.

Researchers: H S Bradlow, G J Anido, D Hughes, M Mei and S Ghahreman.

Adaptive Filtering

Research has concentrated on adaptive notch filtering and comb filtering. Applications for such research are narrow band interference suppression, echo cancelling, spectral estimation and other industrial applications. Areas of research include developing new filter models and investigating their properties and performance under different adaptive algorithms.

Researchers: J F Chicharo and T S Ng.

Voice Coding

Research has concentrated on low bit rate

(5.0 kbps and under) code excited linear predictive (CELP) codecs. Applications of such codecs are the INMARSAT standard-M service, AUSSAT's planned digital mobile satellite service and the GSM Pan-European half-rate digital mobile service. Research effort is mainly concerned with reducing bit rate and improving speech quality in fading channel by interpolation of parameters and by reducing code book sensitivity.

Researchers: A Perkis, P Lei, P Secker and T S Ng.

Image Coding

One of the most important techniques being used to compress an image is the two-dimensional cosine transform (2D-DCT). Research into algorithmic analysis and implementation of 2D-DCT has been the effort of a number of Group members. Apart from deriving new 2D-DCT fast algorithms, considerable effort has been spent in evaluating real-time implementation using special digital signal processing chips and transputers. The Research Group is also designing a VLSI 2D-DCT chip through the UNSW MPC Facility.

Researchers: F J Paoloni, H Wu, J Fulcher and R Knight.

Video Coding for Fast Packet Networks

Main applications of this research are video conferencing, video telephony and stored image sequence retrieval. Research effort has concentrated on two-dimensional vector quantisation and fractal transformations. The Research Group is also building up equipment and developing modules of

subsystems such as predictive coding, filter banks and 2D-DCT so that different coding techniques can be simulated and their performance evaluated.

Researchers: T S Ng, F J Paoloni, A Perkis, H S Bradlow and J Andrew.

Telecommunication Policy

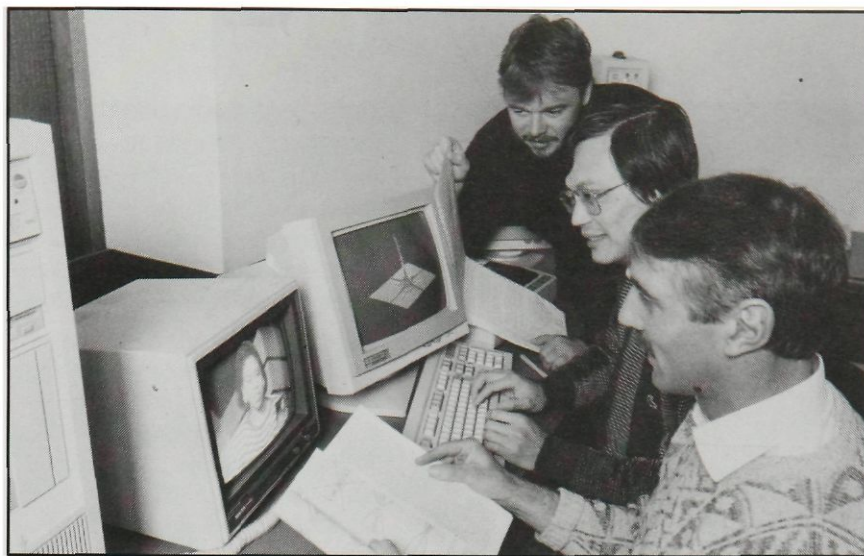
Work has concentrated on organisational aspects of new technology. One study is to assess a stimulation in demand, arising from the availability of fibre optic links, for new communication services in regional centres to metropolitan loops.

Researcher: I Reinecke.

Research Projects with Industry

The Research Group has also been actively working with industry. Co-operative projects completed, in progress or initiated during this reporting period include:

- The development of a G.703/G.704 high speed data link - computer protocol
- The design and performance of protocols for integrated services on packet switched and inter-connected networks - OTC.
- Study of fast implementation of DCT coding systems - Telecom Research Laboratories.
- CELP codecs improvement and evaluation for digital mobile satellite services - AUSSAT.
- Asymmetric codecs for stored image sequences - OTC.
- Radio Integrated Service Digital Networks - Canon, Japan.



Working with Associate Professor Tony Ng (middle) in his advanced telecommunication research is Associate Professor Frank Paoloni (nearest camera), whose work also embraces microwave systems. On the left is lecturer Mr Andrew Perkis



A program of research on Asia-Pacific Development Studies was launched in 1990 to co-ordinate the activities of a number of individuals working in different disciplines throughout the University. Its formation is a reflection of the growing importance of Asian and Pacific Studies to the wider community as well as the need to provide a communication network for numerous researchers throughout the University.

The eight members of the program are engaged in research on issues of resource, economic, social and political development in Asia and the South Pacific.

Several of the group are involved in research on poverty and agricultural development. Dr Edison Dayal (Geography) is investigating the extent of hunger and food poverty in India and its relation to population growth and changing food production systems. Dr Dodo Thampapillai (Economics) is working on problems of soil conservation in poor agricultural communities. Dr Dennis O'Brien (Economics) is researching problems of agricultural development in Indonesia, especially the kinds of policy instruments required to increase rural employment and improve income distribution. Dr O'Brien's work is being carried out in collaboration with Indonesian scholars and a number of post-graduate students are involved with aspects of the research. These projects are supplemented by that of Dr Thampapillai on ways of measuring poverty.

Dr Tony Naughton (Management) is conducting a comparative study of the development of capital markets in Taiwan, South Korea, the Philippines and Indonesia in order to compare levels of financial development and test the capital markets for efficiency in allocation of resources.

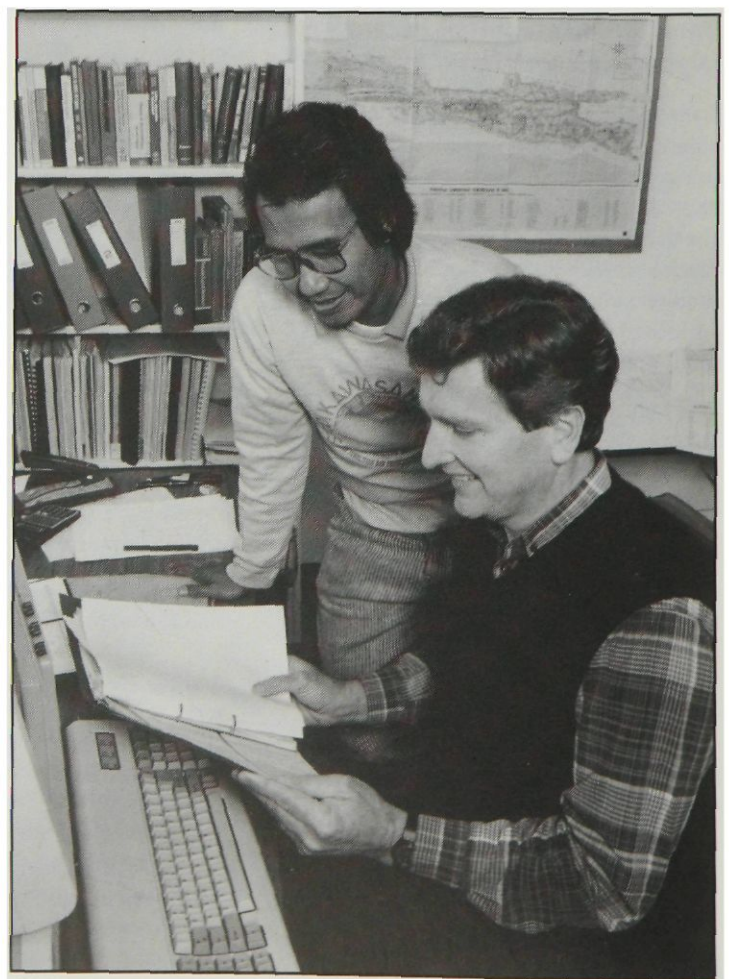
Ms Melanie Beresford (History and Politics) is studying the process of industrial development under the contrasting policy environments of the Philippines and Vietnam. This project dovetails with a wider one undertaken in collaboration with the Nordic Institute for Asian Studies (Copenhagen) and Dr Adam Fforde, an economic consultant based in Hanoi, on the economic and social history of Indochina since the 19th century. Ms Beresford's contribution will be on aspects of industrial development as well as regional problems.

Professor Alan Cook (Geology) is working with members of the program through his study of natural resource development in Indonesia, especially coal, petroleum and gas resources. Professor Cook has a large number of Indonesian post-graduate students conducting thesis research into aspects of resource development.

Ted Booth (Education) is carrying out joint research with the University of Malaya, Kuala Lumpur, on the extent to which cross-cultural field experiences by students from the Universities of Wollongong and Malaya are effective in enhancing knowledge and changing cultural attitudes. An evaluation is being carried out on the extent to which these experiences can improve students' professional development as teachers. It is also expected that the project will assist planners in assessing the attractiveness of Wollongong University for overseas study.

Professor Edward P Wolfers (History and Politics) is engaged in two projects with overseas collaborators. One, being carried out with the University of Papua New Guinea, involves a comprehensive review of the electoral process in PNG, as well as work on constitutional interpretation within a comparative perspective, and is expected to produce a manual for use in Papua New Guinea. The other draws on Professor Wolfers' first-hand experience in analysing foreign policy making and the development of foreign relations by South Pacific Island States. It includes a study of recent regional agreements.

Pictured above is one of the Program Co-ordinators Ms Melanie Beresford. On the right, nearer the camera, is the second Co-ordinator, Dr Dennis O'Brien, with him is Husein Sawit, a PhD student also working in the program



There are within the University 17 Research Centres, most of which operate under the aegis of the Illawarra Technology Corporation Ltd. ITC (as it is known) is located on campus, is part of the University and is responsible to the University Council.

The Centres were established as a means of bridging the gap between fundamental research undertaken within the University and applied research in the areas needed – today more intensively than ever before – by industry, by business and by the community in the Illawarra region and beyond.

Inevitably, of course, much of the work of the Research Centres overlaps with that of the programs and projects research units described in the narrative section of this journal. It is for this reason, and in part, too, because the work of the Research Centres was described in considerable detail in the University's *Annual Report* for 1989, that it has not been repeated here.

The names of the Research Centres are given below. Those seeking to know more about their work may do so by getting in touch with the head of the University of Wollongong Academic Services Branch, Mr Peter Wood, tel. 27 0943, or by writing to him at the University of Wollongong, PO Box 1144, Wollongong, NSW 2500.



The Illawarra Technology Centre

The Centres and their heads

Automation & Engineering Applications Centre	(AEAC)	Prof C Cook
Automation Extension Services Pty Ltd	(AES)	Prof C Cook
Biological and Chemical Analytical Services	(BACAS)	Mr T Lewis
Bulk Materials Handling Division	(BMH)	Prof P Arnold
Centre for Advanced Manufacturing and Industrial Applications	(CAMIA)	Prof G Arndt
Centre for Applied Biology Research	(CABR)	Prof H Garnett
Centre for Information Technology Research	(CITR)	Dr I Reinke
Centre for Mining Research	(CMR)	Prof R Singh
Centre for Multicultural Studies	(CMS)	Prof S Castles
Centre for Studies in Literacy	(CSL)	A Prof B Cambourne
Centre for Technology and Social Change	(TASC)	Prof R Johnston
Centre for Transport Policy Analysis	(CTPA)	Dr R Robinson
Centre for Work and Labour Market Studies	(CWALMS)	Dr J Mangan
Key Centre for Mines	(KCM)	Prof C Gerard
Microwave Applications Research Centre	(MARC)	Prof H Worner
New Literatures Research Centre	(NLRC)	Assoc Prof J Wieland
Polymer Systems Technology	(PST)	Prof G Wallace

Astronomy and Astrophysics Group

Dr W Zealey, tel. 27 0522

Far from being a narrow specialism, Astrophysics requires a strong background in all branches of Physics (and other sciences) together with an ability to weld concepts from differing areas into a coherent theory. In addition it has a strong observational basis, requiring the use and understanding of state-of-the-art optical, infrared and radio instrumentation.

The Astronomy and Astrophysics Group has active observational, theoretical and instrumentation development projects. The research interests of the four staff members and postgraduate students encompass both the pure and applied research areas. While individual staff pursue their own research, they share a common interest in instrumentation, particularly that associated with image analysis.

The injection of major funds into National Facilities in the form of the Anglo-Australian Telescope (1973) and the Australia Telescope (1988) has enabled small groups similar to our own to compete scientifically on an equal basis with major international institutions. The recent acquisition of our own computer-controlled 16-inch telescope equipped with photometers and a CCD camera has enabled us to pursue novel research projects.

Image Digitising and Analysis

Many of the individual research projects depend heavily on image digitising and analysis. Since 1985 Zealey, Moore and Ilnat of the Astronomy group have been developing a major imaging facility based on CCD detectors and PC/AT computers. Two PC/AT based video digitising systems provide a basic image analysis facility. Software has been developed which enables these to analyse images obtained from a variety of sources, including Anglo-Australian Telescope infrared images, infrared astronomical satellite images and CCD frames from our 16-inch telescope.

Evaluation of other possible uses has been proceeding with a view to providing an image analysis service to the community. Use has already been made of the system to provide digital images of forest canopy photographs for a trial project for ALCOA (Dr B Harper), as well as to support analysis of biological autoradiograms.

The development of a high-speed, CCD plate measuring system is at an advanced stage. This system will provide a measurement facility comparable to that of the more expensive PDS and COSMOS measuring machines, for the analysis of UK Schmidt telescope plate material.

In parallel with these developments there is offered a postgraduate course, 'The Physics of Imaging', which provides students with hands-on experience in image analysis.

Galactic and Extragalactic Star Formation Protostars

Young stars are born in dense cold clouds of dust and molecules. During their early years these stars lose prodigious amounts of material in supersonic winds. These winds are channelled by dense circumstellar disks into pencil-thin jets blasting out into the surrounding material.

The researchers – Zealey, Sutters and Randall – have mapped 15 outflow complexes in the infrared, using the Anglo-Australian Telescope as part of a study of the way in which these jets interact with their surroundings. One of these flows, in Orion, has provided evidence for a dense disk extending up to 10,000 times the distance of the earth to the sun from the central star.

Star Burst Galaxies

A major event in astronomy was the bright supernova which occurred, in 1987, in the nearby Large Magellanic Cloud. Considerable effort by Zealey and McIntyre is spent searching for similar events in nearby galaxies in an attempt to understand the processes which lead to such massive stellar explosions.

Recently discovered galaxies – designated as Star Burst Galaxies – are forming stars at several thousand times the rate observed in our own Milky Way. As the stars evolve they are expected to produce supernova explosions at a similarly enhanced rate. Repeated observations of Star Burst Galaxies maximise our chance of observing an energetic supernova soon after it explodes.

In Ring Galaxies, star formation, triggered by a collision with a nearby galaxy, occurs over the whole galaxy. The extended nature of these star-bursts makes searching for supernovae comparatively easy. In order to identify highly active galaxies in this class we are carrying out a survey of all southern Ring Galaxies, using the Parkes 64m radio telescope. Follow-up monitoring of the most active will be carried out using the Department's 0.4m telescope and CCD camera.

Cooling flows

Many of the galaxies in the Universe are bound together by gravity into groups or clusters which may consist of anything from a few up to many thousands of galaxies. Along with the galaxies there is usually a large quantity of very hot gas trapped by gravity in the cluster. The gas is so hot that it emits X-rays, at temperatures of anywhere from a few million to more than 100 million degrees.

Near the centres of many clusters the hot gas has radiated most of its thermal energy and is being deposited as cool gas in and around a central galaxy. The rate at which the cooled gas is being deposited is sufficient to support the theory that the whole of the central galaxy may have been formed from cooled intracluster gas. This process is known as a 'cooling flow'.

Cooling flows raise many interesting questions. It is generally assumed that the cooled gas ultimately forms into stars, but if this is so then the types of stars that are formed are different from those that are formed in the nearby regions where we know that stars are forming. Because of this it is important to understand the details of how the cooled gas is deposited and how it might form into stars. Together with colleagues in the UK and USA, Paul Nulsen is continuing work on this field in a number of areas.

Astrophysical fluid dynamics

Nulsen is also working on the development of a computer numerical code for the study of gas flows in astrophysical situations. Apart from the usual difficulties of fluid simulations, astrophysical problems commonly involve very large dynamic ranges of scale. Most fluid codes are poorly adapted to this type of problem, particularly when dealing with flows in more than one dimension.

One code which has been used quite extensively for simulating astrophysical flows is known as 'smoothed particle hydrodynamics'. This code can handle Lagrangian simulations in more than one dimension, but is not really suitable for treating wide dynamic ranges of scale because the fluid is simulated by pseudo-particles with a fixed, finite size (the 'smoothed particles'). The free-Lagrangian method has a similarly flexible moving grid, but the spatial resolution is determined exclusively by the spacing of the mesh points at any place in the flow.

It is expected that this code will prove useful for studying astrophysical flow problems that have proved intractable to date.

Variable Stars and Stellar Old Age

As stars evolve in time, (writes Glen Moore) they go through increasingly chaotic periods as they attempt to balance their energy budgets. Observations of such variable stars allow us to develop detailed models of the structure of the star and to understand the changes that occur within its core.

The installation of the 0.4m DFM telescope has allowed the group to contribute observations to several international variable-star monitoring projects.

Many massive stars end their lives in huge supernova explosions. It is important to

identify such events as early as possible so that subsequent changes may be monitored closely.

Mr R Reinfrank as part of his Honours thesis produced a catalogue of CCD images of the brightest galaxies in which supernovae are likely to occur. These galaxies will be re-observed at regular intervals as part of a supernova search project.

Directional Mutations

Dr E J Steele, tel. 27 0434

A main theme in current research is the mechanism of antigen-directed somatic hypermutation in mammalian antibody variable-region genes. This system is a premier example of an environmentally sensitive feedback process involving directional genetic change.

While the mutator mechanism is unknown, the possibility is being investigated that an error-prone reverse-transcriptase genetic feedback process lies at the heart of the mechanism, ie, a DNA->RNA->DNA copying loop targeted to expressed V region genes. This approach, in collaboration with Drs G W Both and L Taylor (CSIRO Laboratory of Molecular Biology, North Ryde) involves the use of PCR, a rapid gene amplification and cloning technique (Polymerase Chain Reaction). Various regions of DNA around an expressed V gene are amplified by PCR and sequenced.

In this way it is possible to determine the specific region of DNA subject to the process of hypermutation. Initial data for a group of somatically mutated heavy chain V genes indicate that 94 per cent to 95 per cent of mutations fall within the transcribed region, a result consistent with the proposed model.

Other studies using PCR techniques, involving collaboration with a German colleague, Professor Klaus Rajewsky (Institute for Genetics, Cologne), look directly at hypermutating B cells for putative genetic intermediates likely to be generated by a DNA->RNA->DNA copying loop. In the longer term it is hoped to establish an in vivo system by transferring a particular V gene, incorporated in bone marrow cells, into recipient mice. In this way it will be possible to monitor and also manipulate the hypermutation process in a systematic way.

The work not only is relevant to the generation of antibody diversity in the immune system but also has wider evolutionary implications.

Structural Engineering

Professor L C Schmidt, tel. 27 0040

Significant progress was made during the year in the field of Structural Engineering within the Department of Civil and Mining Engineering. Some of the projects under the direction of Professor Lewis Schmidt included the inelastic behaviour of tubular steel struts, the prediction of static and dynamic wall pressures on silos and hoppers, shear lag and transverse stresses in thin-walled beams, an introduction to self-erection of space trusses by post-tensioning, and the influence of surface frictional characteristics on the behaviour of friction-grip joints.

The work on tubular steel struts showed that there is a serious reduction in load-carrying capacity of such struts when prestrained in tension in order to increase the yield strength. The type of steel is significant, as it has been confirmed that fully-killed steels, which have no strain aging capacity, furnish the greatest reductions of load capacity. This project has been confined to pure tensile prestrains so far; the next stage is to consider the influence of inelastic flexural prestrains, and to determine their effects on strut load carrying-capacity.

The above project has links with the project on the self-erection of space trusses by post-tensioning. During the erection procedure, compressive elements of the structure are likely to be stressed into the inelastic range by flexure in both tension and compression. So apart from the theoretical and experimental development of the self-erecting space trusses, the effects of material inelasticity become significant, and need further investigation. However, there is an increasing world interest in rapidly assembled structures, and the theory of mechanisms for structures is beginning to receive intensive exploration.

The static and dynamic work on pressures in silos and hoppers, conducted by Mr Y H Wu toward his PhD, has been fruitful. An explanation has been offered of the time varying pressures as a silo is opened. The finite element analyses, incorporating sophisticated granular material constitutive relationships, have proved to be highly effective in describing behaviour. Designers of silos for granular materials will now have a better understanding of flow conditions.

Transport engineering

An urban centre parking model has been initiated which involves procedures for modelling parking and route choice within urban centres. The model will predict the effects of parking location, sizing and management policies. It will also allow the

impacts of new land-use developments and traffic management schemes to be determined.

A graphical database system that incorporates traffic, land-use and parking in urban centres is also under development. This system will be compatible with the parking model and will allow the efficient management and planning of transport and parking facilities within city centres to be undertaken. This system is being developed in conjunction with the Wollongong City Council.

A microcomputer-based teaching package is being developed on the Apple Macintosh using hypertext. This is to be used in undergraduate transport engineering courses and will allow students to be introduced to material and to learn independently at their own pace. Key features include a self-assessment module, a high-quality graphical interface, and flexible branching procedures.

Dynamic investigation of footbridges

Selection of the thesis topic below was made after a discussion with Roads and Traffic Authority as potentially beneficial to the University and the Authority. One of several links-to-industry needs, the project is a thesis subject in the Department for a Bachelor of Engineering Degree. The Department has unique dynamic components in its course when compared with other universities in Australia. It has also several members of its academic staff pursuing research in the field of Structural Dynamics. The situation is therefore favourable for utilisation of several major components. The combination includes:

- (a) student interest,
- (b) need to investigate a particular aspect in bridge design generated by industry, and
- (c) interest and expertise in the problem area from a member of the academic staff and resulted in the project of investigation of an improvement in design procedure in footbridges.

Some steel footbridges under excitation have minor serviceability performance problems produced, for example, by joggers. That is to say that a bridge, while perfectly safe, will have larger amplitudes of deformations which are perceived as uncomfortable by a person standing on the bridge. Because of a trend for slender, aesthetically pleasing design, further reduction of mass in future years due to increase in the quality of steel is expected. This project was thus considered as worth while not only for existing footbridges, but mainly for future improved design.

Three footbridges were selected for the project with a range of different support

conditions to cover the most common situations.

All bridges are subjected to dynamic loads. This fact has been recognised for the past 100 years, where the dynamic load is produced by cars, trucks, and pedestrians. However, because of difficulties with a dynamic analysis of such structures, the current design practice is considering all loads as static with some allowance for a dynamic effect by increasing a load by the dynamic factor. An improvement of this existing practice for a design of footbridges is the general aim of the thesis, 'Dynamic consideration of a Design of Footbridges'.

The first aim of the thesis is to produce design procedure with a dynamic analysis which could reliably predict natural frequencies of a footbridge. This prediction ability of natural frequencies should avoid a situation where a single jogger could excite a bridge of a mass of about 15 tonnes. In the process of verification the dynamic analysis applied to the three structures under investigation, measurement of existing bridges is being recognised to be essential for the validation of the theory.

There were small differences between calculated and measured frequency for each bridge which successfully verified the theory applied. This first step will allow a prediction of the serviceability problem in a design stage, which can be subsequently avoided.

Our second aim is to propose some modification to the existing structures to improve the serviceability performance. This part of the project is still in progress with an indication of promising results.

Mr Colin Goodger worked at the Roads and Traffic Authority during vacation. A copy of the thesis is to be made available to the Authority, at its request.

Methodological Studies in Family Relationships

Dr D Midwinter, tel. 27 0673

Dr Darien Midwinter, currently Lecturer in Psychology, was Research Fellow with this project and during 1989 conducted research in collaboration with Associate Professor Graeme Russell at Macquarie University in the area of methodology in family observation studies.

The main work was a laboratory study of family interaction to assess the effect of the observer on observed family interaction.

Half of the participating families were observed and video-recorded as they played games in the laboratory and half of the families played the games without being observed or video-recorded. All families reported on their interaction immediately after the games session and, among other things, described how their interaction differed from their usual family interaction in similar situations at home. These reports were analysed to assess the effect of the observer.

Video-tapes of the families playing games in the laboratory were also coded and analysed for comparison with similar data (collected in a previous home observation study) of families playing the same games in the home. This was done to assess the effect of the research setting - home or laboratory - on the observed interaction.

Transforms for Image Processing

Associate Professor F J Paoloni, tel. 27 0401

Transform algorithms is an important tool for image processing and for transmission of real-time video images on communication systems. Work during the past year has involved further development of multi-dimensional Fourier transform algorithms and evaluation of their computational complexity.

The cosine transform, which is closely related to the Fourier transform, is currently being investigated as a means of reducing the bandwidth required for image transmission.

A number of alternative algorithms and, using randomly generated digital images, have simulated the computation errors and the resulting signal-to-noise ratios. The results are highly dependent on the register size of look-up tables and mathematical round-off operations in the computation. We have also examined the implementation of cosine transform algorithms using various forms of hardware, including microprocessors, digital signal processors and special-purpose integrated circuits. We have shown that the Austek A41102 Fourier Transform Processor can be configured to perform a very efficient cosine transform and can, with suitable parallelism, perform the operation in real-time.

Microwave Applications and Systems

There is interest in the Department of Electrical and Computer Engineering in the use of microwave power for industrial applications. The majority of this work is

performed in conjunction with the Microwave Applications Research Centre. Normally the product to be treated is inserted in a large chamber and microwave power is injected by means of a number of waveguide ports. Because the chamber is highly overmoded, power is not deposited evenly over the material to be heated and hot spots occur. A loaded cavity has been mathematically modelled to examine the physical process of energy distribution. This is a valuable aid in the evaluation of heating systems. Progress has also been made in the design of microwave applicators for special applications such as fluid processing and high-temperature smelting.

There has been a demonstrated need for variable control of the microwave power used for heating. The research team has developed two separate power circuits which provide the necessary control and these have been incorporated in heating systems. In addition to this, a fibre optic measuring device has been developed which can measure temperatures inside materials. Because the device is small and non-metallic, measurements are made without affecting the electromagnetic fields within the heating chamber.

Ben Jonson's Britain

Mr G Barwell, tel. 27 0117

Graham Barwell's research project in the Department of English involves an intensive study of Ben Jonson, the Renaissance poet, dramatist, grammarian and historian. The focus of the study is the idea Jonson developed throughout his life about the country he lived in and considered himself a part. The study takes as its starting point and rationale the contemporary theoretical proposition that people construct the reality they experience and one of these constructions is their picture of their country.

Graham Barwell believes it is particularly useful to study Jonson in this light because of the historical circumstances which had the potential to affect the picture held by him and other members of the intellectual circle he frequented (eg Camden, Cotton, Selden, Raleigh, Carew), such as the arrival of the Scottish King James VI in London and the flourishing of antiquarianism, especially the rediscovery of Britain's Roman past under the influence of Camden's *Britannia*.

It is also important to consider this aspect of Jonson in order to counter the impression left by the common view of him as a writer with an exclusively urban, especially

London, outlook. The research into this aspect of Jonson's conception of history and its relations to the notions prevalent in his circle, together with an examination of his version of Britain's past, has led Barwell to conclude that the Roman heritage (and the national perspective which went with it) was particularly significant for Jonson during the early and middle stages of his career, where he was deeply influenced by Camden, but that the later Jonson shows a greater interest in things more traditionally British, together with an increasing focus on local rather than national matters and areas. Barwell believes that it is likely that such a development is linked to changes in contemporary politics and Jonson's loss of influence at court after the death of King James. Further study of Jonson's picture of British geography and the inhabitants of Britain, his attitude to travel and first-hand experience of Britain will, the researcher believes, round out the idea of Britain which Jonson held.

Syntagmatic Theory

Dr R Harland, tel. 27 0678

A syntagmatic theory of meaning has implications for philosophy, linguistics and especially literary criticism. The syntagmatic dimension (defined but not explored by Saussure) is the 'horizontal' dimension of language, as distinct from the 'vertical' or paradigmatic dimension. Whereas the paradigmatic dimension – favourite stamping-ground of Structuralist and Post-structuralist theorists – relates a word to its analogues in a general language-system, the syntagmatic dimension relates a word to its particular neighbours in an individual sentence.

Syntagmatic theory studies what happens to meaning when words combine syntactically. Key concepts here are complementarity, intersection, projection, facilitation and abduction. Special attention is given to exceptional syntagmatic combinations, ie, combinations where the words in a phrase or sentence only just manage to achieve a meaning together. Like Chomskyan grammar, syntagmatic theory emphasises the uniqueness of human language and the profound gulf separating it from other human and non-human sign systems.

This, then, is a theory of language that stands apart both from the language philosophies of Structuralism and Post-structuralism and from the Anglo-Saxon varieties of Analytic and Ordinary Language philosophy. But it does have an ancestry in the tradition of 'I'-philosophy (as described in Dr Harland's previous book, *Superstructuralism*). In particular, it can

be seen as a linguistic development of the phenomenological perspective. With the core of the theory itself largely completed, Dr Harland's main concern in the past year has been to define syntagmatic theory in its (largely negative) relation to Analytic and Ordinary Language philosophy and in its (largely positive) relation to phenomenology.

Writing the Region

Mr D Davis, tel. 27 0762

Contemporary theatre has increasingly sought broader and broader areas of interest for its content and new and diverse styles for its presentation. One wing of this movement has been experimental and avant-garde; another has been innovative but popular in its appeal, and bound up with the growth of the Regional Theatre Company.

With the dual role of academic and theatre practitioner, Des Davis is undertaking ongoing research into the development of a 'style' of theatre that can be said to have grown out of the Illawarra region. As Artistic Director of Theatre South, he has worked with a series of playwrights – mostly from the region, and all but two of whom are graduates of this University – in the development and production of 11 new plays. He has experimented with the use of elements of the 'Regional style' in all the company's work.

The style he is developing draws upon his studies of theatre history. Many of the conventions – the use of stage space particularly – are based on Elizabethan theatre; some are borrowed and modified from the Documentary Theatre work of Joan Littlewood and Peter Cheeseman in England and Paul Thompson in Canada. Others still derive from the story-theatre style popular in Children's theatre, which Mr Davis researched in his book, *Theatre for Young People*. The style also makes extensive use of music, sound, movement and innovative design elements.

The content of the plays and their subjects have reflected the diversity of the region itself. They have ranged from community and folk history – as in *Windy Gully* and *Tonight We Anchor in Twofold Bay* – to adaptations of literary 'Classics' (*Tom Jones* and *The Birds Have Flown*), to biography (*Diggers' Darling*), regional celebrations (*Wonderful Wollongong*) and plays which have explored the region's social economic life in terms of the problems of its marginalised groups (*A Change in the Weather*, and *Say Goodbye to the Past*).

Associated with the development and

implementation of a particular style of theatre is the development of an audience to whom the style is seen to 'belong'. The problem of audience development – and research into this problem – is a very necessary part of the process of making a theatre for a region.

Black River

Dr A Schultz, tel. 27 0302

The opera *Black River* was composed by School of Creative Arts Senior Lecturer, Andrew Schultz, to a libretto by Julianne Schultz. It was successfully premiered by the Sydney Metropolitan Opera Company and the Seymour Group at the Parade Theatre in Sydney in November 1989 under the auspices of the Australian content department of the Trust. That performance recently won the Sounds Australian National Critics Award for the best performance of an Australian opera or music theatre work performed in 1989. Two large Australian Council grants followed to enable the production of a studio recording of *Black River* in January 1990 and a revival of the earlier production for a Melbourne season at the Victorian Performing Arts Centre. Lucasproduktions, the makers of the film, *Beyond El Rocco*, have begun production of a film version of *Black River* set on location in Western NSW.

Gender Studies in Art

Mr L Duncan, tel. 27 0309

Lindsay Duncan is working in the area of Gender Studies in Art, evident in both his theoretical and practical output.

Sociological change brought about during this century through the influences of feminism, in conjunction with general technological progress, has created new parameters for the definition of masculinity in Western culture. The long-standing stereotypes of men in the family and the workplace and in social interaction have given way to a new and broader set of possible roles on which males may model themselves. As a result, there is a change in the way the male image is used in visual art, reflecting both the challenge to the traditional values of male heroism and the conflicts men experience in adjusting to the new self-definition.

Susan Jorgenson, a post-graduate MCA

student under Lindsay Duncan's supervision, is researching the parallel impact of such changes on the way the female is depicted in art.

Duncan's study investigates the cumulative effects of the floods of visual imagery used in advertising and the movie industry in shaping and educating public thresholds of acceptability with respect to nakedness. The research also investigates the social embarrassment of a public which readily accepts nude female imagery as a tradition of visual fine art, but applies a different set of mores in coming to terms with the use of naked male imagery, a reflection of the accepted privileged role of men in our society.

Hunger, poverty and agricultural development

Dr E Dayal, tel. 27 0684

Despite enormous economic prosperity and the development of science and technology, hunger and poverty persist in the developing countries. They exist, also, to a lesser extent in the developed countries, indicating clearly that either the causes for these two challenging problems are as yet unknown or the right approaches to eradicate them have not been taken. The world community, however, is becoming more aware of the problems, as reflected by the growing number of centres in all major universities and institutes of learning for promoting research and teaching programs on hunger and poverty.

Edison Dayal of the Department of Geography is actively engaged in research on hunger, poverty, and agricultural development. He is currently investigating the extent of hunger and food poverty in South Asia, and the underlying causes for the regional concentration of the problem. He is also involved in developing a regional theory of population growth and change in food production systems. He is a member of the Asia Pacific Research Program of the University of Wollongong.

Urban Poverty

Dr H P M Winchester, tel. 27 0711

One-parent families are the fastest-growing family type in Australia. The majority of single parents are women; a

quarter of these families fall below the poverty line. Dr Hilary Winchester, of the Department of Geography, is a recipient of an ARC grant to study the location and characteristics of this family type in the Illawarra. Questionnaire surveys of single parents are being used to ascertain the extent of need and the uptake of policies designed for the relief of poverty.

It is not only particular social groups which suffer from poverty, but particular areas of cities may remain impoverished over many decades. Research in Paris indicates a strong contrast between long-standing areas of poverty and stigma, and transitional areas which are blighted by the threat of development. The blighted areas are characterised by high turnover rates and an influx of ethnic minorities; whereas the long-standing areas of poverty are more stable in population composition, containing a very high proportion of elderly people (mainly women), and of the unemployed. The poverty of lone parents, the elderly, and migrants may be related not only to their job/income status but also to gender roles.

Department of History and Politics Projects

War by any other name

Dr I McLaine, tel. 27 0670

Dr Ian McLaine's study of the Korean War – 'A War by Any Other Name' – is nearing completion. John Iremonger of Allen and Unwin, having read two sample chapters, comments, 'Clearly, you've embarked on a detailed analysis which brings into play all the elements of diplomatic, economic and political history', which 'sets it apart from books published to date'. He expects to be able to place the book with the firm's headquarters in London. The study focuses on the so-called 'special relationship' between Britain and the United States during the Korean War and on the way in which the conflict exerted a profound influence on the economic, political and foreign policy of the Attlee Labour government.

World War II Origins of the Welfare State

Dr G Mitchell, tel. 27 0704

A second project is an examination of the Second World War origins of the British

welfare state, based upon hitherto untapped domestic intelligence reports. This project will be co-authored with Dr Michael Wilson, of the Open University, who wishes to add to Dr McLaine's historical findings a study of the economic and social resonances of the welfare state under Mrs Thatcher's administration.

Britain and the Cuban Missile Crisis of 1952 forms the basis of a third project in the Department of History and Politics. Harold Macmillan, the British Prime Minister at the time of the crisis, is said to have played an important role and to have exercised a strong influence over President Kennedy. Ian McLaine intends to explore the nature and extent of this alleged influence. The 30-year rule means that the official British papers will not be released until 1993, but within the constraints imposed by work on the studies mentioned, it is hoped to have started research on the American documents well before that date.

Dr Glen Mitchell is writing a history of industrial relations in the building and construction industries in Australia between 1942 and 1988. This project is funded by the Federal Branch of the Building Workers Industrial Union. In addition to this project, Dr Mitchell is working on the other projects:

- A history of the de-registration of the Builders' Labourers Federation
- An economic and social history of industrial Wollongong, 1859-1980
- A history of industrial pollution, Port Kembla, 1870-1980 and
- A critique of health policy in the Healthy Cities Program.

Problems of Political Economic Reform in State Socialist Societies

This project co-ordinated by Dr Mitchell is concerned with the major political and economic issues confronting reformers in state socialist societies (the USSR and China). These include reform of the institutions of public policy, restructuring industry, reformulating the relationships between enterprises and central authorities, and measures to promote higher levels of productivity.

Politics of the Accord

This third project by Dr Mitchell is an examination of whether the Accord and the policies of Hawke - Keating - Kelly constitute a betrayal of Australian Labor Party principles, or if their policies are merely the latest phase in a 'Corporatist' consensus which has characterised Australian political life since Federation. The alternatives confronting organised labour in the early 1980s are examined in the light of the problems of restructuring industry in Australia.

History of US-Australian Relations since 1919

Dr P M Sales, tel. 27 0706

This project – by Dr Peter Sales – is a major study of early American-Australian relations. It builds, inter alia, upon a considerable amount of research into the history of Australian foreign policy and will examine the transPacific relationship through the Second World War and the subsequent implementation of ANZUS. A first volume tentatively entitled *Origins of the Alliance* has recently been completed.

Counterinsurgency in Theory and Practice

This study explores an important preoccupation of US foreign policy. It is an extended examination of theories and methods of waging small wars in the second half of the 20th century. The project currently has two components: a review of revolutionary and counter-revolutionary principles in modern times and a more specific, 'grassroots' approach to low intensity conflict [LIC] in the Philippines. The latter part of this work has also raised ancillary issues of human rights, economic development and peasant studies.

Balinese historiography

Dr A Vickers, tel. 27 0626

Dr Adrian Vickers' research has been in two major areas: Balinese historiography and the relationship between historical and literary texts in Bali; and Australian perceptions of South-east Asia, with particular reference to Australian novels written between 1895 and 1988.

Department of Languages Projects

Head, Professor B Moloney, tel. 27 0676

Research in the Department of Languages is conducted in a variety of areas – a variety which is reflected in the range of publications of members of staff, including Honorary Research Fellow Dr M Cincotta.

Linguistics

In the field of linguistics, Dr B N McCarthy continues to study the interference caused by pausing on the intonation of students in the early stages of learning French as a

foreign language – an approach which will be developed to the teaching of intonation which takes account of the errors and the stage of development of the learner, rather than only the models offered by native speakers of the language. He is also examining theories of language development and analysing teaching materials already used in France and Australia, including two of his own books.

Dr G Rando, on the other hand, is continuing to study Anglicisms in modern Italian, thus supplementing the work which he published in his dictionary of Anglicisms in 1987, and which is now the standard work on the subject. Innovations in this research involve the use of statistical method to determine the entry and spread of loan-words in the Italian language.

The multi-lingual Dr Hull continues profitably to further his researches in Italian, Celtic and Maltese philology and sociolinguistics. His book, *Polyglot Italy*, set in a question-and-answer format, is an introduction to the rich linguistic, ethnic and cultural diversity that is modern Italy. It describes not only the rise of a common Italian language and national tradition but also the appearance over a span of two thousand years of the numerous ethno-linguistic minorities that form today an integral part of the Italian nation.

Australian Literature and Society

The Department is also a major centre of research into Italo-Australian literature. Associate Professor V J Cincotta has now published his second anthology of Italo-Australian poetry in the 80s, while Dr Rando continues to work on both Italo-Australian narrative and multiculturalism. Discussions are expected to begin soon about the possibility of establishing in Wollongong a centre for the collection and study of the manuscripts of Italo-Australian writers – a rich field for future research, the possibilities of which have not yet been fully explored.

In the more general area of Italo-Australian studies Dr Rando is engaged in collaboration with the Centre for Multicultural Studies in a major research project funded by the *Fondazione Giovanni Agnelli*.

French and Italian Literature and Society

Important and original work is also being carried out in the area of French and Italian narrative fiction and society. Dr S Yates has a particular interest in the etiology of beliefs about and attitudes towards women: her book on the representation of the maidservant in 19th-century French fiction from this standpoint will be published by Peter Lang of New York in 1991.

A Small Project Grant made by the University through the Social and Psychological Research Program is facilitating a further

exploration of this theme from a new standpoint: the relationship between the bourgeois woman and her doctor as depicted in works by novelists such as Balzac, Maupassant and Zola.

Professor B Moloney has edited the prestigious journal *Italian Studies* for the last time, no longer being resident in the UK, and now intends to complete his book on Italian novels of peasant crisis 1930-1950. He has also received a \$30,000 grant from the ARC to enable work to begin on the production of a multi-volume social history of the novel in Italy. A team of scholars in Australia and Europe is already at work on the project, the first stage of which will involve the production of a database listing all the novels written and published in Italy from the late eighteenth century onwards.

Further important work in Italian literature and the theatre has been done by Dr M Cincotta, who is also engaged in literary translation. Her English translation of Professor Sergio Michaeli's *Pirandello and the Cinema*, published in Italian by Bulzoni, was published in June this year (1990).

Centre for Multicultural Studies

Professor S Castles, tel. 27 0779

The Centre for Multicultural Studies is the largest specialised research centre for migration and ethnic relations in Australia. Academic research by CMS staff led to the publication of two books and a large number of publications in scholarly journals in 1989-90 (see list of publications in this journal). In addition, the Centre carried out a considerable amount of consultancy work for Australian government departments and non-governmental organisations and for international organisations. Research projects in 1989-90 included:

- A survey, based on 500 interviews in three states on recognition of overseas professional qualifications, for the National Office of Overseas Skills Recognition
- Studies on theories of racism and strategies used in other countries to counter racist violence, for National Inquiry into Racist Violence of the Human Rights and Equal Opportunities Commission
- A policy paper on methods of improving community relations, for the Office of Multicultural Affairs in the Department of Prime Minister and Cabinet

- An empirical study on restructuring in the Port Kembla steelworks and its impact on the migrant labour force, with special reference to language competence and literacy, for the Bureau of Immigration Research
- A survey on the role of the family in migrant settlement, for the Bureau of Immigration Research
- A large-scale longitudinal survey on client satisfaction with the Adult Migrant Education Service, for the Department of Immigration, Local Government and Ethnic Affairs (DILGEA)
- A study of linguistic pluralism in Australian schools, the Organisation for Economic Cooperation and Development
- Research on parental expectations and participation in schools, for the Disadvantaged Schools program
- Development of a data-base for client information services within migrant resource centres, for DILGEA
- Work on a book on Italian settlement and its impact on Australian culture, for the *Fondazione Giovanni Agnelli* of Turin;
- Work on indicators of social class and lifestyle, for the National Health and Medical Research Council and
- A study on drug and alcohol intervention in a multi-ethnic society, involving community consultations in the Illawarra region, for the Department of Health and Community Services.

Department of Sociology

Post-World War II Migrants to Australia

Ms E Vasta, tel. 27 0744

The key analytical focus in this project is on relations of power which have constructed the post-war migrant and on migrant struggle and resistance which have brought significant changes. The sociological significance of the project is the analysis of the relationship between social policy, power and social change with particular reference to Australia's post-war immigration policy.

Euro-Australian project

Begun in 1989, this project is being funded for a sum of \$120,000 over two years by the

Agnelli Foundation of Turin, Italy. It involves writing a book on the history of Italian migration to Australia, the situation of people of Italian origin in Australia today, and the role of Italians in helping to build Australian society. Co-authors and editors are Stephen Castles of the Centre for Multicultural Studies, Gaetano Rando from Languages, Ellis Vasta from Sociology and Caroline Alcorso, previously from the CMS.

A Second Edition for Four Dimensional Social Space

Dr T Jagtenberg, tel. 27 0608 and Dr P D'Alton, tel. 27 0613

Four Dimensional Social Space: Class, gender, ethnicity and nature. A reader in Australian Social Sciences, Harper and Row, Sydney, was in 1989 adopted as a text in seven different tertiary institutions – University of New South Wales, Flinders University, Cumberland CAE, Brisbane CAE, Charles Sturt University, The University of Newcastle and Wollongong University.

The work is a comprehensive introductory source book for students of the social sciences. It contains a collection of commissioned articles by Australian authors, excerpts from previous Australian publications, statistics, bibliographies and editorial comment.

Wollongong University is well represented among the authors, with 11 contributions from local academics. The favourable reception of the book owes much to the vitality of work done in this university.

Four dimensional social space is not an arbitrary construct. The idea of a social space that is structured by class, gender and ethnicity has for some time been established as a mode of conceptualisation in the social sciences. In this respect the book addresses established issues and debates of current concern to Australian social scientists. Nature, however, has been introduced because of failure of traditional discourses in the social sciences to adequately address the environmental context of human activity.

In this last respect the ever-increasing interests in the place of humanity as part of an ecology makes the need for ecologically orientated social sciences even more apparent in 1990.

The editors are members of the Sociology Department of Wollongong University. They are currently engaged in the production of a second edition for 1991.

Philosophy Projects

Dr R Dunn, tel. 27 0621

Dr Robert Dunn, Head of Department, has been appointed to the editorial board of the *Australasian Journal of Philosophy*. Dr Dunn is writing a book entitled *Attitudes and Agency*. This is intended to complement his book, *The Possibility of Weakness of Will*, published by Hackett's in 1987.

Suzanne Uniacke has a book-in-progress entitled *The Self-defence Justification of Homicide*.

* * *

Killing in self-defence is commonly taken to be morally and legally justified homicide. In developing a satisfactory moral underpinning for the law on self-defence, Ms Uniacke critically examines important approaches such as those of natural law and natural rights. Important issues raised and clarified in the course of the discussion include the nature of moral and legal justification and excuse; necessity and proportionality; the conditions of legitimate self-preference; the foundation and limits of rights.

* * *

Dr Harry Beran is developing a democratic theory of political self-determination. The theory is intended to assist in the peaceful resolution of boundary and separatist disputes. His article 'Who Should be Entitled to Vote in Self-Determination Referenda?' has attracted the attention of political theorists in Estonia and will be published there in Estonian and Russian.

Tribology : Friction Lubrication and Wear

Dr A.K. Tieu, tel. 27 0061

Superlaminar Flow in Thrust Bearings

An experimental thrust bearing test rig has been successfully commissioned to test different types of thrust bearings at speeds up to 150m/s. The test rig is fully instrumented to measure the oil film thickness, pressure, friction, temperature and fluid velocity. The data are captured by a high-speed data-logging system. The fluid velocities are obtained by a Laser Doppler anemometer using optical fibre and miniature optics. The experiments are being carried out on bearings operated in the superlaminar regime, and the results are

correlated with a computer simulation. It was found that the existing design theories on turbulent bearings are inaccurate, and a new theory for high-speed bearings has been proposed.

This project has been funded by an ARC grant of \$106,000 from 1988 to 1990.

Vibration Characteristics of Steam-turbine Bearings

A computer simulation has been carried out to determine the vibration characteristics and the stability of steam-turbine bearings in power stations. This simulation indicates a need to correlate with experimental results. A half-size bearing is to be tested in a fully instrumented journal-bearing test rig which has been built and commissioned in the Department of Mechanical Engineering.

This project has been supported by Elcom, NSW and the Australian Electricity Supply Industry Research Board with a grant of \$76,500 from 1988 to 1990.

Friction and Wear of Materials

A co-operative research project with BHP Steel on friction and wear in heavy industry is being carried out. A universal friction and wear test rig was built and tested, and it can be used to simulate realistically adhesive wear and abrasive wear in industrial environment. The test rig is instrumented with load cells, thermocouples, strain gauges, displacement transducers and these signals are captured by a high speed data logger.

The project is supported by BHP Steel, SPPD (Port Kembla) by a grant of \$26,100.

Performance Degradation of Hydraulic Servo Valves

A hydraulic test bench is used to test the performance of servo valves which are worn during service. This study is carried out in collaboration with BHP Steel SPPD.

The project is supported by BHP Steel, SPPD (Port Kembla) by a grant in kind of \$20,000 in 1990.

High-performance Thrust Bearings and Journal Bearings

New thrust and journal bearings with high performance have been studied theoretically and experimentally. They prove to have better load-carrying capacity and lower friction than have conventional bearings. They have been tested on the high-speed test rigs, and the design data for these bearings are being generated.

Elasto-Hydrodynamic Lubrication (EHL) of Gearing

Different numerical methods have been used to simulate the oil film thickness of gear contacts for steady-state load. Transient EHL study of spur gear contacts have been

successfully completed and the contact problems in spiral-bevel gears are being investigated.

Rolling Mill Technology

Studies have been carried out on gauge variation of strip, thermal stress in work rolls, hot plate leveller, friction at the strip-work roll interface and torque amplification in Hot Strip Mill and Five Stand Cold Mills. Computer simulation of drive-train dynamics have been extensively correlated with test measurements in BHP integrated steel works.

Numerical Methods in Tribology

Finite Element methods have been used extensively in tribology, fluid mechanics, and stress analysis. They are used together with CAD/CAM packages such as Nastran, Strand 5, Sap-4, NonSap and Graftek.

RESEARCH PUBLICATIONS

FACULTY OF ARTS

DEPARTMENT OF ENGLISH

BOOKS

Sharrad, P, 'Memory, Childhood and Exile: Self-representation in Post-colonial Writing,' Occasional Papers Series, East-west Center, Honolulu, 1989.

BOOK CHAPTERS

Cranny-Francis, A, 'The Education of Desire: Late Nineteenth-Century Utopian Fiction and its Influence on Twentieth-Century Feminist Fantasy'; in *Nineteenth Century Fantasists* (ed) Filmer, K, London, Macmillan, 1990.

Cranny-Francis, A, 'Feminine Futures: a Generic Study', in *Alien Zone: Critical Theory and Contemporary Science Fiction Cinema* (ed) Annette Kuhn, London, Verso, 1990, pp 219-227.

Cranny-Francis, A, (with Lee, A, Martin, J M and McCormack, R), 'Danger, Shark! Assessing and Evaluating a Student Text', in Christie, F, and Jenkins E (eds), *Literacy in Social Processes*, Sydney, Educational Technologies, 1990.

Jayamanne, L, 'If Upon Learning What We Have To Say We Speak', a conversation piece with filmmakers L Jayamanne and Leslie Thornton compiled by Trinh T Minh-ha, *Discourses: Conversations on Postmodern Art and Culture*, (ed) Ferguson, R, Tucker, M, Olander, B, New York: The New Museum of Modern Art and MIT Press, 1989.

Jones, D L M, 'Flies in the Milk', in McGaw, W and Sharrad, P (eds), *Olga Masters: an Autumn Crocus*, New Literatures Research Centre, University of Wollongong, 1990, pp 1-11.

Wieland, J, Introduction: 'Olga Masters' Place in Australian Literary History', in McGaw, W, and Sharrad, P, (eds), *Olga Masters: An Autumn Crocus*, New Literatures Research Centre, University of Wollongong, 1990.

Wieland, J, Introduction to Blaber, R and Gilman, M, *The Picaresque in Australian and Indian Prose Fiction*, Sydney, Greenhouse, 1990.

JOURNALS EDITED

Cranny-Francis, A, (with Threadgold, T) *Social Semiotics: A Trans-disciplinary Journal in Functional Linguistics, Semiotics and Critical Theory*, vol 1, no 1, July, 1990.

McGaw, W, and Sharrad, P, *Olga Masters: an Autumn Crocus: Proc., Olga Masters Memorial Conf.*, New Literatures Research Centre, University of Wollongong, 1990.

Sharrad, P, Pacific edition of *CRNLE Reviews Journal*, September 1989.

Sharrad, P, 'Post-Canonical' Issue, *New Literatures Review*, 17, July 1989.

JOURNAL ARTICLES

Cranny-Francis, A, 'Gender and Genre: Breaking the Boundaries', *Education Australia*, 7, 1989.

Cranny-Francis, A, 'Batman: Hollywood and the Postmodern', *Social Semiotics*, vol 1, no 1, July 1990.

Hatzimanolis, E, 'Big Words and Little Words (Naturally): An Unnatural Reading', *SPAN*, 29, October 1989.

Jones, D L M, 'Olivia and Chloe: Fictions of Female Friendship', *Australian Literary Studies*, vol 14, no 1, May 1989, pp 3-14.

Jones, D L M, 'Not Much Balm in Gilead', *Commonwealth*, vol 11, no 2, Spring 1989, pp 31-43.

Jones, D L M, 'Canon to the Right of Us, Canon to the Left of Us', *New Literatures Review*, 17, Summer South, 1989, pp 69-79.

Jones, D L M, 'Twentieth Century Women's Humour: Larrikins and Termagants', *Thalia*, November 1989.

Jones, D L M, 'Recording the Gaps', *Hecate*, vol xv, no ii, 1989, pp 70-77.

McConchie, R, 'It hurtheth memorie and hindreth learning': Attitudes to the use of the vernacular in C16 English Medical Writings', *Studia Anglica Posnaniensia* vol 21, 1989, pp 53-67.

Sharrad, P, 'New Indian Fiction', *SPAN*, 28, 1989.

Stone, M, The Image of the Wild Man in 'The True Story of Spit MacPhee', *Children's Literature Assn. Quarterly*, Winter 1990.

Wieland, J, 'Arthur and Emily: only a third of the story. A note on a World War I novel', *Australian Literary Studies*, vol 14 no 3, 1990.

CONFERENCE/SEMINAR PAPERS

Cranny-Francis, A, 'Teaching English at First Year University; or, Dead Poets Reconsidered', Language and Education Seminar Series, Linguistics Dept, University of Sydney, October 1989.

Cranny-Francis, A, 'Language and Gender', Working with Genre Conf., University of Technology, Sydney, November 1989.

Cranny-Francis, A, (with Martin, J M), 'Contratextuality: The poetics of Subver-

sion', Australian Systemics Network Conf., Deakin University, January 1990.

Cranny-Francis, A, 'Semiotics', Workshop with Threadgold, T, Australian Systemics Network Conf., Deakin University, January 1990.

Cranny-Francis, A, (with Martin, J M), 'Contratextuality and Subversion: Bruce Springsteen's 'Born in the U.S.A.', Sydney Linguistics Circle, Macquarie University, March 1990.

Cranny-Francis, A, (with Martin, J M), 'Subversion: U2's 'Sunday, Bloody Sunday', Newtown Semiotics Circle, March 1990.

Cranny-Francis, A, (with Martin, J M), 'Assessment and Evaluation: Multiple Readings of a Student Text', Language and Education Seminar Series, University of Sydney, March 1990.

Gillett, S, 'Loving and Hating the "Inland" reader; Postmodern Ploy or Romantic Reaction?' SPACLALS Conf., University of Wollongong, Jan-Feb 1990, pp 15.

Gillett, S, 'Representing the Past: (Fictional) Perspectives on History', English Department Seminar Series, La Trobe University, August 1989.

Gillett, S, 'A Change of Skies: The Literature of Migration', Post-Colonial Literatures Conf., Macquarie University, October 1989, 17 pp.

Gillett, S, 'Re-presenting History: Glass Churches, White Lies in "Oscar and Lucinda"', Victorian Postgraduate Conf., Melbourne University, November 1989.

Gillett, S, 'Ania Walwicz: Reading and Writing and Boating', La Trobe University, English Department Seminar Series, December 1989.

Gillett, S, 'Living Memories in a World of Uncertainty: Janette Turner Hospital's Charades', New Literatures Research Centre Seminar Series, University of Wollongong, May 1990.

Harland, R, 'The Concept of Magic Realism', SPACLALS Conf., University of Wollongong, January-February, 1990.

Jayamanne, L, 'Hunger for Images: Myths of femininity in the Sri Lankan Cinema, 1947-1989.' Proc., workshop: 'Sri Lanka, Four Decades of Independence', International Centre for Ethnic Studies, Colombo, 1990.

Jones, D L M, 'Decolonizing Women's Romance', ACLALS Silver Jubilee Conf., University of Kent, England, August 1989, 16 pp.

Jones, D L M, 'Jan Mckemmish's "A Gap in the Records"', Modern Language Assn. Conf., Washington, DC, December 1989, 18 pp.

Jones, D L M, 'Writable Realism: the Fiction of Olga Masters', SPACLALS Conf., University of Wollongong, January-February 1990, 15 pp.

O'Halloran, J, 'Asia and Youth are One: The Rationale of Romance Realism in the Stories of Hugh Clifford', SPACLALS Conf., University of Wollongong, January-February 1990, 15 pp.

Sharrad, P, 'The Art of Memory and the Liberation of History', in Thumboo, E (ed), Proc., Seventh ACLALS Congress, Singapore, NUS, 1989.

Sharrad, P, 'Representing the Field: Anthologising Pacific Literature', Joint Seminar of the East-West Center and the Center for Pacific Island Studies, Honolulu, November 1989.

Sharrad, P, 'Closure and Colonial Condition: Randolph Stow's *Visitants* and Vincent Eri's *The Crocodile*', Narratology Seminar, University of the South Pacific, Suva, August 1989.

Sharrad, P, 'Keri Hulme and Michael Ondaatje', 25th ACLALS Conf., University of Kent (UK), August 1989.

Stone, M, 'Telling Lies/Telling Lies: James Aldridge's Handling of Fitzgerald's and Hemingway's Paris/Lyon Car Trip, 1926', Australia/New Zealand History of Education Conf., University of Newcastle, July 1989.

Stone, M, 'Lilli and Huck: Life on the Murray', ACLALS Silver Jubilee Conf., University of Kent, England, August 1989.

Wieland, J, 'There and Back with the Anzacs: More than Touring', 1989 Symposium on Literature in the Asia-Pacific Region, University of Singapore, Oct-Nov 1989.

Wieland, J, 'Neo-historicism and Australian Women in the First World War', EACLALS Conf., University of Lecce, Italy, March-April 1990.

Wieland, J, Conf., keynote paper on his book, *The Enspiring Mind: History, Myths and Fictions in Postmodern Colonial Poetry*, Footscray Inst. of Technology, May 1990.

FILM SCRIPT

Cranny-Francis, A, (with Gunew, Sneja), 'The Social and Political Contexts of the writing of Frankenstein', Introduction to Sneja Gunew's film on Mary Shelley's novel, *Frankenstein*, Deakin University, School of Humanities, 1990.

PLAY SCRIPTS

Davis, D, *Tom Jones*, adapted from the novel by Henry Fielding. Performed by Theatre South at the Bridge Theatre, 18 April-6 May 1990.

PRODUCTIONS

Davis, D, (Director), *Tom Jones*, play by Des Davis from the novel by Henry Fielding, performed by Theatre South at the Bridge Theatre, 18 April-6 May 1990.

Davis, D, (Director), *Lights Out Nellie Martin*, play by Wendy Richardson, performed by Theatre South at the Bridge Theatre, August-September 1990.

DEPARTMENT OF HISTORY AND POLITICS

BOOKS

Beresford, M, *National Unification and Economic Development in Vietnam*, Macmillan, London, 1989.

Hagan, J, *Learning to Work in New South Wales: A Short History of Work Education in NSW Schools*, prepared for the NSW Department of Education, June 1989.

Vickers, A, *Bali: A Paradise Created*, Ringwood: Penguin, 226 pp, 1989, 2nd ed Singapore: Periplus, 1990.

Wells, A D, *Constructing Capitalism: An Economic History of Eastern Australia, 1788-1901*, Allen and Unwin, Sydney, 1989.

BOOK CHAPTERS

Hagan, J, 'The Australian Trade Union Movement: Context and Perspective' in (ed) Ford, Bill and Plowman, David, *Australian Unions - an Industrial Relations Perspective*, second (revised) edition, Melbourne, 1989.

Kiernan, C P, 'Charles Gavan Duffy and "The Art of Living"', in McDonagh O and Mandle W F (ed), *Irish-Australian Studies*, Canberra, Australian National University Press, 1989, pp 137-154.

Piggin, S, "'Not a Little Holy Club": Lay and Clerical Leadership in Australian Anglican Evangelicalism 1788-1988', in Sheils, W J (ed), *The Ministry, Clerical and Lay: Studies in Church History*, Vol 26, Basil Blackwell, Oxford, 1989, pp 367-383.

Piggin, S, 'Witchhunting in the Secular Society: Christianity's Australian Future', in Hocking, B (ed), *Australia Towards 2000*, Macmillan, London, 1990, pp 283-301.

Sales, P M, 'Low Intensity Conflict in Mindanao' in Carr, Barry and McKay, Elaine (eds), *Low Intensity Conflict: Theory and Practice in Central America and Southeast Asia*, Melbourne, La Trobe University Inst. of Latin American Studies and Monash University Centre of South-east Asian Studies, 1989, pp 73-86.

Vickers, A, 'Introduction to Gianyar', 'Batuan', 'Gianyar and Environs', 'Introduction to Klungkung', 'Klungkung', in Oey, E (ed) *Bali: Island of the Gods*, Singapore: Periplus, 1990.

Wolfers, E P, 'How Australian is Australian Education?', in Cameron, W G (ed), *Australian Education, 1988: A Turning Point*, The Australian College of Education, Curtin, ACT, 1989, pp 39-51.

Wolfers, E P, 'The Satanic Versus Freedom of Speech', in Bernhardt, S, Hayward, R and Hood, R (eds), *Issues in Contemporary English*, Macmillan, South Melbourne, 1989, pp 275-277.

JOURNAL ARTICLES

Beresford, M, 'War and Revolution in Southern Vietnam', *Teaching History*, vol 22, no 4, January 1989, pp 3-9.

Kiernan, C P, 'Reflections on Historical Biography: The Case of Daniel Mannix', *Australian Studies*, 3, December 1989, pp 36-45.

Piggin, S, 'Billy Graham in Australia, 1959 -

Was it Revival?', *Lucas*, 6, October 1989, pp 2-33.

Reglar, S, 'So What's New About "The New Right"?' in *Labor Forum*, vol 6, no 1, February 1989, pp 21-26.

Reglar, S and Dutton M, 'Goodbye, Mr Law' in *Australian Left Review*, vol 112, September-October, 1989, pp 30-34.

Sales, P M, "'A Little German Colony Here or There!" The US-Australian Clash at the Paris Peace Conf., 1919', *Australian Journal of American Studies* July 1989, pp 22-34.

Sales, P M, 'Face to Face with Realities', *Philippine Peacemaker*, January-March 1989, pp 13-14.

Wolfers, E P, 'Ambitious but Unrealised', *CRNLE Reviews*, 1989, no 1, pp 106-110.

CONFERENCE/SEMINAR PAPERS

Beresford, M, 'Foreign Trade in Vietnam's Economic Development Strategy', *Journal of Contemporary Asia*, 20th Anniversary Conf., Manila, November 1989.

Hagan, J, 'Dispossession of the Aboriginal Workforce in Australia 1788-1988', Peripheral Visions Conf., James Cook University of North Queensland, July 1989.

Hagan, J and Turner, Ken, 'Labor in Sydney 1891-1910', Whitlam Conf., Sydney University, October 1989.

Hagan, J and Castle, R, 'Award Restructuring: A New Direction, or More of the Same', Industries Assistance Commission, Canberra, January 1990.

Piggin, S, 'Witchhunting in the Secular Society: Christianity's Australian Future', at 'Australia towards 2000' Conf. of British Australian Studies Ass., Lincoln, England. Published in Hocking, B (ed), *Australia Towards 2000*, Macmillan, London, 1989.

Piggin, S, "'Not a Little Holy Club": Lay and Clerical Leadership in Australian Anglican Evangelicalism 1788-1988', Ecclesiastical History Conf. at Magdalene College, Cambridge. Published in Sheils, W J (ed), *The Ministry, Clerical and Lay: Studies in Church History*, Vol 26, Basil Blackwell, Oxford, 1989.

Piggin, S, 'Preaching for Revival from Jonathan Edwards to Billy Graham', Sydney Clergy Conf., Gilbulla, March 1989, pp 1-20.

Piggin, S, 'Billy Graham in Australia, 1959: Was it Revival?' Annual Moore College Library Lecture, Sydney, May 1989, pp 1-40.

Sales, P M, 'Two Steps Forward, One Step Back: The Once and Future Insurgency in Northeastern Mindanao', Mindanao Conf., Research School of Pacific Studies, Australian National University, Canberra, November 1989.

Vickers, A, 'Who Authorises Balinese Culture?', workshop on 'Contesting Cultural Symbols in Southeast Asia', Australian National University, November 1989.

Wolfers, E P, 'Political Parties in Papua New Guinea', Pacific Islands Political Studies Association Conf. on Political Institutions in the Pacific, Guam, December 1989.

Wolfers, E P, 'Papua New Guinea - Promise or Peril? Council on the National Interest Seminar on the Future of Papua New Guinea, Sydney, December 1989.

DEPARTMENT OF LANGUAGES

BOOKS

Cincotta, M, *Luigi Pirandello: the humorous existentialist*, Wollongong University Press, 1989.

Hull, G, *Polyglot Italy: Languages, dialects, peoples*, Melbourne, CIS Educational, 1989.

BOOKS EDITED

Cincotta, V J, *Italo-Australian Poetry in the 80s - II*, University of Wollongong, Department of Languages, 1989.

Cincotta, V J, *L'Italia letteraria: Storia e testi*, University of Wollongong, Department of Languages, 1988.

JOURNAL EDITED

Moloney, B, *Italian Studies. An Annual Review*, Vol XLIV, Leeds, The Society for Italian Studies, 1989.

JOURNAL ARTICLES

Hull, G, 'Parallels and Convergences in Celtic and Romance Philology', Part II, *Australian Celtic Journal*, II, 1989, pp 21-30.

McCarthy, B N, 'Stressing in the Speech of Foreign Language Learners', *Australian Review of Applied Linguistics*, 12/1, 1989, pp 150-172.

Moloney, B, 'Bassani, Primo Levi, and the Holocaust', *ATI Journal*, 57, 1989, pp 26-34.

Rando, G, 'Il multiculturalismo e la narrativa italo-australiana', *Il Veltro*, XXXII (1-2), 1988, pp 83-131.

Rando, G, 'No Alien Daughter', *The CRNLI Reviews Journal*, 1, 1989, pp 22-26.

Rando, G, 'Beyond Beginnings - An introduction to the narrative works of Stanislao Nievo', *Kwartwik Neofilologiczny*, XXXVI (2), 1989, pp 195-208.

CONFERENCE/SEMINAR PAPERS

Moloney, B, 'Pleasure and Power. Cellini and Giambologna at the Medici Court'. Symposium on Pleasure and Power in the Renaissance, University of Melbourne, August 1989, 20 pp.

Moloney, B, 'The Novel in Italy: writing the history', Italian Research Seminar, University of Hull, February 1990, 22 pp.

Rando, G, 'Gli Anglicismi nella lingua italiana', seminar at the Istituto Italiano per Gli Studi Filosofici, Naples, February 1989.

Rando, G, 'Gli italianismi nell'inglese d'Australia', SILFI Conf., University of Siena, March 1989.

Rando, G, 'La Letteratura Italo-Australiana', seminar at the University of Macerata, February 1990.

Cincotta, M, 'L'io, lo specchio e lo sguardo altrui', 22nd International Conf. of Pirandello Studies, Agrigento, December 1989.

DEPARTMENT OF PHILOSOPHY

JOURNAL ARTICLES

Beran, Harry, 'Who Should be Entitled to Vote in Self-Determination Referenda?' in Crisp, Roger and Warner, Martin (eds), *Terrorism, Protest and Power*, Edward Elgar, September 1990.

Braddon-Mitchell, D R and Fitzpatrick, J B, 'Explanation and The Language of Thought', *Synthese*, vol 83 no 1, April 1990.

Dodds, S, Bigelow, J and Pargetter R, 'Temptation and the Will', *American Philosophical Quarterly*, June 1990.

Dodds, S and Jones, K, 'Surrogacy and Autonomy', *Bioethics* 3, 1, 1989. Reprinted in *Bioethics News* 8, No 3, 1989.

Dodds, S and Jones, K, 'Response to Purdy', *Bioethics* 3, 1, 1989.

Uniacke, Suzanne, 'Killing Under Duress', *Journal of Applied Philosophy*, vol 6 no 1, 1989, pp 53-69.

CONFERENCE/SEMINAR PAPERS

Braddon-Mitchell, D R, 'The Microstructural Causation Hypothesis' and 'Explanation and the Language of Thought', with Fitzpatrick, John, Australasian Association of Philosophy, June 1989.

Dodds, S, 'Drug Policies, Paternalism and Autonomy', Australian Doctors' Fund in association with the AMA Drugs Summit, 'Drugs, the Law and Medicine': Sydney, 1989.

Dodds, S, 'Liberty and Property (II)', Australasian Association of Philosophy Conf., Canberra, 1989.

Dodds, S, Bigelow, J and Pargetter, R, 'Temptation and the Will', Australasian Association of Philosophy Conf., Canberra, 1989.

Dunn, Robert, 'Reasons, Fatives and Possibilitives', Department of Philosophy and Law, Research School of the Social Sciences, Australian National University, February 1989.

Dunn, Robert, 'Reasons, Attitudes and the Breakdown of Reasons', Department of Philosophy and Law, Research School of Social Sciences, Australian National University, February 1989. Also: Department of Traditional and Modern Philosophy, University of Sydney, April 1989.

Dunn, Robert, 'Akrasia and Rationality', Department of Philosophy, University of Queensland, March 1990.

Uniacke, Suzanne, 'Self-defence and Natural Law 1', read to Division of Philosophy and Law, Research School of the Social Sciences, Australian National University, August 1989.

Uniacke, Suzanne, 'Self-defence and Natural Law 2', Seminars in Legal Theory Series, Department of Jurisprudence, University of Sydney, November 1989.

DEPARTMENT OF SCIENCE AND TECHNOLOGY STUDIES

BOOKS

Charlesworth, M J, Farrall, L A, Stokes, T and Turnbull, G D, *Life among the scientists: An anthropological study of an Australian scientific community*, Melbourne, Oxford University Press, 1989, pp 304.

Falk, J and Brownlow, A, *The Greenhouse Challenge: What's to be done?*, Melbourne, Penguin, 1989, pp 341.

BOOK CHAPTERS

Falk, J, 'Australia and the Military Industry Complex', in Jagtenberg, T and D'Alton, P, *Four Dimensional Social Space: A Sourcebook for Australian Sociology*, George Allen & Unwin, 1989, pp 289-294.

Martin, B, 'Nonviolent Deterrence', in Rodley, G (ed), *Beyond Deterrence*, Sydney, Centre for Peace and Conflict Studies, University of Sydney, 1989, pp 259-264.

Richards, E, 'Huxley and Woman's Place in Nature: The "Woman Question" and the Control of Victorian Anthropology' in Moore, J (ed), *History, Humanity and Evolution*, Cambridge, Cambridge University Press, 1989, pp 253-284.

Richards, E, "'Metaphorical Mystifications": The Romantic Gestation of Nature in British Biology' in Cunningham, A and Jardine, N (eds), *Romanticism and the Sciences*, Cambridge, Cambridge University Press, 1990, pp 130-143.

Rix, M, 'A World Apart: The Historical Development of Deterrence Theory and Practice' in Rodley, G (ed), *Beyond Deterrence*, Sydney, Centre for Peace & Conflict Studies, University of Sydney, 1989, pp 3-21.

Schuster, J A, 'The Scientific Revolution', in Cantor, G, Christie, J, Hodge, J and Olby, R (eds), *The Companion to the History of Modern Science*, Routledge, London, 1990, pp 217-42.

JOURNAL ARTICLES

Bammer, G and Martin, B, 'The arguments about RSI: an examination', *Community Health Studies*, vol 12, no 3, 1988, pp 348-358.

Falk, J, 'The Discursive Shaping of Nuclear Militarism', *Current Research on Peace and Violence* (Finland), vol XXII, no 2, 1989, pp 53-76.

Joseph, R A, 'Technology parks and their contribution to the development of technology-oriented complexes in Australia', *Environment and Planning Conf: Government and Policy*, vol 7, no 2, 1989, pp 173-192.

Joseph, R A, 'The politics of high technology in Australia', *Prometheus*, vol 7, no 1, 1989, pp 103-128.

Joseph, R A, 'Silicon Valley myth and the origins of technology parks in Australia', *Science and Public Policy*, vol 16, no 6, 1989, pp 353-365.

Joseph, R A, 'Technology Parks in Australia: An Appraisal', *The Australian*

Journal of Regional Studies, no 4, June, 1989, pp 22-32.

Kearton, C, and Martin, B, 'Technological vulnerability: a neglected area in policy-making', *Prometheus*, vol 7, no 1, June 1989, pp 49-60.

Martin, B, 'The sociology of the fluoridation controversy: a re-examination', *Sociological Quarterly*, vol 30, no 1, 1989, pp 59-76.

Martin, B, 'Computing and War', *Peace and Change*, vol 14, no 2, April 1989, pp 203-222.

Martin, B, 'Gene Sharp's theory of power', *Journal of Peace Research*, vol 26, no 2, May 1989, pp 213-222.

Martin, B, 'Analyzing the fluoridation controversy: resources and structures', *Social Studies of Science*, vol 18, May 1988, pp 331-363.

Martin, B, 'Nuclear winter: science and politics', *Science and Public Policy*, vol 15, no 5, October 1988, pp 321-334.

Martin, B, 'Coherency of viewpoints among fluoridation partisans', *Metascience*, vol 6, no 1, 1988, pp 2-19.

Martin, B, 'Fluoridation: the left behind?', *Arena*, no 89, 1989, pp 32-38.

Martin, B, 'Fraud and Australian Academics', *Thought and Action*, vol 5, no 2, Fall 1989, pp 95-102.

Martin, B, 'What should be done about higher education?', *Social Anarchism*, no 14, 1989, pp 30-39.

Martin, B, 'Democracy without elections', *Social Alternatives*, vol 8, no 4, January 1990, pp 13-18.

Martin, B, 'What's your problem?', *Alternatives: Perspectives on Society, Technology and Environment*, vol 16, no 4/vol 17, no 1, March/April 1990, pp 88-92.

Martin, B, 'Left or left behind? Heller and Feher on the peace movement', *Monthly Review*, vol 41, no 8, January 1990, pp 56-62.

Richards, E, 'The "Moral Anatomy" of Robert Knox: The Interplay Between Biological and Social Thought in Victorian Scientific Naturalism', *Journal of the History of Biology*, 22, 1989, pp 373-436.

Richards, E and Schuster, J A, 'The feminine method as myth and accounting resource: a challenge to gender studies and the social studies of science', *Social Studies of Science*, vol 19, no 4, 1989, pp 697-720.

Stokes, T and Hartley, J A, 'Co-authorship, social structure and influence within specialities', *Social Studies of Science*, vol 19, no 1, 1989, pp 101-125.

Stokes, T, 'The Briggs Enquiry', *Search*, vol 20, no 2, 1989, pp 38-49.

CONFERENCE/SEMINAR PAPERS

Falk, J, 'International Co-operation and International Crisis', Conf., Meeting the Challenges of the 1990's: The United Nations in Action, *United Nations Association*, Sydney, October 1989.

Falk, J, 'Meeting the Greenhouse Challenge: Impact on the Illawarra', *Industrial Development and the Greenhouse Effect: The Illawarra's Future*, Illawarra Development Board and Illawarra Healthy Cities,

August 1989.

Falk, J, 'The Discursive Shaping of Nuclear Militarism', Proc., *Second Conf. on Discourse: Peace, Security and International Society*, Ballyvaughan, Ireland, August 1988, Institute on Global Conflict and Co-operation, University of California, San Diego, 1989.

Falk, J, 'The Greenhouse Effect: The Social Shaping of a Technological Threat', *Australian Association for History, Philosophy and Social Studies of Science Annual Conf.*, September 1989.

Falk, J, 'A Future Environmental Perspective', invited address, plenary session 'Contemporary Environmental Issues', *Forty-Sixth Local Government Engineering Conf.*, Hilton Hotel, Melbourne, February 1990.

Joseph, R A, 'Political Myth and Ritual in Australian Technology Policy', 1989 *Annual AAHPSSS Conf.*, Robertson, September 1989.

Martin, B, 'Making environmental decisions democratically', *Ecopolitics IV*, Adelaide, September 1989.

Martin, B, 'The Social Shaping of Science Studies', Annual Conf., *Australasian Association for the History, Philosophy and Social Studies of Science*, Robertson, NSW, September 1989.

Martin, B, 'People's research as a way to promote social defence', *Nonviolent Struggle and Social Defence*, Bradford, England, April 1990.

Martin, B, 'Conference Summary', *Nonviolent Struggle and Social Defence*, Bradford, England, April 1990.

Martin, B, 'Intellectual Suppression', *Intellectual Property and Postgraduate Students*, University of New South Wales, June 1990.

Richards, E, 'The Political Anatomy of Monstrosities', *Ideology in the Life Sciences Conf.*, Harvard University, Cambridge, Mass., April 1989; *Annual Meeting of British Society for History of Science*, University of Edinburgh, July 1989; *AAHPSSS Annual Conf.*, Robertson, 1989; and *Society for the Social Studies of Science*, Irvine, California, November 1989.

Russell, S, 'Writing Energy History: Explaining the Neglect of CHP/DH in Britain', paper to *History of Energy Workshop*, Manchester, UK, March 1990, 28 pp.

Schuster, J A, 'Bruno Latour's (No History Required) Tour of the Past', Annual Conf., *Australasian Association for the History, Philosophy and Social Studies of Science*, Robertson, NSW, September 1989.

Scott, P, Richards, E and Martin, B, 'Captives of Controversy: The Myth of the Neutral Social Researcher in Contemporary Scientific Controversies', *Society for Social Studies of Science*, Irvine, California, November 1989.

Rix, M, 'Latour & Nuclear Strategy: The Big, the Bad, and the Ugly', *AAHPSSS Annual Conf.*, Robertson, July 1989.

DEPARTMENT OF SOCIOLOGY

BOOKS

Hill, Stephen, *The Tragedy of Technology – Human Liberation vs Domination in the Late 20th Century*, London, Pluto Press; and Winchester, MA, Unwin Hyman, 2nd edition (paperback edition), December 1989, pp 294 pages.

Palmer, G and Short, S, *Health Care and Public Policy: An Australian Analysis*, Melbourne: Macmillan, 1989, 321 pp.

BOOK CHAPTERS

Donaldson, Mike, 'Does working for a living mean the unemployed are dead?', in Jagtenberg, T and D'Alton, P (eds), *Four Dimensional Social Space: Class, Gender, Ethnicity and Nature*, Sydney: Harper and Row, 1989, pp 216-221.

Short, Stephanie and Sharman, Evelyn, 'Dissecting the Current Nursing Struggle in Australia', in Lupton, G M and Najman, J M (eds), *Sociology of Health and Illness: Australian Readings*, Melbourne: Macmillan, 1989, pp 225-325.

JOURNAL ARTICLES

Albury, Rebecca, 'Abortion: but I thought that was settled years ago', *Refractory Girl*, May 1989, pp 31-32.

Albury, Rebecca, 'Inquiring into Ethics: the Australian Senate and Embryo Experimentation', *Australian Journal of Social Issues*, 24, 4, November 1989, pp 269-283.

Albury, Rebecca, 'Sexual Politics in the 1990s: Making Sex Safer?', *Social Alternatives*, 9, 1, April 1990, pp 42-46.

Donaldson, Mike, 'Bondmania', *Arena*, 88, 1989, pp 29-36.

Hill, Stephen, 'Technology, Corporate Culture and the Insurance Industry – An Australian Case', *Technology In Society*, 12, April 1990, pp 11-25.

Hill, Stephen, 'Changing the Technological Trajectory – Addressing the "Trailing Edge" of Australia's Historical Culture', *Futures*, 22, April 1990, 26 pp.

Hill, Stephen, 'Promoting Science Policy – Crossing the Cultural Bridge to Progress', *Media Information Australia*, 54, November 1989, pp 67-72.

Short, Stephanie, 'Community Participation or Manipulation? A Case Study of the Illawarra Cancer Appeal-a-thon', *Community Health Studies*, Vol XIII, No 1, 1989, pp 34-38.

Vasta, Ellie, 'Gender, Class and Ethnic Relations: The Domestic and Work Experiences of Italian Migrant Women in Australia', *Migration*, no 7, 1990, pp 7-31.

CONFERENCE/SEMINAR PAPERS

Albury, Rebecca, 'Rationality and Spontaneity', Proc., *Beyond Social Control Conf.*, Sydney, June 1989.

Hill, Stephen, 'Science and Technology Policy and International Cooperation –

The Australian Country Report', Association for Science Cooperation in Asia (ASCA) Conf., Tokyo, Japan, February 1990.

Hill, Stephen, 'The Technology Text and the Culture Assumption', invited paper, Australian Pacific Research on Organisations Society (APROS) International Colloquium, 'Organisations, Technologies and Cultures in Comparative Perspective', Canberra, December 1989.

Hill, Stephen, 'The Challenge of Asian Science and Technology Policy Research', invited lecture, National Institute for Science and Technology Policy, Tokyo, Japan, November 1989.

Hill, Stephen, 'Changing the Technological Trajectory', invited paper, 'Futures for Australia and the Pacific' Conf., University of Melbourne, October 1989.

Hill, Stephen, 'The Tragedy of Technology - The Relations Between Technology and Culture', Australian Association for the History, Philosophy and Social Studies of Science, AAHPSSS National Conf., Robertson, NSW, September 1989.

Hill, Stephen, 'The Tragedy of Technology - Human Liberation vs Domination in the Late 20th Century', Commission for the Future, Melbourne, July 1989.

Hill, Stephen, 'Science and Technology & Policy in Australia', United Nations STEPAN Conf., Developing Practical S&T Management Information Systems for Asian Nations', Colombo, Sri Lanka, July 1989.

Hill, Stephen, 'An Asian Perspective in the Development of S&T Management Information Systems', United Nations STEPAN Conf., 'Developing Practical S&T Management Information Systems for Asian Nations', Colombo, Sri Lanka, July 1989.

Jagtenberg, Tom, 'The Challenge of Change', keynote address to Symposium, 'The Missing Dimension', University of New South Wales, March, 1990.

Short, Stephanie, 'Health Services for Women', National Union of Students Women's Conf., Cumberland College of Health Sciences, Sydney, April 1989, 8 pp.

Short, Stephanie, 'Feminist Reconstructions of Health Care and their Relevance for Nursing in Australia', the Australian Women's Studies Association Conf., South Australian College of Advanced Education, July 1989, 7 pp.

Short, Stephanie and Palmer, George, 'A Public Policy Analysis of Prevention and Health Promotion in Australia', Annual Conf., Public Health Association of Australia, University of Melbourne, August 1989, 8 pp.

Short, Stephanie, 'Mainstreaming, women's health services and power: A sociological analysis of health policies for women in Australia', Behavioural Medicine Conf., Cumberland College of Health Sciences, Sydney, October 1989, 1p.

Short, Stephanie, 'In Defence of Social Constructionism: A Reply to Bury', Annual Conf., The Australian Sociological Association, La Trobe University, December 1989, 9 pp.

Short, Stephanie, 'Researching Consumer and Community Participation in Health Care: Background to the Illawarra Cancer

Appeal-a-thon Study', National Health and Medical Research Council Public Health Research and Development Committee Symposium, 'Maximising the Usefulness of Social Science Research', Historic Village, Ballarat, February 1990, 8 pp.

Short, Stephanie, 'Hidden Agendas: A Public Policy Analysis of the Healthy Cities Australia Project', first National Healthy Cities Australia Conf., Wollongong, February 1990, 7 pp.

Funde, Eddie and Short, Stephanie, 'Democracy: The Key to Health in South Africa', first National Healthy Cities Australia Conf., Wollongong, February 1990, 7 pp.

SCHOOL OF CREATIVE ARTS

BOOKS

Pretty, R K, *Writing Essays: A Casebook Approach*, Melbourne, Longman Cheshire, 1990, pp 106.

BOOK CHAPTERS

Ford, A, 'Donald Hollier's Preludes', 'Donald Hollier's Sonatina', 'Richard Charlton's Threnody', in Canberra School of Music recording project accompanying book.

JOURNAL ARTICLES

Ford, A, 'The Alternative to Pop Nostalgia', *Australian Society*.

Ford, A, 'Music without Cynicism', *Australian Society*.

Ford, A, 'The Kronos Quartet', *Australian Society*.

Rowley, S, 'Inside the Deserted Hut: The Representation of Motherhood in Bush Mythology', *Westerly*, Vol. 34, No 4, December 1989, pp 76-96.

Rowley, S, 'Mind Over Matter? Reading the Art/Craft Debate', *West*, Vol. 1, No 1, 1989, pp 2-7.

Schultz, A, 'The Specialisation Dilemma', *Sounds Australian* No 21, Summer 1989.

CONFERENCE/SEMINAR PAPERS

Jeneid, L, 'Yemen and Turkish Textiles', Aspect of Fibre and Fashion Symp. for Moira Kerr Arts Consultancy, Sydney, March 1990.

Rowley, S, 'Reading the Art/Craft Debate', paper, *Australian Art Association Conference*, Melbourne, September 1989.

Shepherd, P L, 'Arts Evaluation at Higher Degree Level', University of Wollongong. Nat. Conf. Postgraduate Studies in the Arts, October 1989.

COMPOSITIONS/PERFORMANCES/RECORDINGS OF NEW WORKS

Conyngham, Barry E, 'Monuments, for piano and orchestra', Albany Symphony Orchestra U.S.A. World Premiere New York USA, May 1989.

Conyngham, Barry E, Recording, 'Recurrents', for orchestra, Melbourne Symphony Orchestra, Melbourne September 1989.

Conyngham, Barry E, 'Basho', for ensemble, Stichting Symbiosis, Utrecht, Holland, European Premiere November 1989.

Conyngham, Barry E, Recording, 'Monuments', for piano and orchestra, London Symphony Orchestra, London, UK, March 1990.

Conyngham, Barry E, Recording, 'Southern Cross', for violin, piano and orchestra, London Symphony Orchestra, London, UK, March 1990.

Conyngham, Barry E, Recording, 'Vast I II III IV', for orchestra, Australian Youth Orchestra, Sydney April 1990.

Ford, A, 'Wassails and Lullabies', University Singers, conductor Vance, D, Wollongong University, December 1989.

Ford, A, 'Harmony', Salamanca Theatre Company, Tasmanian Symphony Orchestra, conductor Franks, Dodds, Odeon Theatre, Hobart, March 1990.

Schultz, A, 'Machine' (for four percussionists); eight minutes; commissioned by Synergy Percussion and the Performing Arts Board, Australia Council.

Schultz, A, 'Stick Dance 2' (clar, vla, piano) (arranged by N. St. Ilan).

Schultz, A, 'A Distant Shore' (Louis Nowra) (baritone, 3 brs, pf, hp, 1 perc. stg. qtt); commissioned by Jones, Garrick and the Performing Arts Board, Australia Council.

SCORES

Conyngham Barry E, 'Cello Concerto', London Vienna, Universal Edition 1990 (UE 29264)

DISCOGRAPHY

Conyngham, Barry E, 'FLY', an Australian Opera, Victoria State Opera, (conductor John Hopkins) [compact disc], MOVE MD 3076 1989.

Conyngham, Barry E, 'Cello Concerto', Australian Chamber Orchestra (David Pereira Cello) [compact disc, cassette] Anthology of Australian Music CSM:9, 1990.

VIDEO TV/RADIO PROGRAMS

Conyngham, Barry E, 'Sound and Silence' (a profile), 30 minutes, Polish Television and Adamov Films (France) 1989.

Ford, A, Four-program Series of 'Mainstream' (ABC Radio National) *Words and Music*.

Ford, A, Four-program series for ABC-FM 'The Second Viennese School'.

Vance, D, Six programs for ABC-FM, broadcast in July-August, 1989, discussing the Op. 50 String Quartet by Haydn and ten quartets by contemporary Australian composers.

COMMISSIONS

- Conyngham, Barry E, 'Waterways', for Viola and Orchestra, Radio Netherlands.
- Conyngham, Barry E, 'Cloudlines', for Harp and Orchestra, Australian Youth Orchestra (for 1991 North and South American Tour).
- Conyngham, Barry E, 'Tracings', for ensemble and computer, Elision Ensemble, Melbourne.
- Flugelman, H, 1990 HSC Slide Kit, Contemporary Art Resource, Slide Kit for Art Teachers, 1990.
- Ford, A, 'Harmony' (for actors and orchestra). Tasmanian Symphony Orchestra, 1990. Funded by Performing Arts Board, Australia Council.
- Ford, A, 'Wassails and Lullabies' (for chamber choir and ad lib percussion) University Singers, 1989. Funded by Performing Arts Board, Australia Council.
- Ford, A, 'Ringing the Changes' (for piccolo, bass clarinet and piano), Het Trio (Amsterdam) Funded by Performing Arts Board, Australia Council.
- Ford, A, 'Whispers' (Music Theatre for tenor and ensemble), text by Rodney Hall, Seymour Group. Funded by Performing Arts Board, Australia Council.
- Schultz, A, 'Machine' (for four percussionists); eight minutes; commissioned by Synergy Percussion and the Performing Arts Board, Australia Council.
- Schultz, A, 'A Distant Shore' (Louis Nowra) (baritone, 3 brs, pf, hp, 1 perc. stg. qtt); 50 minutes; commissioned by Jones, Garrick and the Performing Arts Board, Australia Council.

EXHIBITIONS

- Chapple, J, Travelling Exhibition, Sydney Creative Embroiderers, 'Geometric bags', 1920 style Erte influenced bag, by invitation, Australia-wide over the whole year. 1989.
- Chapple, J, Sydney Creative Embroiderers Guild exhibition, Chatswood entertainment area. April 1989.
- Chapple, J, Sydney Creative Embroiderers' Guild exhibition at Art Arena, Wollongong. May 1989.
- Chapple, J, Wollongong Embroiderers Guild exhibition, Cram House, Wollongong. October 1989.
- Chapple, J, One-man exhibition of machine embroidery for MCA presentation *Cornerstone*, St Augustines, Church of England, Park Road, Bulli, 1989.
- Flugelman, H, 'Sculptors at the Table', Travelling Exhibition, Sydney Craft Centre, November 1989; Orange Regional Gallery, December/January 1990; Wollongong City Gallery, February 1990.
- Duncan, L J, Wollongong Ceramic Society, Wollongong, July 1989.
- Duncan, L J, Coalface Gallery, Yallourn, Victoria, October 1989.
- Eveleigh, J, 'Heroic Materialism, Aspects of Australian Industry, related to the Natural Order (Aspects of NSW Landscape)', Doctoral Exhibition Submission, November 1989.
- Eveleigh, J, Australian Water Colour Society, Irving Gallery, Sydney, December 1989.

- Eveleigh, J, Exhibited work at the Illawarra Credit Union, Wollongong, 1989.
- Eveleigh, J, Exhibited work at the Technology Centre, University of Wollongong, 1989.
- Hook, R, Campbelltown City Art Gallery, Fishers Ghost Art Prize. Highly commended, open section. November 1989.
- Hook, R, ACTA Maritime Art Prize Travelling Exhibition, runner-up, September 1989.
- Hook, R, Editions (Southbank) Galleries, Melbourne, International Art Fair. June 1990.
- Jeneid, L, Campbelltown City Art Gallery, Fishers Ghost. November 1989.
- Jeneid, L, 'Australian Crafts', Meat Market, Melbourne, May 1990.
- Jeneid, L 'Lie of the Land', NSW State Library, March 1990.
- Rowley, S, 'The Lie of the Land', exhibition curated in conjunction with 'Landscape and a Sense of Place', conf. organised by the *Australian Culture Workshop* at the State Library of New South Wales, 31 May 1990.
- Rowley, S, 'But I Like a Happy Landing', quilt reproduced on front cover of *Westerly*, Vol. 34, No. 4, December 1989.
- Shepherd, P, 'Images of Man', Exhibition of paintings and sculpture with Duncan, L. Coalface Gallery, Gippsland, Victoria. October 1989.

PERFORMANCES/PRODUCTIONS

- Dixon, J W, Conducted four-concert season by City of Wollongong Symphony Orchestra. Programs included works by C P E Bach, Beethoven, Brahms, Dixon, Mendelssohn, Mozart and Schubert.
- Dixon, J W, Musical Director, 'Show Boat', Illawarra Performing Arts Centre, Wollongong, October 1989.
- McGrath, Ian F, lighting design, 'Mother Courage', School of Creative Arts at Theatre South, May 1989.
- McGrath, Ian F, lighting design, 'Windy Gully', Theatre South and on tour, July 1989.
- McGrath, Ian F, lighting design, 'Tempest', School of Creative Arts, June 1989.
- McGrath, Ian F, lighting design, 'Kid Stakes', Theatre South, August 1989.
- McGrath, Ian F, Technical direction, 'Cabaret', School of Creative Arts, September 1989.
- McGrath, Ian F, lighting design, 'Hating Alison Ashley', Theatre South, October 1989 and Victorian tour, May 1990.
- McGrath, Ian F, Director, 'Good Doctor', School of Creative Arts, October 1989.
- Schultz, A, 'Spherics', The Seymour Group, Sydney Opera House, ABC Recording, 9 April 1989.
- Schultz, A, 'Sea-Change', Perihelion Ensemble, Nickson Room, University of Queensland, Brisbane, ABC recording, 15 April 1989.
- Schultz, A, 'Barren Grounds', Perihelion, Music of Contemporary Art, Brisbane, 1 May 1989; University of New England, Armidale, 27 July 1989; Canberra School of Music, 29 July 1989; Illawarra Performing Arts Centre, Wollongong, 31 July 1989;
- Perihelion, University of Wollongong, 3 August 1989; Joseph Post Auditorium, Sydney Conservatorium, MBS recording, 4 August 1989; Nickson Room, University of Queensland, ABC recording; 18 November 1989; Nickson Room, University of Queensland 20 March 1990.
- Schultz, A, 'Fast Talking: The Last Words of Dutch Schultz', Andrew Ford - voice, Perth Institute of Contemporary Art, 13 June 1989, MBS recording; Music Centre, University of Wollongong, 27 October 1989; Studios of 2MBS-FM, Sydney, live broadcast, 25 January 1990.
- Schultz, A, 'Stick Dance 2', Musica Troppo, Music Centre, University of Wollongong, 18 August 1989.
- Schultz, A, 'O Oriensis', University Singers/SCAW Ensemble, Music Centre, University of Wollongong, 18 August 1989.
- Schultz, A, 'Machine', Synergy, L'Atelier Studio, Sydney, ABC and MBS recording, 12 September 1989.
- Schultz, A, 'Black River', Sydney Metropolitan Opera Company/The Seymour Group/Elizabethan Theatre, Sydney, ABC live recording, 2-5 November 1989; Studio Recording ABC Studios, Sydney, 26-27 January 1990.
- Scott-Murphy, L, Movement Consultant, 'Tom Jones', Theatre South, Wollongong. April 1990.
- Shepherd, P L, Director, 'The Tempest', World Premiere. Music-theatre work based on Shakespeare's play, University of Wollongong, August 1989.
- Shepherd, P L, Musical Director, 'The Pirates of Penzance', Gilbert & Sullivan, Illawarra Performing Arts Centre, November 1989.
- Shepherd, P L, Musical Director, 'Some Enchanted Evening', Rodgers & Hammerstein. Australian Premiere, Illawarra Performing Arts Centre, April 1990.
- Vance, D, Musica Troppo, University of Wollongong Bistro, July 1989.
- Vance, D, Conductor, University Singers, 'Sacred and Secular Choral Music', Concert for Kiama Jazz Committee, Kiama.
- Vance, D, Conductor, University Singers, 'Australian Choral Music', SCAW concert, University Music Centre. August 1989.
- Vance, D, Directed University Singers with City of Wollongong Symphony Orchestra, Beethoven's 'Choral Fantasy', September 1989.
- Vance, D, Musical Director and Pianist, 'Cabaret', University of Wollongong. September 1989.
- Vance, D, Piano Recital for Spanish Embassy, Canberra. October 1989.
- Vance, D, Harpsichord continuo. 'Gloria', Vivaldi.
- Vance, D, Conductor. BHP Training Orchestra, Wollongong Orchestra, Performing Arts Centre, Wollongong, Music by Corelli, Tchaikovsky and Mozart. November 1989.
- Vance, D, Conductor. 'Wassails and Lullabies', A Christmas Concert by University Singers, University of Wollon-

gong, December 1989. Commissioned from Andrew Ford with assistance of Performing Arts Board of the Australia Council.

Vance, D, Harpsichord continuo. Handel's 'Messiah'. December 1989.

Vance, D, Piano, Art of Lunch Recital, University of Wollongong. Music by Britten and Ford, March 1990.

Vance, D, Piano, Art of Lunch Recital, University of Wollongong. Music by Debussy and Beethoven. March 1990.

Vance, D, Director, University Singers, 'Music for Easter', Wesley Church, Wollongong, April 1990.

Vance, D, Associate Musical Director, 'Some Enchanted Evening', Performing Arts Centre, Wollongong. April 1990.

Vance, D, Piano, Musica Troppo, Art of Lunch Recital, University of Wollongong. April 1990.

POEMS

Pretty, R K, 'Bald Hill with Gliders', *Meanjin Quarterly*, September 1989.

Pretty, R K, 'Bagatelle', *Sydney Morning Herald*, April 1989.

Pretty, R K, 'Cresting the Dune', *Outrider*, May 1989.

Pretty, R K, 'Equinox', *Social Alternatives*, May 1989.

Pretty, R K, 'Facing the Music', *Southerly*, May 1989.

Pretty, R K, 'Flywheel', *The Age Monthly Review*, September 1989.

Pretty, R K, 'In the Park', *Social Alternatives*, May 1989.

Pretty, R K, 'Ned Kelly takes his Love to the Beach', *Westerly*, March 1990.

Pretty, R K, 'The Piglet as Decadent', *Southerly*, October 1989.

Pretty, R K, 'Rabaul', *The Age Monthly Review*, April 1989.

Pretty, R K, 'Showtime', *Westerly*, March 1989.

Pretty, R K, 'Snake', *Outrider*, May 1989.

Pretty, R K, 'William Street', *Outrider*, May 1989.

CENTRE FOR MULTICULTURAL STUDIES

BOOK CHAPTERS

Castles, S, 'La politica sull'immigrazione in Australia', *Quadro, Delle Politiche Immigratorie Di Accesso Nei Paesi Europei*, in USA, Canada, E Australia, Fondazione Giovanni Agnelli, Turin, 1989, pp 57-109.

Castles, S, Morrissey, M and Pinkstone, B, 'Migrant Employment and Training and Industry Restructuring', in Jupp, J. (ed), *The Challenge of Diversity*, Canberra, AGPS, pp 127-140.

Cope, Bill and Kalantzis, Mary, 'Cultural Differences and Self-Esteem: Alternative Curriculum Approaches', Kenway, Jane and Willis, Sue (eds), *Hearts and Minds: Self-Esteem and the Schooling of Girls*, Department of Employment, Education and Training, Canberra, 1989, pp 151-166.

Cope, B and Poynting, S, 'Class, Gender and Ethnicity as Influences on Australian Schooling: An Overview', in Cole, Mike (ed), *The Social Contexts of Schooling*, The Falmer Press, Brighton, England, 1989, pp 217-238.

Kalantzis, Mary, 'Ethnicity Meets Class Meets Gender in Australia', in Watson, Sophie (ed), *Australian Feminist Interventions*, Verso, London, 1989.

Kalantzis, Mary, Cope, Bill and Hughes, Chris, 'The Ideology of Multiculturalism', in RIZVI, Fazal (ed), *Migration, Ethnicity and Multiculturalism: Making Policy for a Polyethnic Society*, Deakin University Press, Geelong, 1989, pp 146-150.

Kalantzis, M, Slade, D, and Cope, B, 'Minority Languages and Mainstream Culture: Problems of Equity and Assessment', in De Jong, John Hal, and Stevenson, Douglas, K (eds), *Individualising the Assessment of Language Abilities*, Multilingual Matters, London, 1989.

JOURNAL ARTICLES

Alcorso, C, 'Migrant Workers and the Workers' Compensation System: the Making of an Ideology', *Australian and New Zealand Journal of Sociology*, March 1989.

Castles, S, Gibson, K, Collins, J, Tait, D and Alcorso C, 'Understanding Ethnic Small Business: a Case Study of Marrickville', *Australian Journal of Social Issues*, spring, 1989.

Cope, Bill, 'Communication in a Pluralist World: The Problem of Reading Culture', *Network for Intercultural Communication Newsletter*, Vol 3, no 8, 1989, pp 11-27.

Cope, Bill and Kalantzis, Mary, 'Ending the "Producer Monopoly"', *Education Australia*, no 5, 1989, pp 4-7.

Kalantzis, M, 'Ethnic Affairs in New South Wales', *Migration Action*, vol X, no 3, pp 7-10.

Kalantzis, Mary and Cope, Bill, 'Pluralism and Equitability: Multicultural Curriculum Strategies for Schools', *Curriculum and Teaching*, vol 4, no 1, 1989.

CONFERENCES/SEMINAR PAPERS

Cope, Bill, 'Communication in a Pluralist World: The Problem of Reading Culture', *Network for Intercultural Communication Newsletter*, vol 3, no 8, 1989, pp 11-27.

Cope, Bill, 'Culture By Whom and For Whom? The Arts in a Multicultural Society', Proc., National Conf., Arts Policy for a Multicultural Society: Towards Cultural Democracy, Adelaide, 1989, pp 27-33.

Cope, Bill, keynote address, 'Racism in Children's Books', *Literature Across the Curriculum*, Primary Librarians' Conf., Meadlow Bath, May 1989.

Cope, Bill, keynote address, 'Stereotyping and Racism', Aboriginal Education Conf., Catholic Education Office, Armidale, September 1989.

Cope, Bill, keynote address, 'Curriculum in Transition', Working with Genre Conf., University of Technology, Sydney, November 1989.

Cope, B, and Kalantzis, M, Workshop Presentation, 'The OECD Education for Cultural and Linguistic Pluralism Project: The Australian Case Studies', for the Australian Advisory Committee on Languages and Multicultural Education, Sydney, August 1989.

Kalantzis, Mary, Paper, 'Adult Literacy: State of the Art', Literacy: Let's Get On With The Job, The Australian Council for Adult Literacy National Symposium, University of New South Wales Institute of Administration, Sydney, May, 1989.

Kalantzis, Mary, Keynote Address, 'Dilemmas in Making Curriculum', Working with Genre Conf., University of Technology, Sydney, November 1989.

Kalantzis, Mary and Cope, Bill, 'The Experience of Multicultural Education in Australia: Six Case Studies', *Problemi Educativi delle Minoranze Culturali e Linguistiche dalla Ricerca alla Practica Scolastica*, conf. conducted Istituto Regionale di Ricerca Sperimentazione e Aggiornamento Educativi per L'Emilia-Romagna, Bologna, Italy, December 1989.

FACULTY OF COMMERCE

DEPARTMENT OF ACCOUNTANCY

BOOKS

Gaffikin, M J R, *Accounting Methodology and the Work of R J Chambers*, Garland Press, 1989.

Gaffikin, M J R, *Principles of Accounting* (second Australian edition), Harcourt Brace Jovanovich, 1990.

Gaffikin, M J R, *The Word Shoppe*, second edition, Harcourt Brace Jovanovich, 1990.

Gerrard, M, Bramson, G, Kaidonis, M, *Computerised Accounting Using Sybiz*, Prentice-Hall Australia, 1989.

Gul, F A, Teoh, H Y and Andrew B, *Theory and Practice of Australian Auditing*, Thomas Nelson Australian, 1990 (revised and expanded edition).

JOURNAL ARTICLES

Gul, F A, Guthrie, J, Andrew, B and Teoh, H Y, 'Corporate Social Disclosure Practices in Developing Countries: The Case of Malaysia', *British Accounting Review*, 1989.

Teoh, H Y, 'Issues of Financial Reporting and Auditing: The Malaysian Case', *The Malaysian Accountant*, February 1990.

Wijewardena, H, 'Structure and Performance of Small Industry in Sri Lanka', *Upanathi*, vol 3, no 2, 1989.

CONFERENCE/SEMINAR PAPERS

Funnell, W N, 'Pathological Responses to Accounting Controls', European Accounting Association Conf., Stuttgart, 1989.

Greenwell, M M, 'The Meaning of a True and Fair View - An Australian and German Comparison', European Accounting Association Conf., Stuttgart, 1989.

Shannon, R P, 'Accounting Standards Overload Problem - A Suggested Solution', European Accounting Conf., Budapest, 1990.

Teoh, H Y and Ming, W, 'Alternatives to State-Owned Enterprises: A Review of Some Successful Models of Business Operation in China', Pan-Pacific Business Association Conf., VII, Seoul, Korea, May-June 1990.

Teoh, H Y and Lau, C M, 'A Comparative Study of Capital Budgeting Strategies by Domestic Companies and Foreign Subsidiaries in Malaysia', Pan-Pacific International Accounting Conf., Fresno, California, October 1989.

Tibbits, G E and Greenwell, M M, 'An International Case Study on Accounting for Goodwill', European Accounting Association Congress, Budapest, April 1990, pp 1-12.

McKenna, J P, Harrington, P R, Lowe, J F and Tibbits, G E, 'Small Business in New South Wales: Why some don't Succeed',

published by Business and Consumer Affairs, February 1990, 198 pp.

Teoh, H Y, 'Preparation of Section 70 Certificates: A Cost Analysis' for the Institute of Strata Title Management, New South Wales, April, 1990.

DEPARTMENT OF BUSINESS SYSTEMS

BOOK CHAPTER

Tognetti, K, Winley, G and van Ravenstein, T, 'The Fibonacci Tree, Hofstadter and the Golden String', in Bergum, G E, Philippou, A N, Horadam, A F (eds) *Applications of Fibonacci Numbers*, vol 3, Dordrecht, Kluwer Academic, 1990.

JOURNAL ARTICLES

Little, S E and Margetson, D B, 'A Project-based Approach to Information Systems Design for Undergraduates', *Australian Computer Journal*, 21, 2, 1989, pp 130-138.

Little, S E, 'Task Environments and Institutional Environments: Understanding the Context of Design Decision Making', *Design Studies*, 11, 1, 1990, pp 29-42.

Lo, B, 'Australian Information Systems Curricula', *Journal of Computer Information Systems*, 1989.

Winley, G Tognetti, K and van Ravenstein, T, 'Hurwitz's Theorem and the Continued Fraction with Constant Terms', *Fibonacci Quarterly*, vol 27, no 5, 1989.

CONFERENCE/SEMINAR PAPERS

Hasan, H, 'Computer Aided Management and Teaching of Large Classes', Proc., ASCILITE-89, Gold Coast, Queensland, December 1989, pp 259-269.

Little, S E, 'Organisational Cultures and Technological Failures: Reconciling Task and Institutional Environments', APROS International Colloquium on Organisations, Technologies and Cultures, Canberra, ACT, December 1989, 35 pp.

Little, S E, 'Quality and Robustness in Information Systems: an organisational perspective', QUALCON '90 7th Biennial Conf., Australian Organisation for Quality Control, Adelaide, SA, October 1990, 16 pp.

Little, S E, 'A Grounded Theory Approach to Information Systems Research: a longitudinal study of the deployment of knowledge-based systems', IFIP WG 8.2 Workshop, ISRA-90, The Information

Systems Research Arena of the 90s: Challenges, Perceptions and Alternative Approaches, Copenhagen, December 1990, 6 pp.

Shue, L Y, 'An Intelligent GPSS Model Builder With Turbo Prolog', Proc. 3rd Pan Pacific Computer Conf., Beijing, China, August 1989.

DEPARTMENT OF ECONOMICS

BOOKS

Castle, R G, *Employment Prospects for Aborigines in Rural Labour Markets*, AGPS, Canberra, 1989.

Jackson, D, *The Australian Economy*, Macmillan Company of Australia Pty Ltd, 1989.

Jackson, D, *The Australian Economy Workbook*, Macmillan Company of Australia Pty Ltd, 1990.

O'Brien, D T, Lewis, D E, and Guest, J E, *Mathematics for Business and Economics*, Harcourt Brace Jovanovich, Sydney, 1989.

Nyland, C, *Worktime and Rationalisation: A Select Bibliography*, Association of Industrial Relations Academics of Australia and New Zealand, Sydney, 1990.

BOOK CHAPTERS

Kelly, D, 'Changing Industrial Relations in the Steel Industry', in Markey, R (ed) *Changing Patterns of Work and Pay*, Riverina Murray Institute Press, June 1989.

Tran Van Hoa, 'Report on the Economic Efficiency of Stamp Duties on Financial Transactions and Excise Duties on Selected Commodities in New South Wales', *Review of the State Tax System*, vol 2 (commissioned studies), New South Wales Tax Task Force, undated. The Treasury, NSW Government.

JOURNAL ARTICLES

Anderson, J R and Thampapillai, D J, 'Soil Conservation - Project and Policy Intervention in Developing Countries', World Bank Staff Paper, PPR Policy Research Series, The World Bank, Washington DC, 1989.

Harvie, C and Wilson, E, 'The Twin Deficits Issue: A Theoretical and Simulation Exercise', *Journal of Economics and Finance*, vol 13, no 4, Spring 1990.

Hawke, A and Lewis, D E, 'A Fair and Feasible Income Support Program for Australia', *Economic Papers*, June 1989, pp 37-47.

Nyland, C, 'The Income and Fatigue Explanation of Worktime Change', *Journal of Industrial Relations*, vol 31, no 4, December 1989, pp 538-551.

Park, H-Y and Thampapillai, D J, 'The Valuation of the Natural Environment and the Social Cost of Black Coal Extraction: A Small Case Study in the Hunter Valley',

Economics, 25(2), 1989.

Steinke, J, 'A Model of Interrelationships between Standard Hours and Work of Other Major Labour Market Variables', *Labour Economics and Productivity*, vol 2, Perth, 1990.

Thampapillai, D J, 'The Elimination of Absolute Poverty: Approaches to Monetary Valuation', *Indian Economic Journal*, April-June 1989.

Tran Van Hoa and Ironmonger, D S, 'Equivalence Scales: A Household Production Approach', *Economics Letters*, vol 31, 1989, pp 407-410.

Tran Van Hoa and Reece, B F, 'An Empirical Study of Optimal Taxation on Australian Financial Institutions', *Economics Letters*, vol 29, 1989, pp 163-166.

Tran Van Hoa, 'System Estimation of Generalized Working Models: A Semiparametric Approach', *Economics Letters*, vol 31, 1989, pp 363-366.

CONFERENCE/SEMINAR PAPERS

Castle, R G and Hagan J S, 'Award Restructuring', CWALMS seminar, Charles Sturt University, November 1989. Revised version presented to Industry Assistance Commission, Canberra, January 1990.

Castle, R. G., 'Microeconomic Reform and Public Sector Labour', CAPSM Seminar, Griffith University, March 1990.

Castle, R G and Hagan, J S, 'Aboriginal Labour in the White Economy', Peripheral Visions Conf., Townsville, July 1989.

Harvie, C and Wilson, E, 'Current Account Consequences from Alternative Monetary, Fiscal and Wages Policies', 17th Midsouth Academy of Economics and Finance, Jackson, Mississippi, February 1990.

Hawke, A and Lewis, D E, 'Evaluation of an Alternative Income Maintenance Scheme for Australia', National Social Policy Conf., Sydney, July 1989.

O'Brien, D T, 'The fertilizer subsidy and fertilizer use in Indonesia', invited paper at international meeting on Sulfur Fertilizer Policy for Lowland and Upland Cropping Systems in Indonesia, Jakarta, Indonesia, July 1989.

Pol, E and Wilson, E, 'On the Wage/Tax Trade-Off', mimeo, 18th Annual Conf., Economic Society of Australia, University of Adelaide, July 1989.

Pol, E, 'Multiproduct Cost Functions with Variable Scale Economies', mimeo, 1989 Australasian Meeting of Econometric Society, University of New England, July 1989.

Sinden, J A, and Thampapillai, D J, 'Introduction to Cost-Benefit Analysis', University of New England, Armidale, 1990.

Thampapillai, D J, 'An Introduction to Cost-Benefit Analysis for the Evaluation of Rural Development Projects', Special Courses Program, Development Studies Centre, Australian National University, Canberra, 1989.

Tran Van Hoa, 'A Class of Dominating Mean-Squared-Error Estimators for Linear Econometric Models', *Econometrics*

Seminar, Stanford University, USA, May 1989.

Tran Van Hoa, 'A New Class of MELO Estimators for Linear Structural Econometric Models', 38th Meeting of the NBER-NSF Seminar on Bayesian Inference in Econometrics, University of Missouri at Columbia, USA, April, 1989.

Tran Van Hoa, 'MSE Estimators for Linear Econometric Models', paper presented at the following universities: Department of Economics, London School of Economics and Political Science, London, January 1989; Centre for Operations Research and Econometrics, Universite Catholique de Louvain, Louvain-la-Neuve Belgium, February 1989; Centre for Economic Research, Tilburg University, Holland, February 1989.

Verrucci, N, 'Analysis of Labour Market Conditions of Queensland Aborigines 1976-86', CWALMS Symposium, Charles Sturt University, November 1989.

DEPARTMENT OF MANAGEMENT

BOOKS

Craig-Lees, M and Coombes, R, *Business Studies One*, Social Science Press, 1989.

Lowe, J and Craig-Lees, M, *Management Training In Australia*, Technology Management Publications, 1989, 65 pp.

McKenna, J, Lowe, J, Harrington, P and Tibbits, G, *Why Small Firms Decline*, NSW State Government Department of Business and Consumer Affairs.

BOOK CHAPTERS

Mangan, J and Stokes, L, 'Who are the Unemployed?' in Whitfield, K (ed), *Contemporary Issues in Australian Labour Markets*, Sydney, Harper Row, pp 87-91.

Patterson, P, Three case studies, 'PGH Ceramic Tiles Pty Ltd'; 'Survey of World Cup Athletics Event'; and 'Purchasing a Slow Combustion Heater', in McColl-Kennedy, J, Yan, O and Hardman, R (eds), *Australian Marketing: A Casebook*, Sydney, Harper and Row, 1990.

Patterson, P, 'International Marketing of Australian Tertiary Education', in Graham, P (ed), *Readings and Cases in Marketing*, second edition, Sydney, Prentice Hall, 1990.

Patterson, P, and Dawes, P, 'What Are They Good For?', in Bradmore, D, Joy, S and Kimberley, C (eds), *Marketing Visions: Classical and Topical Readings*, Sydney, Prentice Hall, 1989, pp 293-298.

JOURNAL ARTICLES

Hough, M, 'The Problems of Implementing Long Term Curriculum Change: Some Proposals for More Effective Practice', *The Educational Administrator*, winter, 1989, 32, pp 24-32.

Hough, M, 'Teacher Morale: Some Suggestions for Improvement', *APEA Journal*, November, 1989, pp 44-59.

Jabri, M, Payne, R and Lane, D, 'A Two Dimensional Person-Environment Fit Analysis of the Performance, Effort and Satisfaction of Research Scientists', *British Journal of Management*, 1990.

Lowe, J and Clemens, P, 'Strategy and Planning in Small Firms', *International Journal of Small Business*, 1990, pp 81-95.

Mangan, J, 'The new industrial economics', *Economic Analysis*, 1989, vol 19, no 2, pp 197-206.

Mangan, J, 'Wage Subsidies for the Disabled: a discussion of their impact in Australia', *International Journal of Manpower*, 1990, vol 11, no 1, pp 20-26.

Naughton, T, 'Interest-free Banking: A Case Study of Malaysia', *National Westminster Bank Quarterly Review*, February, 1990, pp 16-32.

Naughton, T, 'Islamic banking in South East Asia - A Review', *Asian-Pacific Economic Literature*, 3, 2, 1989, pp 52-56.

Patterson, P, Dawes, P and Dowling, G, 'The Structure of Buying Centres in the Purchase of Professional Services', *Institute for the Study of Business Markets, Pennsylvania State University*, Report 6, 1989, pp 1-37.

Patterson, P and Lloyd, P, 'Attitudes of Nursing Executives to the Health-Care Facility Accreditation Program: An Exploratory Study', *Australian Health Review*, 12, 3, pp 28-42.

Zanko, M, 'Managing Unplanned Absence in Organisations', *Asia Pacific HRM*, 27, 4, 1989, pp 34-43.

CONFERENCE/SEMINAR PAPERS

Craig-Lees, M, 'Consumerism: Fact or Fiction', 4th Conf., Historical Research in Marketing, Charleston, South Carolina, USA, April, 1989, pp 1-41.

Craig-Lees, M, 'Understanding Consumerist Activities', Marketing Research Society, Sydney, September, 1989, pp 1-34.

Craig-Lees, M, 'Opinions of the Marketplace: Australian Consumers 1895-1978', Marketing Educators Conf., SAIT, Adelaide, September, 1989, pp 1-29.

Dawes, P L, Dowling, G R and Patterson P, 'Determinants of Buying Centre Structure: A Causal Path Analysis', Australian Marketers and Educators Conf., Adelaide, February, 1990.

Dawes, P L, Dowling, G R and Patterson, P, 'External Information Search in the Commissioning of Professional Consulting Services', ANZAME Conf. and Symposia, Auckland, December, 1989.

Dawes, P L, Dowling, G R and Patterson, P, 'The Structure of Buying Centres in the Purchase of Professional Services', Institute for the Study of Business Markets, Pennsylvania State University, Report 6, 1989, pp 1-37.

Dawes, P L, Dowling, G R and Patterson, P, 'Searching for a Consultant: An Analysis of the Use of Alternate Types of Information by Users', Charles Sturt University, June, 1989, pp 1-21.

Hough, M, 'Curriculum Management: Leadership Competencies', Proc., Sydney Association for Educational Administration Annual Symposium, 1989, pp 79-91.

Hough, M, 'Defining Educational Leadership: Competency Statements and Performance Indicators', Proc. Annual Conf., Australian Council for Educational Administration, 1989.

Hough, M, 'Leader and Teacher Competencies: Indicators of Quality', videotape produced by New South Wales Department of Education Metropolitan North Principals' Conf., 1989.

Lepani, B, Collyer, F, Williams, T A, Johnston, R, Hayter, G and Loveden, P, 'The Impact of Fusion Technologies (Mechatronics) on Work Organisation, Cross-Skilling and Training: Case Studies of Australian Enterprises', Report to Australian Skills Foundation, Centre for Technology and Social Change, Wollongong, 1989.

Lowe, J, and Clemens, T, 'Small Firm Planning and Strategy in Australia', 7th Annual Conf. on Small Business, Thames Polytechnic, November 1989.

Naughton, T and Chanmugam, B, 'Recent Developments in Malaysian Banking', Proc., Asia-Pacific Financial Markets Conf., National University of Singapore, December 1989, pp 575-592.

Naughton, T, Jones, M and Sim, A B, 'Corporate Strategy and Capital Structure: Australian Evidence', Australasian Graduate School of Management, November-December 1989.

Naughton, T, Lowe, J, Jones, M and Sim, A B, 'Corporate Strategy and Capital Structure', Cranfield Management Seminar, Cranfield School of Management, December 1989.

Sim, A B and Lowe, J, 'First Mover Advantages and Competitive Strategies', Department of Management, University of Wollongong, June 1989 and Research Seminar at Cranfield Institute of Technology, December 1989.

Sim, A B, 'Determinants of Turnaround in Small Businesses', Illawarra Regional Information Service, August 1989.

Williams, T A, 'Office Structures Implementation and Modernisation in the Australian Taxation Office (Sydney)', discussion paper for Australian Taxation Office, Sydney, August 1989.

FACULTY OF EDUCATION

SCHOOL OF LEARNING STUDIES

BOOK

Cambourne, B and Turbill, J, *Secondary Literacy Inservice Course*. Professional Development Program. Curriculum Development Centre, Canberra, 1989. (Program includes 64 page Manual, 6 x 64 page Teachers Booklets, a video and audio tape support.)

BOOK EDITED

King, R C and Collins, J K (eds), *Social Applications and Issues in Psychology*, Amsterdam, Elsevier Science Publ, 1989, pp 379.

BOOK CHAPTERS

Brown, H and Cambourne, B L, 'Evaluation in Whole-Language Classrooms: A collaborative research Project' in Daly, E (ed), *Monitoring Children's Language Development*, Melbourne, Australian Reading Association, 1989.

Cambourne, B L and Brown, H, 'Learning to control narrative and argument: A grounded theory of the acquisition of different registers by young learner writers' in Andrews, R (ed), *Narrative and Argument*, Cambridge, Cambridge University Press, 1989.

Kyle, N J, 'Woman's Natural Mission but Man's Real Domain: The Masculinisation of the State Elementary Teaching Service in NSW' in Taylor, S, et al (eds), *Battlers and Bluestockings: Two Hundred Years of Women and Australian Education*, Australian College of Education, 1989, pp 25-36.

Turbill, J, 'Evaluation in a Whole Language Classroom: the What, the Why, the How, the When' in Daly, E, *Monitoring Children's Progress in Literacy*, Melbourne, Australian Reading Association, 1989.

Wright, J, 'Remember those skirts: the constitution of gender in physical education' in Scratton, S (ed), *Gender and physical education*, Geelong, Deakin University Press, 1990.

JOURNAL ARTICLES

Cambourne, B and Turbill, J, 'Accountability and assessment in "whole language" classrooms: theory into practice', *Elementary School Journal*, 90 3, 1990.

Cambourne, B L and Fleet, A, 'The coding of naturalistic data', *Research in Education*, 41, 1989.

Cambourne, B L, 'Assumptions underlying once-only, group administered, computer-marked, standardised tests of literacy', in Shrubbs, G (ed) *Mass Testing: Tonic or Toxin? Counterpoints*, 1, 1989, pp 14-18.

Cambourne, B L, 'Look what they've done to my song ma: A reply to Luke, Baty and Stehbens', *English In Australia*, 90, 1989, pp 13-23.

de Lacey, P R (with Moens, G), 'Issues in current demands of universities', *Education Monitor*, February, 1990.

Jones, J M, Wilson, J and Winsler, W N, 'Changes in Education in the U.K. and Australia: Common Imperatives, Predictable Outcomes', *The Australian Educational Researcher*, 16 4, 1989, pp 79-88.

Kyle, N J, 'Policy, Politics and Pragmatism: The State and the Rural School in Colonial New South Wales', *History of Education*, 19,1, 1990, pp 41-54.

Kyle, N J, 'Caroline Edgeworth David: A Short Biography', *Unicorn*, 15 1, 1989, pp 4-5.

Kyle, N J, 'History, Hagiography or Hobby? Women and Family History in Australia', *History*, 6, 1989, pp 5-12.

Stone, M, 'An Interview with Barbara Giles, Children's Author and Poet', *SPAN (Journal of the South Pacific Association for Commonwealth Literature and Language Studies)*, October 1989, pp 1-11.

Wilson, M, 'SISS Science Curriculum in Papua New Guinea', *Papua New Guinea Journal of Education*, 25 1, 1989, pp 81-90.

Wilson, M, 'Pinhole Camera Plus', *School Science Review*, 254, 1989, pp 108-110.

Wright, J, 'The construction of gender through tenor choices in physical education lessons', *Australian Review of Applied Linguistics*, 12 1, 1989, pp 83-101.

Wright, J, 'Sport: a comparison of difference', *Australian Left Review*, 113, 1989.

CONFERENCE/SEMINAR PAPERS

Booth, E, 'Moving from Text to Practice: Changing the Dominant Paradigm in Teacher Education', Proc., Australian Association for Research in Education, Adelaide, December 1989.

Cambourne, B L and Turbill J, 'Co-Researching as a Medium of Professional Development', Symposium in Whole Language AERA Annual International Conf., San Francisco, 1989.

Cambourne, B L, 'Learning to Control Register' and 'Assessment in Whole-Language Classrooms', Plenary Sessions, Western Australian Reading Conf., Perth, 1989.

Cambourne, B L, 'The Conditions of Learning' and 'Theory into Practice', Addresses given at University of South Pacific Symposium, Seattle, 1989.

Cambourne, B L, 'How Do Young Children Learn?', Plenary Address given at Whole-Language Conf., East Washington University, Spokane, and at Whole-Language Conf., Greeley, Colorado, 1989.

Cambourne, B L, 'Assessment and Evaluation in Whole Language Classrooms', Plenary Address given at Whole-Language Conf., East Washington

- University, Spokane, and at Whole-Language Conf., Greeley, Colorado, 1989.
- Cambourne, B L and Turbill, J, 'Assessment and Evaluation in Whole Language Classrooms: Theory into Practice', Whole Day Strand Workshop, National Reading Conf., Australian Reading Association, Darwin, 1989.
- Cambourne, B L and Turbill, J, 'The Secondary Literacy Inservice Course', Paper presented at National Reading Conf., Australian Reading Association, Darwin, 1989.
- Cambourne, B L, Derewianka, B and Turbill, J, 'How Children Acquire Different Written Registers', Whole Day Strand Workshop, National Reading Conf., Australian Reading Association, Darwin, 1989.
- Cambourne, B L, 'Natural Learning And The Acquisition Of Literacy: Research Update', National Reading Conf., Australian Reading Association, Darwin, 1989.
- Cambourne, B L, 'Holism and the New Movement In Language Education', Invited Plenary Paper, Auckland Reading Association, Annual Conf., Auckland, New Zealand, 1989.
- Cambourne, B L, 'Natural Learning and Adult Literacy Education', Invited Plenary Session, National Conf. on Adult Education, Hobart, Tasmania, August 1989.
- Cambourne, B L, 'Whole Language Classroom in Action: All Day, Every Day', Pre-Conf. Institute, International Reading Conf., New Orleans, USA, Blind Review, May 1989.
- Cambourne, B L, 'Responsive Evaluation - Holistic Approach to the Assessment and Evaluation of Literacy' and 'The Secondary Literacy In-Service Course': A description of its contents, aims and initial trials', Strand Workshop, Australian Reading Association Conf., Darwin, Blind Review, July 1989.
- Cambourne, B L, 'Assessment and Evaluation in the Whole Language Classroom', Vermont Teachers of Whole Language Conf., Rutland, Vermont, USA, invited speaker, November 1989.
- Cambourne, B L, 'The Conditions of Learning', Whole Language Conf., Tuscon, Arizona, USA, invited speaker, November 1989.
- Cambourne, B L, 'Issues in Assessment and Evaluation of Language', Reading Association Sydney Conf., invited speaker, December 1989.
- Cambourne, B L, 'Getting To The Guts of Whole Language', Plenary Address, Primary English Teachers' Association, National Conf., Wollongong, 1990; opening plenary address at Meanjin Reading Association Conf., Brisbane, invited speaker, March 1990; and Whole Language Umbrella Conf., St Louis, Missouri, USA, invited speaker, August 1990.
- Cambourne, B L, 'Evaluation in Literacy: Where Have We Come From?', International Reading Conf., Atlanta, USA, Blind review, May 1990.
- de Lacey, P R, 'Corporal punishment, education and the law', National Conf., Australian Society of Legal Philosophy', University of Queensland, August 1988 (by invitation), published 1990 in Book of Proceedings.
- Derewianka, B, 'The Genre-Based Approach to Writing', Workshop Presenter, ARA/AATE National Conf.: Across the Borders, Darwin, July 1989.
- Derewianka, B, 'Coming to Terms with Text', Workshop Co-ordinator and Presenter (with Brian Cambourne and Jan Turbill), ARA/AATE National Conf.: Across the Borders, Darwin, July 1989.
- Derewianka, B, 'Learning About Language: An Alternative to Traditional Grammar', Keynote Speaker at ARA/PETA Conf.: Language as the Core, Wollongong University, January 1990.
- Derewianka, B, 'The Transition from Childhood to Adolescence', AILA 9th World Congress, Thessaloniki, Greece, April 1990.
- Jones, J M, 'Achievement and Aspirations in Mathematics and Science in Two School Systems', paper presented at AARE Conf., University of Adelaide, Nov./Dec. 1989.
- King, R C, 'The Convention Industry in Australia: Issues for the Future', Association of Conference Executives, Terrigal, April 1989.
- Kyle, N J, King, R C and Stone, M, 'Telling Lives or Lively Telling? The Changing Art of Biography in the 1980s', Australian and New Zealand History of Education Conf., University of Newcastle, July 1989.
- Kyle, N J, Wright, J and James, J, 'A Report on Research into Women and Girls and Non-traditional Study, Employment and Training in the Illawarra', Australian Women and Education Coalition Conf., Glebe High School, October 1989.
- Kyle, N, King, R C, Wright, J and James, J, 'The participation of girls in non-traditional areas of study', paper presented at the Australian Women in Education Conf., Sydney, October 1989.
- Turbill, J, 'Researching Whole Language', Symposium, American Educational Research Conf., San Francisco, USA, Blind Review, April 1989.
- Turbill, J, 'Whole Language Classroom in Action: All Day, Every Day', Pre Conference Institute, International Reading Conf., New Orleans, USA, Blind Review, May 1989.
- Turbill, J, 'Assessment and Evaluation in the Whole Language Classroom', Vermont Teachers of Whole Language Conf., Rutland, Vermont, USA, invited speaker, November 1989.
- Turbill, J, 'Co-shaping the Curriculum: Teachers and Children Working Together in A Whole Language Classroom', Whole Language Conf., Tuscon, Arizona, USA, invited speaker, November 1989.
- Turbill, J, 'Language at the Centre: Integrating the Curriculum', opening plenary address, Australian Reading Association Conf., Central Queensland, March 1990.
- Turbill, J, 'The Theory of Responsive Evaluation and Its Implications for the Classroom', International Reading Conf., Atlanta, USA, Blind Review, May 1990.
- Turbill, J, 'Literacy into the 90's', opening address, Tasmania Reading Conf., Hobart, June 1990.
- Turbill, J, 'Reading-writing Connections: Implications for Literacy Education', Tasmanian Reading Conf., Plenary session, invited speaker, June 1990.
- Turbill, J, 'Language and Integrating the Curriculum', Whole Language Umbrella Conf., St Louis, Missouri, USA, invited speaker, August 1990.
- Wilson, M, Harper, B M and Lewis, R A, 'The use of CML in Physics Tutoring', in Bishop, G and Baker, J (eds), ASCALITE-89 Proc., Seventh Annual Conf., Australian Society for Computers in Learning in Tertiary Education, Bond University, Gold Coast, December 1989, pp 229-241.
- Wilson, M, Harper, B M and Lewis, R A, 'Computer Managed Assignments in a First Year Tertiary Science Course: A Component in Effective, Efficient Teaching', AARE Conf., Flinders University, Adelaide, November 1989.
- Winser, W N, 'Knowing what you're doing in language and literacy learning', 1st Joint Conf., Australian Reading Association for the Teaching of English, Darwin, July 1989.
- Winser, W N, 'The role of awareness of language in mother-tongue language acquisition', 9th World Congress of Applied Linguistics, Halkidiki, Greece, April 1990.
- Winser, W N, 'Knowledge about language and the teaching of reading', National Foundation for Educational Research (Primary Advisory Teachers and the LINC program), London, April 1990.
- Wright, J, 'Personal Pronouns and Social Relations: the Constitution of Solidarity, Power and Intimacy in Physical Education Lessons', invited paper, International Conf., pub., Language and Education: Theory into Practice, Kuala Lumpur, July 1989.
- Wright, J, 'Teacher talk, gender and physical education', the Commonwealth and International Conf. on Physical Education, Sport, Health, Dance, Recreation and Leisure, Auckland, January 1990.
- Wright, J and Tinning, R, 'Learning about teacher talk through action research', Commonwealth and International Conf. on Physical Education, Sport, Health, Dance, Recreation and Leisure, Auckland, January 1990.
- Wright, J, 'Comparisons of difference: gendered representations of the body in sport', Commonwealth and International Conf. on Physical Education, Sport, Health, Dance, Recreation and Leisure, Auckland, January 1990.

SCHOOL OF POLICY AND TECHNOLOGY STUDIES IN EDUCATION

BOOKS

Gannicott, K, with Throsby, C D, *Educational Development in Thailand: The Role of World Bank Lending*, Washington, The World Bank, 1989, 48 pp.

Temmerman, N, *Music Projects for the Classroom Teacher*, Melbourne, Macmillan, 1989, 72 pp.

Temmerman, N, *Composers Through the Ages*, Melbourne, Macmillan, 1990, 36 pp.

BOOK EDITED

Gannicott, K, *Education for Economic Development in the South Pacific*, National Centre for Development Studies, Australian National University, 1990.

BOOK CHAPTER

Watkin, B and Youngen, L, Chapter in *Comparative Physical Education and Sport*, vol 5, (Editors: Bloom et al), 1989.

CONFERENCE/SEMINAR PAPERS

Elliott, A, 'Computers and Curriculum: Productive Partnerships in Learning', Australian Curriculum Studies Conf., Canberra, July 1989.

Elliott, A, 'Preparing Submissions for Project Funding in Early Childhood Education', invited paper, Australian Early Intervention Conf., Sydney, October 1989.

Elliott, A, 'Computers and Cognition Computers', invited presentation, Downs Syndrome of Australia, Computers and Communication Seminar, Sydney, October 1989.

Fasano, C, 'Policy Education and Policy Research', keynote paper, National Conf., 'Education Policy in Australia: The Shifting Balance of Power and Accountability', Sydney, July, 1989, 16 pp.

Fasano, C, 'Distance Education in Australia', invited keynote paper, International Conf., 'New Media, Communication and Education', Osaka and Tokyo, Japan, August 1989, 13 pp.

Fasano, C, 'Computer Education, Economics and Education Policy', invited keynote paper, International Conf., 'New Media Communication and Education', Osaka and Tokyo, Japan, August 1989, 12 pp.

Fasano, C, 'The Delivery of Education Over the Next Decade', invited keynote paper, 1989 Conf., New Zealand Computers in Education Society: 'Learners and Computers: Redefining Communication', New Plymouth, New Zealand, September 1989, 14 pp.

Fasano, C, 'Technological Innovation and the Education Industry', invited keynote paper, 1989 National Conf., Royal Australian Association of Public Administrators, Canberra, November 1989, 20 pp.

Harper, B, Lewis, R and Wilson, M, 'The Use of CML in Physics Tutoring', ASCALITE Conf., Bond University, Gold Coast, December 1989.

Patterson, J, Hunt, A and Rowland, G, 'Competition, Contingency Contracting on Team Involvement - A Strategy for Weight Loss in Worksite Health Promotion', National Conf., Behavioural Medicine, Sydney, October 1989.

Webb, P, Fasano, C and Rowland, G, 'Development of Sport Policy and Programs: Theoretical and Practical Considerations', Management for Sport Conf., Canberra, December 1989.

Webb, P and Blackett, G, 'The Use of The National Coaching Accreditation Scheme and Coaching Courses in Tertiary Institutions for the Development of Junior Sport', Management for Sport Conf., Canberra, December 1989.

FACULTY OF ENGINEERING

DEPARTMENT OF CIVIL AND MINING ENGINEERING

BOOK

Loo, Y C, *Reinforced Concrete Analysis and Design*, University of Wollongong Press, Australia, 1990, 312 pp.

BOOKS EDITED

Baafi, E Y, *Proc., Computer Systems in the Australian Mining Industry Symposium*, The University of Wollongong, September 1989, 288 pp.

Aziz, N I, *Workshop Proc., Operator Training in Longwall Mining*, The University of Wollongong, October 1989, 194 pp.

BOOK CHAPTERS

Chowdhury, R N, 'An Overview of Slope Analysis in Practice', Victor De Mello Commemorative Volume, *Int Soc Soil Mechanics and Foundation Engineering*, Brazilian National Ctme, Rio De Janiero, 1989, pp 69-76.

Zhang, S and Chowdhury, R N, 'Identification of Critical Slope Failure Surfaces with Critical Tension Cracks', Khair, A W (ed), *Rock Mechanics as a Guide for Efficient Utilisation of Natural Resources*, Balkema, Rotterdam, 1989, pp 185-192.

JOURNAL ARTICLES

Aashari, Y and Arenicz, R M, 'Effect of Backfill Thrust on Vertical Pressure Distribution in Reinforced Soil Model Walls', *Geotechnical Testing Journal, GTJODJ*, vol 13, no 13, September 1990, 30 pp.

Aziz, N I, Johnston, A J and Craft, T, 'Dust Suppression in Coal Mines Using Sprayed Screens', *Mining Science and Technology*, vol 8, 1989, pp 177-188.

Benshehamadi, S, Singh, R N and Porter, I, 'Assessment of Ground Movement Under a Major Aquifer Using Numerical

Modelling', *Int. J. of Mine Water*, vol 8, no 3, 1989, pp 9-18.

Boyd, M J and Bufill, M C, 'Parameters Without Rainfall Data', *Journal of Hydrology*, vol 108, 1989, pp 281-294.

Chowdhury, R N and Zhang, S, 'Convergence Aspects of Limit Equilibrium Methods for Slopes', *Canadian Geotechnical Journal*, vol 27, February 1990, 10 pp.

Nguyen, V U, 'A FORTRAN Program for Modelling Methane Gas Desorption From Coal', *Computers and Geosciences*, vol 15, no 5, 1989, pp 695-707.

Nguyen, V U, 'Error Estimation on Footing Settlement Using Log-Normal Cone Penetration Resistance', *Reliability Engineering and System Safety*, 26, 1989, pp 329-339.

Nguyen, V U, 'Non-Invariant Failure Probabilities with Invariant Reliability Index', *Reliability Engineering and System Safety*, 28, 1989, pp 99-110.

Nguyen, V U, 'Application of Fuzzy sets and MYCIN Rules in Combining Expert Estimates of Activity Time', *Australian Civil Engineering Transactions*, vol CE31, no 4, 1989, pp 192-199.

Schmidt, L C, Lu, J P and Morgan, P R, 'The Influence on Steel Tubular Strut Load Capacity of Strain Hardening, Strain Aging, and the Bauschinger Effect', *J. Cons. Steel Res*, vol 14, no 2, 1989, pp 107-119.

Schmidt, L C and Wu, Y H, 'Prediction of Dynamic Wall Pressures on Silos', *Int. J. of Bulk Solids Handling*, vol 9, no 3, August 1989, pp 333-338.

Schmidt, L C and Morgan, P R, 'Successive Strain Aging Effects on Member Strength and Ductility', *Int. J. Space Structures*, vol 4, no 2, 1989, pp 81-88.

Singh, R N, Denby, B and Ren, T, 'A Knowledge Based System for Assessing Spontaneous Combustion Risk in Longwall Mining', *Mining Science and Technology*, 10, 1990, pp 1-13.

Singh, R N and Sun, G X, 'An Investigation Into Factors Affecting Fracture Toughness of Coal Measures Sandstones', *Mining Science and Technology*, vol 10, 1990, 1-20 pp.

Singh, R N and Gahroohee, D R, 'Application of Rock Mass Weakening Coefficient for Stability Assessment of Slopes in Heavily Jointed Rock Mass', *Int. J. of Surface Mining*, 3, 1990, pp 1-13.

Singh, R N and Sun, G, 'Application of Fracture Mechanics to Some Mining Engineering Problems', *Mining Science and Technology*, 10, 1990 pp 53-60.

Singh, R N and Sun, G, 'A Numerical and Experimental Investigation for Determining Fracture Toughness of Welsh Limestone', *Mining Science and Technology*, 10, 1990, pp 61-70.

Singh, R N and Gahroohee, D R, 'Deterministic Stability and Sensitivity Analyses of Slopes in Jointed Rock Masses', *Mining Science and Technology*, 10, 1990, pp 1-22.

Thompson, R G, 'A Sampling Technique for Origin and Destination Surveys', *Australian Road Research*, 19, 3, 1989, pp 230-233.

Thompson, R G and Young, W, 'Traffic Distribution Fitting: A Systematic Methodology', *Transport Research Record 1194*, Transportation Research Board, National Research Council, Washington DC, 1990, pp 87-98.

CONFERENCE/SEMINAR PAPERS

Arenicz, R M and Chowdhury, R N, 'Analysis of Failure Surfaces and Their Design Implications in Reinforced Earth Walls', Proc. of 10th South East Asian Conf. on Geotechnical Engineering, Taiwan, ROC, April 1990, 10 pp.

Baafi, E Y, 'An Expert System Analysis of Gases in Sealed Areas in Underground Coal Mines', Proc. of Symposium on Colliery Safety, Sydney, October 1989, pp 35-44.

Boyd, M, Sivakumar, M, et al, 'Comparison of Design Flood Estimation Methods', Proc. of Fifth Nat. Local Govt. Eng. Conf. IEAust., Nat. Conf. 89/13, Sydney, 1989, pp 192-196.

Boyd, M J, Bates, B C, Cordery, I and Pilgrim, D H, 'PC Programs for Flooding and Drainage', Proc. of First Australasian Conf. Technical Computing in the Water Industry, IEAust. Nat. Conf. Publ. 1989/90, pp 99-103.

Boyd, M J and Cordery, I, 'A Study of Design Parameters for Flood Hydrograph Models', Proc. of IEAust. Nat. Symposium on Hydrology Engineering and Water Resources, Christchurch, NZ, Nat. Conf. Publ. 89/90, pp 119-123.

Bufill, M C and Boyd, M J, 'Effect of Urbanisation on Catchment Lag Parameters', Proc. of Symposium on Hydrology and Water Resources, IE Aust., Christchurch, 1989, pp 171-175.

Bufill, M C and Boyd, M J, 'Modelling Runoff from Impervious Urban Areas', in Conf. on Urban Storm Drainage, IAHR-IAWPRC, Osaka, 1990.

Chowdhury, R N and Zhang, S, 'Bayesian Updating for Open Pit Slopes', Proc. of Second Conf. on Large Open Pit, Aus. IMM, Latrobe Valley, Victoria, Australia, 1989, pp 9-13.

Chowdhury, R N and Zhang, S, 'Aspects of Probabilistic Modelling of Slopes', Proc.

ALPS 90, Milan (Italy), August 1990, 8 pp.

Dean, R E, Aziz, N I and Baafi, E Y, 'Subsidence Calculation as Easy as "123"', Proc. of Symposium on Computer Systems in the Australian Mining Industry, Wollongong, 1989, pp 283-287.

Falamaki, M and Loo, Y C, 'Strength Tests of Half-Scale Reinforced Concrete Flat Plate Models with Spandrel Beams', Proc. of Int. Conf. on Structural Engineering and Computation, Beijing, 1990, 17 pp.

Hargraves, A J, 'Coal Seam Gas and the Atmosphere', Proc. of Conf. on Greenhouse and Energy, CSIRO Institute of Minerals Energy and Construction, Natural Resources and Environment, Sydney, 1989, 11 pp.

Hii, J K and Aziz, N I, 'Microcomputer Automation of the Strength Testing System for Use in a Rock Mechanics Laboratory', Proc. of Conf. on Australasian Instrumentation and Measurement, IEAust, Adelaide, 1989.

Hii, J K and Aziz, N I, 'Influence of Water Content on the Mechanical Properties of CCWR Concrete', Proc. of First Conf. on Concrete and Structures, Malaysia, Kuala Lumpur, 1989, pp 47-50.

Hii, J K and Aziz, N I, 'Influence of Geometry on Strength and Elasticity of Cement and Coal Washery Refuse Material Models', Proc. of 3rd Int. Symp. on Reclamation, Treatment and Utilization of Coal Mining Wastes, University of Glasgow, UK, September 1990, 7 pp.

Hii, J K and Aziz, N I, 'Properties and Behaviour of Cement and Coal Washery Refuse Concrete', Proc. of Concrete for the Nineties Int. Conf. on Use of Fly Ash, Slag, Silica Fume and Other Siliceous Materials in Concrete, Leura, NSW, September 1990, 15 pp.

Hii, J K and Aziz, N I, 'Development and Utilization of Coal Washery Refuse for Strata Reinforcement in Underground Coal Mining Operations', Proc. of 3rd Int. Symp. on Reclamation, Treatment and Utilization of Coal Mining Wastes, University of Glasgow, UK, September 1990, 9 pp.

Hii, J K and Wu, Y H, 'Effect of Virgin Stress Fields on the Feasibility of Using Yield Pillar Technique', Proc. of Symposium on Computer Systems in the Australian Mining Industry, Wollongong, 1989, pp 107-111.

Hii, J K and Yu, A B, 'The Design of CCWR Concrete', Proc. of First Conf. on Concrete and Structures, Malaysia, Kuala Lumpur, 1989, pp 51-56.

Hii, J K and Standish, P, 'Data Acquisition Systems for Rock Mechanics Applications', Proc. of Symposium on Computer Systems in the Australian Mining Industry, Wollongong, 1989, pp 133-139.

Huang, Z B, Zhang, Y G and Hii J K, 'On the Matrices, Wear and Self-sharpening of Impregnated Diamond Drill Bits', Proc. of Second Conf. on Large Open Pit Mining Conf., AusIMM Latrobe Valley, Melbourne, 1989, pp 25-29.

Ichwan, Z and Baafi, E Y, 'A PC-Based Screen Handling System for Mining Applications', Proc. Conf. on Computer Systems and Information Technology, Sydney, August 1989, IEAust, Nat. Conf. Publ. no 89/11, pp 45-48.

Kelly, M A and Baafi, E Y, 'A Microcomputer Cost Reporting and Planning System for Underground Coal Mining', Proc. Symposium on Computer Systems in the Australian Mining Industry, Wollongong, 1989, pp 198-199.

Kohoutek, R, 'Dynamics of Beam on Elastic Foundation, Rail Analysis with Spot Replaced Sleepers', Proc. Symposium on George Sved 80th birthday, University of Adelaide, June 1990, 6 pp.

Kohoutek, R, 'Dynamics of Beam with Semi-Rigid Joints, Part 1 - Analytical Model', Proc. of Conf. on Australian Vibration and Noise, Monash University, September 1990, 5 pp.

Kohoutek, R, 'Relationship Between Static and Dynamic Stabilities for Structures with Semi-Rigid Joints', Proc. of 12th Australian Conf. on Mechanics of Structures and Materials, Queensland University of Technology, September 1990, 6 pp.

Kohoutek, R and Behrens, M, 'Dynamics of Beam with Semi-Rigid Joints, Part II - Experimental Evaluation', Proc. Conf. on Australian Vibration and Noise, Monash University, September 1990, 5 pp.

Kohoutek, R and Goodger, C, 'Dynamic Considerations of Pedestrian Bridges', Proc. of Conf. on Australian Vibration and Noise, Monash University, September 1990, 5 pp.

Li, J X and Baafi, E Y, 'Database Management System for Mine Ventilation Analysis', Proc. Symposium on Computer Systems in the Australian Mining Industry, Wollongong, 1989, pp 273-276.

Loo, Y C, 'Integrated Reinforced Concrete Building Design Packages for Personal Computers', Proc. of First Conf. on Concrete and Structures, Malaysia, Kuala Lumpur, 1989, pp 77-82.

Lowe, S L and Sivakumar, M, 'Numerical Simulation of Flow in Sedimentation Basins', Proc., First Australasian Conf. on WATERCOMP '89 - Technical Computing to the Water Industry, IEAust/ACADS, Nat. Conf. 89/8, Melbourne, 1989, pp 14-16.

Lowrey, M J, 'Elasticity/Finite Strip Solutions for Free Vibration of Orthotropic Plate Systems', Proc. George Sved 80th Birthday Conf., Adelaide, June 1990, 9 pp.

Lowrey, M J, 'Educational Software for PC/ Graphics Simulation of Vibration Problems in Engineering', Proc. Int. Conf. on Education, Practice and Promotion of Computational Methods in Engineering using Small Computers, August 1990, Macau, 9 pp.

Montgomery, D G, 'The Notion of A Coherent Professional Curriculum - An Engineering Perspective', AVCC Workshop on Curriculum Development, Melbourne, February 1990, 4 pp.

Montgomery, D G, 'Utilization of Coal Washery Waste in Engineering Construction', Proc. of Conf. on Coal Handling and Utilization, IEAust, Sydney, June 1990, 5 pp.

Montgomery, D G and Wang G C, 'Strength Properties of Concrete Containing Instant-chilled Steel Slag Aggregate', Proc. Conf. on Concrete for Nineties, IEAust, Leura, September 1990, 14 pp.

Nguyen, V U, 'Mathematical and Physical Aspects of the Unified Theory of Methane Gas Migration in Coal', Proc. Symp. on Computer Systems in the Australian Mining Industry, Wollongong, 1989, pp 208-217.

Nguyen, V U, 'Combining and Updating Expert Knowledge', Proc. Symp. on Computer Systems in the Australian Mining Industry, Wollongong, 1989, pp 256-265.

Osei-Tutu, S and Baafi, E Y, 'Coupling Knowledge Based and Data Based Systems', Proc. Symposium on Computer Systems in the Australian Mining Industry, Wollongong, 1989, pp 250-255.

Pilgrim, D H, Boyd, M J and Knee, R M, 'Upstream Routing of Floods', Proc. IEAust. Nat. Symposium on Hydrology Engineering and Water Resources, Christchurch, NZ, Nat. Conf. Publ. 89/90, pp 372-376.

Samarin, A and Montgomery, D G, 'Alkali-Aggregate Reactivity in Concrete', Proc. Conf. on Concrete for Nineties, IEAust, Leura, September 1990.

Siahaan, B, Aziz, N I and Nguyen, V U, 'Dam Requisition and Processing for Gas Sorption Isotherms', Proc. symposium on Computer Systems in the Australian Mining Industry, Wollongong, 1989, pp 277-282.

Sivakumar, M and Lowe, S L, 'Simulation of the Effect of Wind on Rectangular Sedimentation Tanks', Proc. Conf. on Hydraulics in Civil Engineering, IEAust, Sydney, 1990, 6 pp.

Sivakumar, M and Sidrak, F, 'Utilization of Fly-Ash and Sludge - A solidification Approach', Proc. Conf. on Effluent Reuse Conf, Water Research Foundation of Australia, Wollongong, 1990, 13 pp.

Thompson, R G and Young W, 'Determining the Parking Need and Traffic Generation of Shopping Facilities', Proc. the Australasian Transport Research Forum, Perth, 1989, 7 pp.

Wong, Y W, Baafi E Y and Ichwan, Z, 'Introducing AutoCad in Mining Education', Proc. Symposium on Computer Systems in the Australian Mining Industry, Wollongong, 1989, pp 147-151.

Wu, Y H, Hii, J K and Aziz, N I, 'A New Yield Function for CCWR concretes', Proc. First Conf. on Concrete and Structures, Malaysia, Kuala Lumpur, 1989, pp 173-176.

Yang, Y and Loo, Y C, 'No-Tension Finite Element Analysis of Masonry Arch Bridges', Proc. Int. Conf. on Structural Engineering and Computation, Beijing, 1990, 10 pp.

Zhang, S and Chowdhury, R N, 'Computing Techniques for Identifying Critical Failure Surfaces', Proc. symposium on Computer Systems in the Australian Mining Industry', Wollongong, 1989, pp 126-132.

Zhang, S and Hii, J K, 'An Analytical Approach for the Estimation of Pillar Strength', Proc. of Ninth Int. Conf. on Ground Control in Mining, Morgantown, WV, USA, June, 1990, 8 pp.

DEPARTMENT OF MATERIALS ENGINEERING

JOURNAL ARTICLES

Feng, B, Chandra, T and Dunne, D, 'The Effect of Alloy Nitride Particle Size Distribution of Austenite Grain Coarsening in Ti and Ti-Nb Bearing HSLA Steels', *J. Materials Forum*, 13, 1989, pp 139-146.

Gibson, M A and Delamore, G W, 'Crystal morphologies in cobalt-based metallic glasses', *J. Crystal Growth*, 96, 1989, pp 763-768.

Gibson, M A and Delamore, G W, 'Crystallisation of low silicon content FeSiB metallic glasses', *J. Mat. Sci. and Eng. A.*, 117, 1989, pp 255-262.

Gibson, M A and Delamore, G W, 'Crystallisation of stable and metastable eutectics in FeSiB metallic glasses', *J. Materials Science*, 25, 1990, pp 93-97.

Gibson, M A and Delamore, G W, 'Crystallisation kinetics of FeSiB metallic glasses', Accepted for publication, *J. Can. Met. Quarterly*, 1990.

Kennon, N, 'The origin of dross in galvanizing process', *J. Materials Forum*, 13 1, 1989, pp 69-72.

He, Q L and Standish, N, 'A model Study of Droplet Generation in the BOF Steelmaking', *J. ISIJ International*, 30, 1990, pp 305-311.

He Q L and Standish, N, 'A Model Study of Residence Time of Metal Droplets in the Slag in BOF Steelmaking', *J. ISIJ International*, 30, 1990, pp 356-361.

Kennon, N, 'Possible source of dross formation in zinc-0.1% nickel galvanizing process', *J. Materials Forum*, 13 1, 1989, pp 73-75.

Kennon, N, 'Zinc-0.1% nickel coating of silicon steels', *J. Materials Forum*, 13 2, 1989, pp 153-157.

Kennon, N, 'Identification of Iron-Silicon particles formed during galvanizing of silicon steels', *J. Materials Forum*, 13 3, 1989, pp 225-227.

Kennon, N, 'Hot dip galvanizing; A short overview', *J. South East Asian Iron and Steel Institute Quarterly*, 18 2, 1989, pp 57-63.

Kennon, N, 'The origin of dross in zinc and zinc-0.1% nickel galvanizing process', *J. South East Asian Iron and Steel Institute Quarterly*, 18 2, 1989, pp 64-70.

Kennon, N, 'The effect of nickel addition in galvanizing of silicon containing steels', *J. South East Asian Iron and Steel Institute Quarterly*, 18 2, 1989, pp 71-78.

Plumbridge, W J, Davis, F H and Ellison, E G, 'Effects of Hydrostatic Pressure on the Rate of Fatigue Crack Growth', *J. Fatigue and Fracture of Engng. Maths. and Structures*, 12, 1989, pp 511-525.

Standish, N and He, Q L, 'Effect of Bottom Blowing on the Metal Drop Generation Mechanism in the Combined Blowing Converter', *J. ISIJ International*, 29, 1988, pp 455-461.

Standish, N, 'Microwave Application in the Reduction of Metal Oxides with Carbon', *J. Electromagnetic Energy Review*, 3, 1990, pp 1-5.

CONFERENCE PAPERS

Plumbridge, W J, 'Materials Aspects in Designing for Manufacture', Conf. on Design for Manufacture, University of Wollongong, 1989.

Plumbridge, W J, Smith, R and Dam, G, H, 'Deformation Processes During Fatigue and Fatigue-Creep of an Advanced Titanium Alloy', 'Fatigue 90' Conf., Honolulu, July 1990.

Plumbridge W. J, 'Engineering Education - Time for a Revolution?', 1990 National Engineering Conf., Institution of Engineers Australia, April 1990, pp 50-53.

Plumbridge, W J, 'Engineering - The People Problem', 1990 National Engineering Conf., Institution of Engineers, Australia, April 1990, pp 123-126.

Plumbridge, W J, Kosasih, P, B and Jawahir, I, S, 'Investigation into Machinability Assessment of Coated and Uncoated Cutting Tool Inserts with Controlled Chip Groove Geometry', Fifth International Conf. on Manufacturing Engineering, 1990, Wollongong, July 1990.

DEPARTMENT OF MECHANICAL ENGINEERING

JOURNAL ARTICLES

Arnold, P C, 'Editorial', *Powder Handling and Processing*, vol 1, no 3, 1989, 241 pp.

Arnold, P C, 'Foreword', *Transactions of Mechanical Engineering*, vol ME14, no 3, 1989.

Arnold, P C and Roberts, A W, 'Powder and Bulk Solids Handling Research. Recent Developments at the Universities of Newcastle and Wollongong, Australia', *Powder Handling and Processing*, vol 1, no 3, 1989, pp 297-300.

Arnold, P C and Wypych, P W, 'Pneumatic Conveying of Coal', *Australian Energy Research*, no 8, 1989, pp 20-21.

Basu, A, McConchie, P and Boyd, M, 'Numerical Modelling of Two Phase Flow of Gas and Water in Bulli Mines (Australia)', *Int. Journ. of Mine Water*, vol 7, no 4, 1989, pp 27-42.

Basu, A, Izgi, H and Lama, R D, 'Mathematical Modelling to Determine Field Parameters of Diffusing Methane Gas and Carbon Dioxide in Coal Particles', *Mining Science and Technology*, vol 10, no 1, 1990, pp 23-27.

Boyd, D and Cooper, P, 'Domestic Kitchen Extract Fans: Effectiveness in Surface Condensation Prevention', *Building and Environment*, vol 24, no 4, 1989, pp 335-345.

Cardillo, P C, Davey, R J, Hutton, E A, Lopez, M A, Russell, M J, and Wheway, R T, 'Geometry Factor Data for the Rating of Spur and Helical Gears to AS 2938', *Transactions of Mechanical Engineering*, vol ME15, no 1, 1990, pp 13-22.

Davey, R J and Wheway, R T, 'The Rating of Spur and Helical Gears to AS 2938', *Transactions of Mechanical Engineering*, vol ME15, no 1, 1990, pp 3-12.

Ibrahim, M Y, Cook, C and Tieu, A K, 'Dynamic Characteristics of a SCARA Robot Subject to NC2 Velocity Trajectories with Different Payloads', *Robotics and Computer Integrated Manufacturing*, vol 6, no 3, 1989.

McLean, A G, 'Empirical Description of Wall Friction Angle Variations', *Powder Handling and Processing*, vol 1, no 2, 1989, pp 151-156.

McLean, A G, 'Improving Stockpile Performance', *Bulk Solids Handling*, vol 10, no 1, 1990, pp 19-22.

Soh, W K and Yu, C F, 'Numerical Study of Transient Heat Transfer Around a Heated Plate with Flow Separation', *Energy Quarterly*, vol XIX, no 3, 1989, pp 125 - 143.

Tieu, A K, 'The Effects of Controlled Elastic Deformation on the Performance of Hydrodynamic Bearings', *Transactions of Mechanical Engineering*, vol ME4, no 2, 1989, pp 22-27.

Weston, K C and Yao, Y, 'Integrating Robotics and Solid Modelling in a Sophomore Design Project', *Journ. of Computers in Education*, vol 9, no 4, 1989, pp 64-70.

Wheway, R T, 'Foreword', *Transactions of Mechanical Engineering*, vol ME15, no 1, 1990.

CONFERENCE/SEMINAR PAPERS

Arndt, G, 'PIQS-1: Practical Industrial Quality Systems: An Introduction to Visible Improvement Management', Proc. CAMIA CPC Seminar no 1 on Practical Industrial Quality Systems (PIQS), Wollongong, March 1989, 150 pp.

Arndt, G, 'JQT-IV: An Update on Developments on JQT and an Introduction to TAGUCHI Methods', University of Auckland, CCE Seminar Notes, April 1989, 72 pp.

Arndt, G, 'Continuous Improvement in Manufacturing Based in JQT', Proc. 4th International Conf. on Manufacturing Science and Technology of the Future, (MSTF), Stockholm, June 1989, pp 359-372.

Arndt, G, 'KAIZEN - The Basis of Manufacturing Achievement', Proc. 'Solutions 89' Manufacturing Seminar MRP III Association, Sydney, August 1989.

Arndt, G, 'PIQS - Basic: Basic Improvement Concepts and the "Basic Seven" Tools for Total Quality Management', Proc. CAMIA CPC Seminar no 6 on PIQS, Wollongong, October 1989, 64 pp.

Arndt, G, 'PIQS - Planning: Further "KAIZEN" Concepts and the "New Seven" Tools for Total Quality Management', Proc. CAMIA CPC Seminar no 7 on PIQS, Wollongong, October 1989, 58 pp.

Arndt, G, 'PIQS - Management: "KAIZEN" Strategy and Implementation Using VIM: Visible Improvement Management', Proc. CAMIA CPC Seminar no 8 on PIQS, Wollongong, November 1989, 85 pp.

Arndt, G, 'PIQS - KJ/Taguchi: An Update

on KAIZEN/JQT Developments and an Introduction to "TAGUCHI" Methods', Proc. CAMIA CPC Seminar no 11 on PIQS, Wollongong, November 1989, 78 pp.

Arndt, G, 'An International Perspective on Laser Processing', Proc. CAMIA CPC Seminar no 10 on Manufacturing with Lasers, Sydney, October 1989, pp 35-69.

Arnold, P C, 'Developments in Pneumatic Conveying of Bulk Solids - An Australian Perspective', 44th APPITA Annual General Conf., New Zealand, 1990.

Arnold, P C, 'Powder Handling - Good Design Pays Handsome Dividends', Western Powder and Solids Processing Conf., California, 1990.

Basu, A and Ellsmore, P, 'A Comparison and Correlation of Methods of Monitoring Dust Emissions from Rotary Cement Kilns at Blue Circle Southern Cement Ltd.', Proc. of Fourth Asian Congress of Fluid Mechanics, Hong Kong, August 1989, vol 1, pp E1-E4.

Basu, A and Widjaja, A S, 'Considerations When Mining Under Stored Water Bodies', Int. Conf. on Computational Techniques and Applications Conf. CTAC-89, Brisbane, July 1989.

Cooper, P, 'Electrohydrodynamic (EHD) Enhancement of Two-Phase Heat Transfer', Proc. 10th Australasian Fluid Mechanics Conf., Melbourne, December 1989, pp 14.21-14.24.

Freund, N and Tieu, A K, 'An Elastohydrodynamic Study of Journal Bearing', Computational Techniques and Applications Conf., CTAC-89, Brisbane, July 1989.

Gibson, P R, Lin, G C I and Hoang, K, 'Industrial Co-operation in the Education of Graduate and Undergraduate Manufacturing Engineers', Proc. of World Conf. on Engineering Education for Advancing Technology, Sydney, 1989, pp 279-282.

Gibson, P R, Johnston, A, Lin, G C I. and Hoang, K, 'Statistical Process Control by Automatic Gauging on a CNC Machine Tool', Proc. of Australian Instrument and Measurement Conf., Adelaide, 1989, pp 206-210.

Gibson, P R, 'Co-operative Education in Mechanical and Industrial Engineering', Proc. Australasian Assn for Engineering Education, 1st Annual Convention and Conf., Sydney 1989, pp 181-186.

Gibson, P R, 'Quality for a Competitive Edge Seminar Papers', Institute of Manufacturing Management and Technology, Kensington, November 1989, 269 pp.

Lin, G C I, Gibson, P R, and Hoang, K, 'Strategic Management of Engineering Education for Advancing Technology', Proc. of World Conf. on Engineering Education for Advancing Technology, Sydney, 1989, pp 18-21.

Shue, Li-Yen, 'A Production Scheduling Support System', Proc. European Simulation MultiConf., Rome, 1989, pp 113-11.

Shue, Li-Yen, 'Manufacturing System Simulation', CAMIA Seminar on Manufacturing System Simulation, Wollongong, May/December 1989, 38 pp.

Siores, E, 'An Intelligent Sensory System for Welding Manufacturing', Proc. of 3rd Int. Conf. on Advances in Manufacturing

Technology, Singapore, 1989, Session 5, Paper 4.

Siores, E, 'Artificial Intelligence in Welding Management Systems', Proc. of 37th Int. Conf. on Welding Technology for Profit', Sydney 1989, Session 4, Paper 2.

Siores, E, 'An Autonomous Welding and Inspection System', Proc. of 37th Int. Conf. on Welding Technology for Profit', Sydney 1989, Session 7, Paper 6.

Siores, E, 'Ultrasonics - A Tool for Real-time Welding in Process Monitoring and Control', Proc. of 6th Asia-Pacific Conf. on Non-Destructive Testing, New Zealand, 1990, Paper 54.

Siores, E, 'Advanced Quality Inspection Systems', presented at CAMIA Seminar on Advanced Quality Inspection Systems, Wollongong, November 1989, 87 pp.

Soh, W K and Yu, F F, 'Numerical Study for the Shedding of Vorticity from a Semi-Infinite Plate', Tenth Australasian Fluid Mechanics Conf., The Institution of Engineers, Australia, Melbourne, December 1989, pp 413-416.

Soh, W K and Yu, C F, 'Numerical Study of a Vortex Core', presented at Fourth Asian Congress of Fluid Mechanics, University of Hong Kong, 1989.

Tieu, A K, 'Performance of Hydrodynamic Thrust Bearing in the Transition Regime', Proc. 4th Asian Congress of Fluid Mechanics, Hong Kong, May 1989, pp L23-L26.

Tieu, A K, Kosasih, P B, McKenzie, M and Ng, D, 'Characteristics of Viscous Flow in Narrow Rectangular Channel', Proc. of 10th Australasian Fluid Mechanics Conf., Melbourne, December 1989, pp 5.43-5.46.

Wang, L H and Tieu, A K, 'The Effects of Elastic Deformation on the Dynamic Stability of Journal Bearing', presented at Computational Techniques and Applications Conf., CTAC-89, Brisbane, July 1989.

Wheway, R T (ed), 'Design for Manufacture', Proc. CAMIA Seminar on Design for Manufacture, Wollongong, June 1989, 71 pp.

Wheway, R T, 'Industry Involvement in the Teaching of Mechanical Engineering at the University of Wollongong', Proc. Australasian Association for Engineering Education First Annual Convention and Conf., Sydney 1989, pp 167-172.

Wheway, R T, 'Introducing Ethics and Professional Behaviour to Engineering and Applied Science Students', presented at HERDSA '89 Conf., Adelaide, July 1989.

Wong, K C, Soh, W K and Blake, J R, 'High Speed Flow Visualization of a Cavitation Bubble', Proc. Tenth Australasian Fluid Mechanics Conf., Melbourne, 1989, pp 227-230.

Wypych, P W and Arnold, P C, 'Meeting the Demands of Long Distance and Large Throughput Pneumatic Conveying Applications in Australia', 6th International Symposium on Freight Pipelines, Missouri, 1989.

Wypych, P W and Arnold, P C, 'Plug-Phase Pneumatic Transportation of Bulk Solids and the Importance of Blow Tank Air Injection', Proc. of Technical Program 14th Powder and Bulk Solids Handling Conf., Illinois, 1989, pp 365-378. Also published in *Powder Handling and Processing*, vol 1, no 3, 1989, pp 271-275.

Xu, Z and Tieu, A K, 'A Comparison of Different Techniques in the Simulation of Elasto-Hydrodynamic Study of Journal Bearing', presented at Computational Techniques and Applications Conf., CTAC-89, Brisbane, July 1989.

Yao, Y, 'Transient Compliance Motion of

Assembly Robots', Proc. 3rd Int. Conf. on Advances in Manufacturing Technologies, Singapore, 1989, pp 1-12.

Yunus, A M and Tieu, A K, 'An Elastic Analysis of Undercut Hydrodynamic Journal Bearing', 3rd Australasian MSC Users Conf., Sydney, November 1989.

Ward, G R, 'From concepts to application', *J Adapted Physical Activity*, vol 6, West Berlin, 1989, pp 11-16.

Wrisberg, C A and Anshel, M H, 'The effect of cognitive strategies on the free throw shooting performance of young athletes', *The Sport Psychologist*, 3, 1989, pp 95-104.

FACULTY OF HEALTH AND BEHAVIOURAL SCIENCES

DEPARTMENT OF HUMAN MOVEMENT SCIENCE

BOOKS

Anshel, M H, *Sport Psychology: From Theory to Practice*, Scottsdale, Arizona (USA), Gorsuch Scarisbrick Publishers, 1990, 456 pp.

Anshel, M H, *Instructor's Manual for Sport Psychology: From Theory to Practice*, Scottsdale, Arizona (USA), Gorsuch Scarisbrick Publishers, 1990, 50 pp.

BOOK CHAPTER

Oakes, B W and Parker, A W, 'Bone and Connective Tissue Adaptations to Physical Activity', in Bouchard, C, Shepherd, R J, Stephens, T, Sutton, J R, McPherson, B D, (eds), *Exercise, Fitness and Health - A Consensus of Current Knowledge*, Champaign, Illinois, Human Kinetics Publishers, Inc., 1990, pp 345 - 361.

JOURNAL ARTICLES

Anshel, M H and Hoosima, D, 'The effect of positive and negative feedback on casual attributions and motor performance as a function of gender and athletic participation', *Journal of Sport Behaviour*, 12, 1989, pp 119 - 130.

Anshel, M H, 'Examination of a college football coach's receptivity to sport psychology consulting: A three-year case study', *Journal of Applied Research in Coaching and Athletics*, 4, 1989, pp 1-11.

Anshel, M H, 'The ten commandments of effective communication for referees, judges, and umpires', *Sports Coach*, 12, 1989, pp 32-35.

Anshel, M H, 'An information processing approach to explaining motor skill acquisition, retention and performance with implications for instruction', *Journal of Physical Education, Recreation, & Dance*, 53, 1990, pp 43-51.

Anshel, M H, 'Commentary on the national drugs in sports conf.', 1989, *Australian Journal of Science and Medicine in Sport*, 22, pp 16-25.

Anshel, M H, Gregory, L and Kaczmarek, M, 'Effectiveness of a stress management technique to cope with criticism in sport', *Journal of Sport Behaviour*, 13, 1990, pp 78-88.

Anshel, M H and Sailes, G, 'Discrepant attitudes of intercollegiate athletes as a function of race', *Journal of Sport Behaviour*, 13, 1990, pp 68-77.

Anshel, M H and Novak, J, 'Effect of different fatigue intensities on performing a sport skill requiring explosive muscular effort: A test of the specificity of practice principle', *Perceptual and Motor Skills*, 69, 1989, pp 1379-1389.

Chad, K E and Quigley, B M, 'The effects of substrate utilization, manipulated by caffeine, on post-exercise oxygen consumption', *Eur. J. Appl. Physiol.*, 59, 1989, pp 48-54.

Forwood, M R and Parker, A W, 'Micro-damage in Response to Repetitive Torsional Loading in the Rat Tibia', *Calc. Tissue Int.* 1989, 45, pp 47-53

Hennessy, M P and Parker, A W, 'Electromyography of Arrow Release in Archery', *Electromyogr Clinical Neurophysiol*, 30, 1990, pp 7-17.

Kippers, V and Parker, A W 'Validation of single-segment and three-segment spinal models used to represent lumbar flexion', *J. Biomech.* 22 (i) 1989, pp 67-76.

James, B W and Parker, A W, 'Electromyography of Stair Locomotion in Elderly Men and Women', *Electromyogr Clinical Neurophysiol*, 29, 1989, pp 161-168.

James, B W and Parker, A W, 'Active and Passive Mobility of Lower Limb Joints in Elderly Men and Women', *Am. J. Phys. Med and Rehab.*, 68:4, 1989, pp 162-167.

McLean, B D and Parker, A W, 'An Anthropometric Analysis of Elite Australian Track Cyclists', *J. Sports Science*, 7, 1989, pp 247-255.

Steele, J R and Milburn, P D, 'A kinetic analysis of footfall patterns in landing in netball', *Australian Journal of Science and Medicine in Sport*, 21(1), 1989, pp 10-13.

CONFERENCE/SEMINAR PAPERS

Anshel, M H, 'Toward validation of the COPE model: Strategies for Acute Stress Inoculation in Sport', Proc., International Society for Sport Psychology Conf., Singapore, August 1989, pp 240-243.

Anshel, M H, 'Coaching Strategies for Preventing and Reacting to Drug Abuse', Proc., National Drugs in Sport Conf., 1989: Treating the Causes and Symptoms, Wollongong, NSW, February 1990, pp 57-60.

Anshel, M H, 'Drugs in Women's Sport: The Coach Role', Proc. of the Gateways to Participation Conf. for Women in Sport, Wollongong, NSW, October 1989, pp 42-53.

Anshel, M H, 'Strategies for Effective Staff Supervisory Meetings: The Critical Link to Accountability and Performance Evaluation', Proc of the Management and Sport Conf., Canberra, ACT, December 1989, pp 53-62.

Anshel, M H, 'Cognitive and Behavioural Strategies for Combating Drugs in Sport', Proc. of the Commonwealth and International Conf. on Physical Education, Sport, Health, Dance, Recreation and Leisure, Auckland, New Zealand, January 1990, Part 2, pp 89-97.

Anshel, M H and Webb, P, 'A Model for Determining and Evaluating Competencies in Sport: Implications for Sporting Organisations', Proc of the Management and Sport Conf., Canberra, ACT, December 1989, pp 5-12.

Chad, K E, 'Women in Sport: a physiological perspective', Proc of Gateways to Participation: First Annual Conf. for Women in Sport, Wollongong, Australia, 1989.

Chad, K E and McLean, B, 'Fitness characteristics of competitors in a six day sailboard marathon', Proc. of Australian Sports Medicine Federation National Scientific Conf., Melbourne, Australia, 1989.

Kippers, V and Parker, A W, 'Validation of Single-segment and Three Segment Spinal Models used to Represent Lumbar Flexion', *Excerpta Medica - Section 19, Rehabilitation and Physical Medicine* 1989, pp 32 (3) pp 99.

Kippers, V and Parker, A W, 'Effect of Muscle Length on the Integrated Electromyography-joint Moment Relationship of the Trunk Extensors', 27th Annual Conf., Anatomical Society of Australia and New Zealand, 1989, pp.

Milburn, P D, 'The Kinetics of Various Rugby Union Scrumming Techniques' in George, R J, Zemicke, R F and Whiting, W C (eds), Proc., XIIth International Congress of Biomechanics, Los Angeles, University of California, Los Angeles, 1989.

Milburn, P D, 'Mechanics of a Rugby Union Scrum' in Morrison, W E (ed) Proc., VIIth International Symposium of the Society of Biomechanics in Sports, 1989, pp 61-72.

Parker, A W, Kippers, V and Burgess, R, 'Electromyographic Changes During Two Hours of Keyboard Operation, a Case Study', in B Green, M Regan and T Gevick (eds), *Ergonomics, Technology and Productivity: Proc., 25th Annual Conf., Ergonomics Society in Australia, Canberra, November 1989*. ESA Fortitude Valley, Q'ld, pp 249-257.

Parker, A W and Kippers, V, 'Muscular Stress as a Function of Variation in Work Practice and Skill of Keyboard Operators': Report of Research Project supported by the National Occupational Health and Safety Commission, 1989, 48 pp.

Simond, C, Gemmel, R and Parker, A W, 'Demonstration A L'Aide De La Microscopie Electronique a Transmission de l'Intercommunication Mitochondriale Dans Le Muscle Squelettique'. Proc., 57th Congress Association Canadienne - Francaise pour l'avancement des Sciences, 1989, v 57, p 288.

Steele, J R, 'Injuries and the Veteran Netball Player: Minimising the Risks', Conf. Proc., Commonwealth and International Conf. on Physical Education, Sport, Health, Dance, Recreation and Leisure, Auckland, New Zealand, January 1990. Volume 4 Sports Science Part 2, pp 164-175.

Steele, J R, 'Analysing Action in Netball', Gateways to Participation Conf., Wollongong, NSW, 1989, 7 pp.

Steele, J R and Lafortune, M A, 'The Relationship Between Technique and Ground Reaction Forces at Landing in Netball', Gregor, R.J, Zernicke, R F and Whiting, W C (eds), Proc., XIIIth International Congress of Biomechanics, University of California, Los Angeles, California, USA, June, 1989 (abstract 243), 2 pp.

Steele, J R and Milburn, P D, 'A Kinetic Analysis of Footfall Patterns at Landing in Netball', *Australian Journal of Science and Medicine in Sport*, 1989, 21, 1, pp 10-13.

Steele, J R and Lafortune, M A, 'A Kinetic Analysis of Footfall Patterns at Landing in Netball: A Follow-up Study', Morrison, W E (ed) Proc., VIIth International Symposium of the Society of Biomechanics in Sports, Footscray, Victoria, 1989, pp 101-112.

Ward, G R, 'From Concepts to Applications - A new wheelchair model', 7th International Symposium of Adapted Physical Activity, Berlin, 1989.

Ward, G R, 'The role in Rehabilitation of Recreation Facilities', Institute of Swimming and Recreation Centre Management of Australia Conf., Wollongong, July 1989.

Ward, G R, 'Regulation of Pyruvate Dehydrogenase in Highly trained athletes', McMaster Medical School and Biochemistry Department's Symposium, Hamilton, Ontario, June 1989.

DEPARTMENT OF NURSING

BOOK CHAPTER

Speedy, S, 'Nursing theory and practice: risks and rewards', in Koch, T (ed), *Theory & Practice: An Evolving Relationship*, SACAE, Adelaide, 1989.

JOURNAL ARTICLES

Pincombe, J, 'Domiciliary midwifery preparation course', *Midwifery Matters*, 3, 5, pp 12-14.

Speedy, S, 'The theory-practice debate: setting the scene', *Australian Journal of Advanced Nursing*, vol 6, no 3, 1989, pp 12-20.

CONFERENCE/SEMINAR PAPER

Partridge, B, 'Nursing Theories: Forces for Unity, Diversity or Division', 4th Annual Conf., Australian Nurse Teachers' Society, Sydney, March 1990.

DEPARTMENT OF PSYCHOLOGY

BOOKS

Mackay, N, *Motivation and Explanation*, New York, International Universities Press, 1989.

Mixon, D, *Obedience and Civilization: Authorized Crime and the Normality of Evil*, London: Pluto Press and Winchester, MA: Univin Hyman, 1989.

Viney, L L, *Images of Illness*, Malabar, Florida, Krieger, Second Edition, 1989.

Wragg, J, *Talk Sense to Yourself: The development of self-control and self-management in educational and clinical settings*, Australian Council for Educational Research, Melbourne, 1989.

BOOKS EDITED

Leiser, R G and Avons, S E, *Paralanguage and human-computer dialogue*. Proc. European Speech Communication Association, 1989.

Madden, C, Summers, J, Brown, D F, *Coping with competitive sport*. Proc. Commonwealth and International Conf. on Physical Education, Sport, Health, Dance, Recreation and Leisure, vol 3, *Sport Science*, Part 1, Auckland, New Zealand, January, 1990, pp 148-153.

Sheehy, N P, Bermingham, P, Leiser, R G, Avons, S E, Rogers, Y and Carr, D J, *ESPRIT Project 527. Communication Failure in Dialogue: Techniques for detection and repair*, Deliverable 10, The PC interface model, 1989.

BOOK CHAPTERS

Lovegrove, W, Pepper, K, Martin F, Mackenzie B and McNicol D, 'The role of

vision, phonological recoding and short-term memory in specific reading ability', in Vickers, D and Smith, P (eds) *Human Information Processing: Measures, Mechanisms and Models*, Elsevier Science Publishers, North Holland, 1989, pp 65-75.

Mackenzie B, Bingham E, Cumming S, Doyle D, Turner C, Molloey E, Martin F, Alexander J and Lovegrove W, 'Inspection time is related to intelligence in some subjects but not all', *Human Information Processing: Measures, Mechanisms and Models*, Elsevier Science Publishers, North Holland, 1989, pp 487-495.

Srinivasan, S, 'Matching individual response patterns and treatment procedures in social anxiety. Clinical and Abnormal Psychology', in Lovibond, P and Wilson, P (eds), Proc., XXIV International Congress of Psychology, vol 9, Amsterdam, Elsevier, 1989.

Viney, L L, 'A constructivist model of psychological reactions to illness and injury', in Neimeyer, G J and R A (eds), *Advances in personal construct psychology*, New York, J.A.I. Press, 1989.

JOURNAL ARTICLES

Allister, J H, Spencer, A J, Wright, F A C, Brown, D F, Hammond, R H, and Lewis, J M, 'Use of dental services', *J. of Dental Research*, 68 (4), 1989, pp 540.

Avons, S E, Leiser, R G and Carr, D J, 'Paralanguage and human-computer interaction. Part 1: Identification of recorded vocal segregates', *Behaviour and Information Technology*, 8, 1989, pp 13-22.

Brown, D F, Kirk, A and Stanley, G V, 'Diagnostic and treatment comparisons of patients presenting at psychiatric emergency centres', *Australian Psychologist*, vol 25, no 1, March 1990, pp 40-44.

Holmes, V M, Stowe, L A and Cupples L, 'Lexical expectations in parsing complement-verb sentences', *J. of Memory and Language*, 28, pp 668-689.

Leiser, R G, Avons, S E, and Carr, D J, 'Paralanguage and human-computer interaction. Part 2: Comprehension of synthesised vocal segregates', *Behaviour and Information Technology*, 8, 1989, pp 23-32.

Mapperson, B and Lovegrove, W J, 'Stimulus variables affecting induced rotation', *Bulletin of the Psychonomic Society*, 27, pp 331-334.

Mapperson, B and Lovegrove, W J, 'Color-contingent aftereffects on relative dominance', *Bulletin of the Psychonomic Society*, 27, 1989, pp 335-336.

Lovegrove, W J, 'How reliably are visual differences found in dyslexics?' *Irish J. of Psychology*, 10, 1989, pp 557-565.

Lovegrove, W J, Garzia, R and Nicholson, S, 'A transient deficit in dyslexia', *American J. of Optometry*, 61, pp 137-146, 1990.

Viney, L L, 'Dare we develop a constructivist psychology?' *International J. of Personal Construct Psychology*, 2, 1989, pp 103-106.

Viney, L L, Benjamin, Y N and Preston, C, 'Mourning and Reminiscence: Parallel Psychotherapeutic Processes for the Elderly', *International J. of Ageing and Human Development*, 28, 1988/89, pp 237-249.

Viney, L L, Benjamin, Y N and Preston, C, 'An evaluation of personal construct therapy for the elderly', *British J. of Medical Psychology*, 62, 1989, pp 35-41.

Viney, L L, Henry, R, Walker, B M and Crooks, L, 'The emotional reactions of HIV antibody positive men', *British J. of Medical Psychology*, 62, 1989, pp 153-161.

Walker, B M, 'Construing George Kelly's construing of the person-in-relation', *International J. of Personal Construct Psychology*, 3(i), 1990, pp 41-50.

Wragg, J, 'The development, design and evaluation of a longitudinal drug education study: Did it work?' *Drug Education Journal of Australia*.

CONFERENCE/SEMINAR PAPERS

Badcock, D, Lovegrove, W J and Whitworth, F, 'The inhibitory and facilitatory effects of uniform-field flicker', Conf., Association for Research in Vision and Ophthalmology, Sarasota, Florida, 1989.

Blofelds, M E, Bradley, D C and Cupples L, 'Lexically governed structural expectations in parsing: Task differences', Seventh Australian Language and Speech Conf., Melbourne, Victoria, 1989.

Crooks, L, Viney, L L, Walker, B M and Henry, R, 'Counselling people with AIDS', Asian Conf. on AIDS, Hong Kong, 1989.

Cupples, L and Inglis, A L, 'Measuring sentence comprehension in aphasia', Fifteenth Experimental Psychology Conf., Jamberoo, NSW, 1989.

Cupples, L and Inglis, A L, 'Aphasic patients "understand" more than they "know": A study of sentence processing', Seventh Australian Language and Speech Conf., Melbourne, Victoria, 1989.

Cupples, L and Inglis, A L, 'There's more to sentence-picture matching than sentence comprehension', Australian Association of Speech and Hearing Conf., Manly, NSW, 1990.

Leiser, R G and Avons, S E, 'Paralanguage and human-computer interaction', European Conf. on Speech Communication and Technology, Paris, September, 1989.

Lovegrove, W, 'A visual basis of dyslexia', International Conf. of Dyslexia, Pavia, Italy, 1989.

Midwinter, D, 'The appropriate performance of actions in family interaction as a function of interacting dyad, type of action and expressive effect of action', XVII Annual Meeting of Australian Social Psychologists, Coolangatta, 1989.

Viney, L L, 'Social science research in the 1990s: The contribution of constructivism', International Congress of Personal Construct Psychology, Assisi, Italy, 1989.

Viney, L L, Allwood, K, Stillson, L, Walmsey, R and Crooks, L, 'Constructivist therapy for people with AIDS', Australian AIDS Conf., Sydney, Australia, 1989.

Viney, L L, Allwood, K, Stillson, L, Walmsey, R and Crooks, L, 'Personal construct therapy for people who are HIV antibody positive', Australian Psychological Society Conf., Hobart, Australia, 1989.

Viney, L L, Crooks, L, Walker, B M and Henry, R, 'The psychological reactions of HIV antibody positive men in a sample of gay communities', International Congress on AIDS, Montreal, Canada, 1989.

Walker, B M, 'Values and Kelly's Theory', Eighth International Congress of Personal Construct Psychology, Assisi, Italy, August, 1989.

Wragg, J, 'Cognitive restructuring with children and adolescents', The First National Conf., Australian Guidance and Counselling Association, Sydney, 1987.

Wragg, J, 'Development of a model of drug evaluation', 2nd National Drug Educators Workshop, ACT Health Authority, Canberra, 1987.

Wragg, J, 'Disruption in schools: Options for change (The Talk Sense to Yourself Program - self management skills for children and adolescents in schools and clinics)', Proc, Fifth Guidance Conf., Brisbane, 1988.

Wragg, J, 'Longitudinal Evaluation of a primary drug prevention program', Fourth National Drug Education Conf., Adelaide, 1989.

Wragg, J, 'Disruptive Behaviour: Options for Change', Inaugural Northern Territory Guidance and Counselling Conf., Darwin, NT, Keynote Address, 1989.

Wragg, J, 'Service Delivery Models - Casework and Beyond', The Inaugural Northern Territory Guidance and Counselling Conf., Darwin, NT

Wragg, J, 'On Task training for Attention Deficit Disorders', Australian Guidance

and Counselling Association Second National Conf., University of Sydney, September 1989.

Wragg, J and Woodward, R, 'Peer Friendship Training: A Structured Systems and Skills Approach', Australian Guidance and Counselling Association Second National Conf., University of Sydney, September 1989.

DEPARTMENT OF PUBLIC HEALTH AND NUTRITION

BOOK CHAPTER

Ewan, C E, 'Educating health professionals in the care of the elderly', in Kane, R L, Grimley Evans, J and Macfadyen, D, (eds), *Improving the Health of Older People: A World View*, Oxford University Press, 1990.

JOURNAL ARTICLE

Ewan, C E and Maidla-Dewhurst, S, 'Perceptions of heart disease risk and prevention among tertiary and non-tertiary educated Australians', *International Journal of Health Sciences*, vol 1, April 1990.

FACULTY OF INFORMATICS

DEPARTMENT OF COMPUTER SCIENCE

BOOKS

Maciaszek, L A, *Database Design and Implementation*, New York, London, Toronto, Sydney, Tokyo, 1990, Prentice-Hall, p 383.

Teufel, B, *Informationsspuren zum numerischen und graphischen Vergleich von reduzierten natürlingsprachlichen Texten*, Verlag der Fachvereine, Zürich, 1989.

Zelinsky, A, *Lecture Notes in Computer Science Series, AI'88*, January 1990, Springer-Verlag, ISBN, 3-540-52062-7.

JOURNAL ARTICLES

Fulcher J A, 'Laboratory Support for the Teaching of Computer Architectures', *Intl. J. Applied Engineering Education*, vol 5, no 2, 1989, pp 229-238.

Fulcher, J A, 'On the Upgrading of a Personal Robot for the Teaching of Robotics Fundamentals', *Intl. J. Electrical Engineering Education (UK)*, vol 26, October 1989, pp 305-322.

Gorton, I, 'Formal Specification: An Overview', *Computing*, January 1989, pp 21 - 23.

Gorton, I, Kerridge, J K and Jervis, B, 'Simulating Microprocessor Systems Using Occam and a Network of Transputers', *IEEE Proc.*, vol 136, pt E, no 1, January 1989, pp 22-28.

Herring, P and Maciaszek, L A, 'Fundamentals of Data Normalisation', by Dutka, A F and Hanson', H H, *Computer*, December 1990, p 129.

Reinfelds, J, 'The Development of a Program to Find the Length of the Longest

M-Sequence in a String', *Structured Programming*, 1990, vol 11, pp 45-52.

Teufel, B, 'VISIR - ein Prototyp zum Vergleich von Texten', *Angewandte Informatik*, vol 11, no 4, 1989, pp 159-167.

Teufel, B, 'Visualization of Natural Language Documents Using Information Traces', *Angewandte Informatik*, vol 11, no 12, 1989, pp 500-507.

CONFERENCE/SEMINAR PAPERS

Fulcher, J A, 'Neural Networks for Robot Control', Proc. 1st Australian Neural Network Conf., Sydney, January 1990, pp 118-119.

Fulcher, J A, 'Laboratory Support for the Teaching of Computer Architectures', Proc. World Conf. Engineering Education for Advancing Technology, Sydney, February, 1989, pp 688-690.

Fulcher, J A, 'Applications of Bit Serial Architectures', Proc. Comp Sys & Inf Tech Conf., Sydney, August 1989, pp 168-172.

Fulcher, J A, 'Mapping the CORDIC Technique on to a Network of Transputers', Proc. IREECON '89, Melbourne, September 1989, pp 216-219.

Korczak, J, Maciaszek, L and Stafford, G, 'Knowledge Base for Database Design', Proc. International Symposium on Database Systems for Advanced Applications, Seoul, Korea, 1989, 15 pp.

Kozaczynski, W and Maciaszek, L A, 'Design Recovery as Integral Aspect of Software Engineering', Proc. Fifth Australian Soft. Eng. Conf. ASWEC'90, Sydney, May 1990, pp 87-92.

Maciaszek, L, Stafford, G and Krav, S, 'A Case Workbench for Hypersemantic Database Modelling', Fourth Australian Software Engineering Conf., ASWEC'89, Canberra, May 1989, pp 76-81.

Teufel, B, 'Information Traces in Information Retrieval', Proc., Australian Computer Science Conf. (ACSC-13), Melbourne, February 1990, pp 392-401.

Zelinsky, A, 'Navigation with Learning', IEEE Int. Conf. on Intelligent Robot Systems, Tsukuba, Japan, September 1989, pp 331-338.

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

JOURNAL ARTICLES

Chen, Z Q and Paoloni, F J, 'Electrical impedance image from measured data using iterative reconstruction algorithm', *Electronics Letters*, 25, 1, 1989, pp 38-40.

Chichuro, J F, 'Error Surface Analysis of an Adaptive Comb Filter', *IEE Electronics Letters*, Vol 26, No 9, April 1990, pp 587-589.

Chicharo, J F and Ng, T S, 'Tunable/adaptive second order IIR notch filter', *International Journal of Electronics*, 68, No 5, 1990, pp 779-792.

Chicharo, J F and Ng, T S, 'Gradient-based adaptive IIR notch filtering for frequency estimation', *IEEE Transactions on Acoustics, Speech and Signal Processing*, May 1990, pp 769-777.

Cung, L C and Ng, T S, 'AKAS - an automated diagnostic knowledge acquisition system', *Engineering Applications of Artificial Intelligence*, June 1989, pp 131-138.

Evans, P J, Paoloni, F J, Noorman, J T and Whichello, J, 'Mass separation in a vacuum arc centrifuge', *J. Applied Physics*, 66, 1, July 1989, pp 115-118.

Hall, S C and Bradlow, H S, 'A comparison of 1-bit adaptive quantizers for speech coding', *Electronics Letters*, 25, 1989, pp 586-588.

Luk, B, Naghdy, F and Billingsley, J, 'Stochastic force sensing application in robotics - II', *Microprocessing and Microprogramming*, 27, August 1989, pp 47-52.

Naghdy, F and Strickland, P, 'Distributed manipulation environment (a transputer-based distributed robotic system)', *International Journal of Computer Integrated Manufacture*, 2, 5, 1989, pp 281-289.

Paoloni, F J, 'Calculation of power deposited in a highly overmoded rectangular cavity with a dielectric load', *J. Microwave Power*, 24, 1, 1989, pp 21-32.

Platt, D, 'Permanent magnet synchronous motor with axial flux geometry', *IEEE Transactions on Magnetics*, 25, 4, July 1989, pp 3076-3079.

Strickland, P, Naghdy, F, Hollis, J E L and Billingsley, J, 'The use of new design tools to add a new dimension of concurrency', *Microprocessing and Microprogramming*, 27, August 1989, pp 223-228.

Wu, H R and Paoloni, F J, 'On the 2D vector split-radix FFT algorithm', *IEEE Transactions on Acoustics, Speech and Signal Processing*, 37, 8, August 1989, pp 1302-1304.

Wu, H R and Paoloni, F J, 'The structure of vector radix fast fourier transforms', *IEEE Transactions on Acoustics, Speech and Signal Processing*, 37, 9, September 1989, pp 1415-1424.

Yousef Ibrahim, M, Cook, C D and Tieu, A K, 'Dynamics Characteristics of a SCARA robot, subject to NC2 velocity trajectories with different payloads', *Robotics and Computer-Integrated Manufacturing*, Vol 6, No 3, 1989, pp 259-264.

CONFERENCE/SEMINAR PAPERS

Brown, J G, Galvin, J E, MacGill, R and Paoloni, F J, 'A broad beam multi-ampere metal ion source', paper D21, International Conf. on Ion Sources, Berkeley, CA, July 1989, pp 577-579.

Chicharo, J F and Ng, T S, 'A roll eccentricity sensor for steel strip rolling mills', Proc., 1989 IEEE Industrial Applications Conf., San Diego, CA, October 1989, pp 1461-1466. (This paper won the best paper prize in the Metal Industries Section).

Chicharo, J F and Ng, T S, 'An on-line sensor for back-up roll eccentricity measurement in steel rolling mills', Proc., 1989 Australian Instrumentation and Measurement Conf., Adelaide, SA, November 1989, pp 200-205.

Coowar, F, Hoole, P and Watai, L, 'A comprehensive project assigned for the computer and information engineering course', World Conf. on Engineering Education for Advancing Technology, Sydney, Proc., I E Aust, 4, 1989, pp 121-123.

Coowar, F and Robinson, B, 'A student-oriented component in an integrated foundation year engineering course', World Conf. on Engineering Education for Advancing Technology, Sydney, Proc., I E Aust, 4, 1989, pp 67-70.

Evans, P J and Paoloni, F J, 'Isotope and element separation in a VAC', 17th AINSE Symposium on Plasmas, Sydney, NSW, 1989, pp 89-90.

Gosbell, V J, 'Electric motors and drives', ESAA Residential School in Electrical Power Systems, L-A11, January 1990.

Hao, S, Naghdy, F and Cook, C D, 'Vision system using coloured liquid', IREE Conf., Canberra, ACT, December 1989, pp 171-174.

Liu, M and Cook, C D, 'Adaptive decentralized dynamic control for robot manipulators', Proc., IASTED International Symposium on Robotics and Manufacturing, Santa Barbara, CA, November 1989, pp 89-94.

Liu, M and Cook, C D, 'An adaptive controller for robotic manipulators', Proc., ROBZHANZ 89, New Zealand, 1989, pp 73-77.

Naghdy, F and Strickland, P, 'Parallel control of advanced production machines based on transputer/Occam', Proc., Australian Occam User Group Conf., July 1989, pp 113-121.

Ng, T S, Cung, L D and Chicharo, J F, 'DESPLATE; an expert system for abnormal shape diagnosis in the Plate Mill', Proc., 1989 IEEE Industrial Applications Conf., San Diego, CA, October 1989, pp 1439-1444.

Ng, T S, 'Investigation of indoor wireless communications at 60GHz', Workshop on Radio Propagation and Applications in the Upper Microwave and Millimetre Wave Bands, Epping, NSW, February 1990, pp 22-29.

Perkis, A, Paoloni, F J, Bradlow, H S and Ng, T S, 'Video transmission rate reduction by hybrid and interpolative coding techniques', 13th Australian Computer Science Conf., Melbourne, February 1990, pp 11-12.

Whichello, J V, Evans, P J and Paoloni, F J, 'The measurement of mass separation in a

vacuum arc centrifuge', 2nd Meeting on Separation Phenomena in Liquids and Gases, Versailles, France, July 1989, pp 102-120.

Wu, H R and Paoloni, F J, 'A 2D fast cosine transform algorithm - a structural approach', Proc. International Conf. on Image Processing, Singapore, September 1989, pp 50-54.

Wu, H R and Paoloni, F J, 'A structural approach to 2D direct fast cosine transform algorithm', International Symposium on Computer Architecture and Digital Signal Processing, Hong Kong, October 1989, pp 50-54.

Wu, H R and Paoloni, F J, 'Implementation of 2D DCT for image coding using FDP A41102', Proc. Inst. Radio and Electronics Engineers Australia Conf. on Image Processing and the Impact of New Technologies, Canberra, ACT, December 1989, pp 35-38.

DEPARTMENT OF MATHEMATICS

JOURNAL ARTICLES

Bunder, M W, 'Paraconsistent and combinatory logics' in *Paraconsistent Logic, Essays on the Inconsistent*, Priest, G, Routley, R (eds), *Analytica Series - Philosophia Verlag*, 1987, pp 218-226.

Bunder, M W, Hindley, J R and Seldin, J P, 'On adding (z) to weak equality in combinatory logic', *J Symbolic Logic*, 54, 1989, pp 590-607.

Cleary, J and Morris, S A, 'Locally dyadic topological groups', *Bull. Austral. Math. Soc.* 40, 1989, pp 417-419.

Eliot, I G and Clarke, D J, 'Temporal and spatial bias in the estimation of shoreline rate-of-change statistics from beach survey information', *Coastal Management*, 17, 1990, pp 129-156.

Hill, J M and McNabb, A, 'On Danckwert's transformation for two variable coupled systems', *Bull Austral Math Soc.* 41, 1990, pp 355-369.

Hill, J M, 'Similarity solutions for nonlinear diffusion - A new integration procedure', *J Eng Math*, 23, 1989, pp 141-155.

Hill, J M, 'Simple exact solutions applicable to microwave heating', *J Appl Math Phys (ZAMP)*, 41, 1990, pp 872-882.

Hill, J M, 'Some integrable and exact similarity solutions for plane finite elastic deformations', *J Inst Math Applic*, 44, 1990, pp 111-126.

Hill, J M and Tordesillas, A A, 'The pressure distribution for symmetrical contact of circular elastic cylinders', *Q J Mech Appl Math*, 42, 1989, pp 581-604.

McDowell, C and Sparks, R S, 'The multivariate modelling and prediction of farmers' conservation behaviour towards natural ecosystems', *J Envir Manage*, 28, 1989, pp 185-210.

McDowell, C., Sparks, R.S., Grindley, J. and Moll, E. 'Persuading the Landowner to Conserve Natural Ecosystems through effective communication', *J. Envir. Manage.*, 28 (1989) pp 211-225.

Tognetti, K P, Winley, G and van Ravenstein, T, 'The Fibonacci tree, Hofstadter and the golden string', *Applic. Fibonacci Numbers*, vol 3, Bergum, G E, Philippou, A N and Horodam, A F (eds), Klower, 1990, pp 325-334.

Winley, G, Tognetti, K P and van Ravenstein, T, 'Hurwitz Theorem and the continued fraction with constant terms', *Fibonacci Q*, 277, 1989, pp 420-423.

CONFERENCE/SEMINAR PAPERS

Best, J P, Kucera, A and Blake, J R, 'Underwater explosion bubble dynamics in the neighbourhood of boundaries', Proc., Tenth Australasian Fluid Mechanics Conf., Melbourne, 1989, pp 231-234.

INFORMATION, TECHNOLOGY AND COMMUNICATION UNIT

CONFERENCE PAPERS

Scott, P, 'Levers, laboratories and Latourian linguistics', Australian Assoc for the History, Philosophy and Social Studies of Science Conf., Moss Vale, September 1989.

Scott P, Richards, E and Martin, B, 'Captives of Controversy: The Myth of the Neutral Social Researcher in Contemporary Scientific Controversies', Society for Social Studies of Science Conf., Irvine, California, November 1989.

FACULTY OF SCIENCE

DEPARTMENT OF BIOLOGY

BOOK EDITED

Steele, E J, Bellett, A J D, McCullagh, P J, and Selinger, B, *Evatt Revisited: Interpretation of Scientific Evidence*, Centre for Human Aspects of Science and Technology, University of Sydney, NSW, Australia, 1989.

BOOK CHAPTERS

Bellett, A J D, McCullagh, P J, Selinger, B, and Steele, E J, 'Evatt revisited- interpretation of scientific evidence: aims and outcomes of the conference', in Steele, E J, Bellett, A J D, McCullagh, P J and Selinger, B, (eds) *Evatt Revisited: Interpretation of Scientific Evidence*, Centre for Human Aspects of Science and Technology, University of Sydney, NSW, Australia, 1989, pp 1-5.

Davis, A R, Targett, N M, McConnell, O J, and Young, C M, 'Epibiosis of marine algae and benthic invertebrates: natural products chemistry and other mechanisms inhibiting settlement and overgrowth', in Scheuer, P J (ed), *Bioorganic Marine Chemistry*, Berlin, Springer-Verlag, 1989, pp 85-114.

Davis, A R, 'Temperature correlates with the daily release of larvae and their settlement in a temperate Australian ascidian', in Ryland, J S and Tyler, P A (eds), *Reproduction, Genetics and Distribution of Marine Organisms*, Fredensborg, Denmark, Olsen and Olsen, 1989, pp 61-65.

Gordon, G and Hulbert, A J, 'The

Peramelidae' in Walton, D W (ed), *Fauna of Australia. vol 1B: Mammalia*, Australian Government Publishing Service, Canberra, 1989, pp 603-624.

Steele, E J, 'Herbicide exposure and birth abnormalities: re-evaluation of some key data considered by the Evatt Royal Commission', in Steele, E J, Bellett, A J D, McCullagh, P J and Selinger, B (eds), *Evatt Revisited: Interpretation of Scientific Evidence*, Centre for Human Aspects of Science and Technology, University of Sydney, NSW, Australia, 1989, pp 37-43.

Whelan, R J, 'The influence of fauna on plant species composition' in Majer, J D (ed), *Primary Succession: The Role of Animals in Reclaimed Land*, Cambridge University Press, Cambridge, 1989, pp 107-142.

JOURNAL ARTICLES

Ayre, D J and Whelan, R J, 'Factors controlling fruit set in hermaphroditic plants: studies with the Australian Proteaceae', *Trends in Ecology and Evolution*, 4, 1989, pp 267-272.

Bellett, A J D, McCullagh, P R, Selinger, B and Steele, E J, 'Evatt Revisited, Interpretation of Scientific Evidence', *Search* 21, 1990, 52-54.

Chaplin, J and Ayre, D J, 'Genetic evidence of variation in the contributions of sexual and asexual reproduction to populations of the freshwater ostracod

Candonocypris novaehelandiae, *Freshwater Biology*, 22, 1989, pp 275-284.

Coles, R B, Guppy, A, Anderson, M B and Schlegel, P, 'Frequency sensitivity and directional hearing in the gleaning bat', *Plecotus auritus* (Linnaeus 1758), *J. Comp Physiol.*, 165, 1989, 269-280.

Copland, B J, and Whelan, R J, 'Seasonal variation in flowering intensity and pollination limitation of fruit set in four co-occurring *Banksia* species', *Journal of Ecology*, 77, 1989, pp 590-604.

Davis, A R, and Butler, A J, 'Direct observations of larval dispersal in the colonial ascidian *Podoclavella moluccensis* Sluiter: evidence for closed populations', *J. Exp. Mar. Biol. Ecol.*, 127, 1989, pp 189-203.

Davis, A R, and Wright, A E, 'Interspecific differences in fouling of two congeneric ascidians (*Eudistoma olivaceum* and *E. capsulatum*): is surface acidity an effective defence?', *Mar. Biol.*, 102, 1989, pp 491-497.

Goldingay, R L, 'Time budget and related aspects of the foraging behaviour of the Yellow-bellied Glider *Petaurus australis*' *Aust. Wildl. Res.*, 1989, 16, pp 105-12.

Gupthar, A S and Garnett, H M, 'Vegetative stress features of *Candida shehatae*-*Pichia stipitis* protoplast fusants', *Proc. Electron. Microsc. Soc. South Africa* 19: 75-76, 1989.

Harris, I, and Garnett, H M, 'Assessment of the major slime forming organisms in Southern African paper mills, the causes of inoculation and pattern of colonisation', *Tappi J.* 72, 1989, pp 136-140.

Hunt, A, and Ayre, D J, 'Population structure in the sexually reproducing sea anemone *Oulactis muscosa*', *Marine Biology*, 102, 1989, pp 537-44.

McGuinness, K A and Davis A R, 'Analysis and interpretation of the recruit-settler relationship', *J. Exp. Mar. Biol. Ecol.*, 134, 1989, pp 197-202.

Marengo, T, Brown, A D and Lilley, R McC, 'The response of the green halotolerant alga *Dunaliella* to osmotic stress: Effects on adenine nucleotide contents', *Biochim. Biophys. Acta* 976, 1989, pp 102-108.

Whelan, R J, 'Australian ecology: past and future', *Trends in Ecology and Evolution*, 4, 1989, pp 33-34.

Whelan, R J, 'When is a flower visitor a pollinator-or-can a honeybee pollinate *Grevillea*?' *Science Education News* 38, 1989, pp 50-55.

Whelan, R J, and Goldingay, R L, 'Factors affecting fruit set in *Telopea speciosissima* Proteaceae: the importance of pollen limitation', *Journal of Ecology*, 77, 1989, pp 1123-1135.

CONFERENCE/SEMINAR PAPERS

Ayre, D J, 'The population genetics of Australian marine invertebrates: effects of larval connections and historical factors', Keynote address: First Aust. Symp. on the Ecology of Temperate Reefs, Melbourne, July 1989, p 7.

Ayre, D J, 'Genetic variation within and among coral reefs', *Ecological Society of Australia*, Wollongong, September 1989, p 7.

Bellgard, S, 'The mycorrhizal status of the plant species in a dry sclerophyllous

Hawkesbury Sandstone heath community', *Ecological Society of Australia*, Wollongong, September 1989, p 14.

Carthew, S M, 'Mate choice in *Banksia*', *Ecological Society of Australia*, Wollongong, September 1989, p 11.

Chaplin, J A, 'The sex life (or lack of it) of an ostracod', *Ecological Society of Australia*, Wollongong, September 1989, p 2.

Chaplin, J A, 'The sex life (or lack of it) of an ostracod', *Australian Limnological Society*, Canberra, July 1989, p 8.

Coles, R B, 'Listening and foraging by gleaning in echolocating bats', *Proc. 8th International Bat Research Conf.*, Sydney, July 1989 p 6.

Coles, R B and Guppy, A, 'Echolocation and Doppler-shift compensation in *Rhinonycteris aurantius* and *Hipposideros ater*', *Proc. 8th International Bat Research Conf.*, Sydney, July 1989, p 6.

Coles, R B & Guppy, A, 'Identification of Australian bats by echolocation calls', *Proc. 8th International Bat Research Conf.*, Sydney, July 1989, p 6.

Davis, A R and Wright, A E, 'Ascidians, fouling organisms and antifouling defenses', *Ecological Society of Australia*, Wollongong, September 1989, p 12.

Davis, A R, 'Settlement in a colonial ascidian: *in situ* observations of larval behaviour', *Ecology of Temperate Reefs Symp.*, Melbourne, July 1989, p 11.

Garnett, H M, 'Legionella: The facts and the unanswered questions', *Australian Microbiologist* 10, 3, 313, Abstract S12.2, 1989.

Garnett, H M, Moses, A V, Mc Kay, G, Woodroffe, S and Kramvis, 'Persistence of cytomegalovirus', *Australian Microbiologist* 10, 3, 332, Abstract S17.3, 1989.

Garnett, H M, 'Microbiology of Legionella and its distribution within water systems', *Proc. Standards Australia Seminar - Legionnaires Disease*, 1989 pp 1-7.

Garnett, H M, Mochaba, F, Civerolo, E L, Lee, R F, Brlansky, R H and Bock, D, 'Serological comparison of putative greening isolates', Abstracts, 11th Conf. of the International Organisation of Citrus Virologists, 1989.

Goldingay, R, 'Mating system of the yellow-bellied glider', *Ecological Society of Australia*, Wollongong, September 1989, p 24.

Goyal, A and Lilley, R McC, 'Effect of salt stress on the activities of the dehydrogenase enzymes of glycerol and oxidative pentose phosphate metabolism in *Dunaliella tertiolecta*', *Proc.*, American Society of Plant Physiology, Toronto, 1989.

Hortelano Hap, G and Garnett, H M, 'Analysis of DNA from putative greening isolates', Abstracts, 11th Conf., International Organisation of Citrus Virologists, 1989.

Hulbert, A J, Janssens, P A and Mantaj, W A, 'Growth of tissues and mitochondria in a developing mammal, the tammar wallaby *Macropus eugenii*', *Proc. XXXIth Int. Congress Union Physiol. Sci.* 27:517 (Helsinki, Finland), 1989.

Hunt, A, 'Some preliminary genetic data describing the structure of several populations of co-occurring starfish', *Ecological Society of Australia*, Wollon-

gong, September 1989, 5 pp.

Janssens, P A, Hulbert, A J, Grigg, J A and Mantaj, W, 'Thyroid function and tissue metabolism in a developing mammal, *Macopus eugenii*', *Proc. XIth Int. Symposium on Comparative Endocrinol*, Malaga, Spain, 1989.

Janssens, P A, Hulbert, A J and Grigg, J A, 'Development of thyroid function in a typical mammal, the tammar wallaby *Macropus eugenii*', *Proc. XXXIth Int. Congress Union Physiol. Sci.* 27:517 (Helsinki, Finland), 1989.

Jonusys, A M and Steele, E J, 'IgM Natural autoantibodies specific for bromelain-treated mouse red blood cells recognise carbonic anhydrase', *Australian Society for Immunology - 19th annual meeting*, Adelaide, 1989, Abstract 232, p 94.

Lee, R F, Civerolo, E L, Brlansky, R H, Hooker, M E, Garnsey, S M and Garnett, H M, 'Establishment of a collection of citrus greening isolates', Abstracts, 11th Conf., International Organisation of Citrus Virologists, 1989.

Lilley, R McC, Marengo, T and Brown, A D, 'The effect of salt stress on the extraction of protein and DHAP reductase from *Dunaliella tertiolecta*', *Proc.*, Australian Society of Plant Physiology, Brisbane, 1989, Abstract 131.

Lumsden, L F and Coles, R B, 'Echolocation by *Myotis adversus* foraging over water', *Proc. 8th International Bat Research Conf.*, Sydney, July 1989, p 17.

Moses, A V and Garnett, H M, 'Human cytomegalovirus and monocyte cytokine production', *Proc. 19th Annual Meeting, Australian Society of Immunology*, Abstract 192, 1989.

Portis, A R jr, Robinson, S P and Lilley, R McC, 'Regulation of ribulose bisphosphate carboxylase activity by rubisco activase: Aspects of the mechanism', *Proc.*, VIII International Congress on Photosynthesis, Stockholm, 1989.

Schibeci, S, 'Hybridization in *Banksia*', *Ecological Society of Australia*, Wollongong, September 1989, p 4.

Steele, E J, Pollard, J W and Both, G W, 'Pattern of mutations around rearranged antibody variable region genes', 7th Int. Congress Immunology, Berlin, August 1989, W4-1.

Steele, E J, 'Herbicide exposure and birth abnormalities: re-evaluation of some key data considered by the Evatt Royal Commission', an ANU Public Affairs Conf.: Evatt Revisited, Centre for Continuing Education, ANU, Canberra, August 1989.

Taylor, L, Both, G W, Pollard, J W and Steele, E J, 'The pattern of somatic mutation in mouse immunoglobulin heavy chain variable genes', *The Genome Conf.*, Lorne, Victoria, February 1990.

Walker, B A, Ayre, D J and Whelan, R J, 'Population genetic consequences of the mating systems of *Banksia* shrubs', *Ecological Society of Australia*, Wollongong, September 1989, p 27.

Walker, B A and James, S H, 'Phenotype, genotype and environment in *Viminaria juncea*', *Ecological Society of Australia*, Wollongong, September 1989, p 7.

DEPARTMENT OF CHEMISTRY

BOOK CHAPTER

Kane-Maguire, L., 'Chapter 12, Reactivity of Coordinated Ligands' in Twigg, M V (ed) *Mechanisms of Inorganic and Organometallic Reactions*, Plenum Publ. Co., London, 1989, vol 6.

JOURNAL ARTICLES

Barisci, N J, and Wallace, G G, 'Evaluation of Flow through Photochemical Reactors for Liquid Chromatography with Electrochemical Detection', *Electroanalysis*, 1, 1989, pp 347-35.

Berger, E, Griffiths, D W T, Schuster, G and Wilson S, 'Matrix-Isolation-FTIR-Spectroscopy with an integrating sphere', *Appl. Spectry.*, 43, 1989, pp 320-320.

Carver, J A and Collins, J G, 'NMR identification of a partial helical conformation for bombesin in solution', *Eur. J. Biochem.*, 187, 1990, pp 545-650.

Easteal, A J, Price, W E and Woolf, L A, 'Hydration models for trivalent metal ionsolutions: shear viscosities and diffusion coefficients of Fe(III) and THO in Iron (III) perchlorate solutions at 298.15K', *J. Phys. Chem.*, 93, 1989, pp 7517-7520.

Easteal, A J, Price, W E and Woolf, L A, 'A diaphragm cell for high temperature diffusion measurements; Tracer Diffusion Coefficients for Water to 363 K', *J.C.S. Faraday Trans. 1.*, 85, 1989, pp 1091-1087.

Garson, M J, 'Biosynthetic studies on marine natural products', *Natural Product Reports*, 6, 1989, pp 143-170.

Garson, M J, Manker, D C, Maxwell, K E, Skelton, B W and White A H, 'Novel brominated metabolites from a dictyoceratid sponge', *Aust J. Chem.*, 42, 1989, pp 611-622.

Garson, M J and Murphy P T, 'Marine-derived drugs - an Australian reality?', *Chemistry in Australia*, 56, 1989, pp 358-361.

Garson, M J, Small, C J, Skelton, B W, Thinapong, P and White, A H, 'Stereochemical correlations of polypropionate metabolites from marine pulmonates: revision of the relative stereochemistry of pectinatone by x-ray structure analysis', *J. Chem. Soc. Perkin Communications*, 1990, pp 805-807.

Lao, Y, Korth, J, Ellis, J and Crisp, P T, 'Heterogeneous reactions of 1-pristene catalysed by clays under stimulated geological conditions', *Organic Geochemistry*, 14, 1989, pp 375-379.

Lin, Y P, Wallace, G G, and Riley, P J, 'Controlled release of the dithiocarbamate ligand from a Polypyrrole polymer a basis for on-line electrochemically controlled derivatisation materials', *Anal. Lett.* 22, 3, 1989, pp 669-681.

Liokas, V, Garson M J, and Carver, J A, 'A new furanosesterpene from the marine sponge *Psammocinia rugosa*', *Aust. J. Chem.* 42, 1989, pp 1805-1811.

Manthey, M K, Pyne, S G and Truscott, R J W, 'Addition of Aliphatic and Aromatic Amines to Catechol Under Oxidising

Conditions', *Aust. J. Chem.*, 42, 1989, pp 365-373.

Manthey, M K, Pyne, S G and Truscott, R J W, 'The Autoxidation of 3-Hydroxyanthranilic Acid in the Presence of Amino Acids', *Tetrahedron*, 45, 1989, pp 2803-2810.

Pyne, S G and Boche, G, 'Stereoselective Reactions of Lithium and Zinc tert-Butyl phenylmethylsulfoxide with Carbonyl Compounds and Imines', *J. Org. Chem.*, 54, 1989, pp 2663-2667.

Pyne, S G, Bloem, P and Griffith, R, 'Conjugate Addition of Amines to (Rs) - 10' Isoborynl Vinyl Sulfoxides', *Tetrahedron*, 45, 1989, pp 7013-7022.

Pyne, S G, Bloem, P, Chapman, S L, Dixon, C E and Griffith, R, 'Stereochemistry of the Intermolecular and Intramolecular Conjugate Addition of Amines and Anions to Chiral (E) and (Z) Vinyl Sulfoxides. Total Synthesis of (R)-(+)-Carnegine and (+) and (-) Sedamine', *J. Org. Chem.* 55, 1990, pp 1086-1093.

Pyne, S G and Dikic, B, 'Diastereoselective Kinetically and Thermodynamically Controlled Additions of (R) (+) Methyl p-Tolyl Sulfoxide Anion to Imines', *J. Chem. Soc., Chem. Commun.*, 1989, pp 826-827.

Pyne, S G and Dikic, B, 'Diastereoselective Addition of (R) (+) Methyl p-Tolyl Sulfoxide to Imines. Asymmetric Synthesis of (R)-(+)-Tetrahydropalmatine', *J. Org. Chem.* 55, 1990, pp 1932-1936.

Pyne, S G, Truscott, R J W, Maxwell, K, Morales, M C, Walsh, B C and Wynn, B L, 'Model Studies for Insect Protein Sclerotization: Oxidative Loss of the Side Chain from 4-Substituted Catechols', *Tetrahedron*, 46, 1990, pp 661-670.

Price, W E, 'Tracer diffusion of caffeine in aqueous solutions at 298.15K: The effect of caffeine self-association', *J C S Faraday Trans.1.*, 85, 1989, pp 415-419.

Price, W E, Trickett K and Harris, K R, 'The association of caffeine in aqueous solutions: Its Effects on Caffeine Intradiffusion', *J C S Faraday Trans.1.*, 85, 1989, pp 3281-3288.

Rovere, C E, Ellis, J and Crisp, P T, 'Determination of polynuclear aromatic hydrocarbons in shale oil by low pressure liquid chromatography', *Fuel*, 68, 1989, pp 249-252.

Short, S A, Lowson, R T, Ellis, J and Price, D M, 'Thorium-uranium disequilibrium dating of late Quaternary ferruginous concretions and rinds', *Geochimica et Cosmochimica Acta*, 53, 1989, pp 1379-1389.

Spiro, M, Grandoso, D M, and Price, W E, 'The protonation constant of caffeine in aqueous solution', *J C S Faraday Trans. 1*, 85, 1989, pp 4259-4267.

Teasdale, P, Spencer, M and Wallace, G G, 'Selective Determination of Cr(vi) oxyanions using characterisation Chromium Analysis and Speciation using a Poly-3-Methylthiophene Modified Electrode', *Electroanalysis*, 1, 1989, pp 541-547.

Wallace, G G and Hailin, G, 'Electroanalysis of Chromatographic Stationary Phases', *Anal. Chem.*, 61, 1989, pp 198.

Wallace, G G and Hailin, G, 'Characterisation of conducting polymeric chromato-

graphic stationary phases and Electrochemically controlled HPLC', *J. Anal. Chem.* 61(21), 1989, 2391 pp.

Wallace, G G, John, R, Mailin, Ge, Meaney, M and Smith M R, 'Differential Pulse Voltammetric Study of a Typical Anaerobic Adhesive Formulation Coated on a Glassy Carbon Electrode', *Analytica Chinica Acta*, 217, 1989, pp 335-341.

Wallace, G G, Meaney, M, Smyth, M R and Vos, J S, 'Some Analytical Applications of Polymer-Modified Electrodes', *Anal. Proc.* 26, 1989, p 15.

Wallace, G G, Smyth M R, Meaney, M and Vis, J G, 'Stabilisation of a Ruthenium Polymer-Modified Electrode for Use in Flowing Solution Analysis', *Electroanalysis*, 1, 1989, pp 357-361.

Wallace, G G, Wilke, E A, Barisci, J N, Meaney, M, Smyth, M R and Vos, J S, 'The use of Chemisorbed Electrocatalytic polymers for Detection in flowing solutions', *Electroanalysis*, 1, 1989, 245 pp.

CONFERENCE/SEMINAR PAPERS

Burton, P.G. 'A Psychonomic Theory of the Brain and Learning', Research Initiative on Pattern Recognition, Royal Signals and Radar Establishment, Malvern, UK, April 1989.

Burton, P G, 'Adaptive Expert Systems for Futures and Forex Markets', L/E/K Partnership, Sydney August 1989; London October 1989.

Carver, J A and Collins, J G, 'Bombesin adopts a partial helical conformation in solution', *Proc., Aust. Biochem. Soc.*, Gold Coast, September 1989, 21, p C81.

Garson, M J, 'Terpene biosynthesis in sponges - (how), why and where?', 11th National RACI Conf., Organic Chemistry, Townsville, July 1989, p L8-1.

Garson, M J, 'Biosynthetic and Related Studies on Marine Natural Products', 1990 Gordon Conf., Marine Natural Products, Ventura, USA, February 1990.

Garson, M J, Bali, D K and Liokas, V, 'Bioactive Brominated Metabolites from Marine Sponges of the Illawarra', 11th National RACI Conf., Organic Chemistry, Townsville, July 1989, p P3.

Garson, M J and Small, C J, 'Biosynthetic Studies on Marine Pulmonates', 11th National RACI Conf., Organic Chemistry, Townsville, July 1989, p P 23.

Garson, M J, Nonato, M G and Truscott, R J W, 'The Natural Products Chemistry of Philippine Flowering Plants', 11th National RACI Conf., Organic Chemistry, Townsville, July 1989, p P48.

Griffith, D W T, Mankin, W G and Coffey, M T, 'Remote Sensing of Biomass Burning Emissions by FTIR Spectroscopy', American Geophysical Union Fall Meeting, San Francisco, USA, December 1989.

Kane-Maguire, L A P, 'Extraction of Biologically Useful Materials from Sewage Sludges', Conference Proceedings, Effluent Route Conf., Wollongong, B18, February 1990.

Kane-Maguire, L A P and Ghazy, T, 'Kinetics and Mechanisms of Nucleophilic

Addition at a Co-ordinated Vinyl Ligand on an Osmium Cluster', Abstracts, XXVII Internat. Conf. Co-ord. Chem., Broadbeach, Australia, M38, 1989.

Kane-Maguire, L A P, Ghazy, T and Kanitz, R, 'Chiral [Fe(CO)₃(dienyl)]⁺ Complexes as Selective Reagents in the Preparation of Optically-active Amines, Amino Acids and Phosphines', Conf. Abstracts, Applied Organomet, Chemistry - an Entry to New Technology, Pokolbin, NSW, 1989, p 81.

Korth, J, Hutton, A C and Ellis, J, 'A comparison of microscale pyrolysis and organic petrography for the estimation of yield from oil shale', Australian Organic Geochemistry Conf., Hobart, April 1989.

Mockler, G M, Butcher, R J, Diven, G W, Erickson, G R and Sinn, E, 'Copper metalloprotein models. Structures and properties of pyridine-N-oxide, phenol and catechol adducts of binuclear copper (II) complexes containing an exogenous bridge', 197th American Chemical Society Meeting, Dallas, Texas, April 1989, Paper Inor. 147

Mockler, G M, Butcher, R J, Diven, G W, Riley, P, Sinn, E. and Werakso, S, 'Model compounds of copper proteins containing type 11 and type 111 copper atoms', XXVII International Conf., Coordination Chemistry, Gold Coast, July 1989, Paper W29.

Mockler, G M, Butcher, R J, Diven, G W, Sinn, E and Werakso, S, 'Model compounds of multicopper oxidases', 4th International Conf., Bioinorganic Chemistry, Massachusetts, USA, July 1989, Paper G090.

Mockler, G M, Butcher, R J, Diven, G W, Sinn, E and Werakso, S, 'Model compounds of multicopper oxidases', 1989 International Chemical Congress of Pacific Basic Societies, Honolulu, Hawaii, December 1989, Paper Inor. 152.

Price, W E and Woolf, L A, 'Hydration information from diffusion measurements in aqueous salt solutions', Transport Properties in Liquids Symposium, Aachen, W. Germany, September 1989.

Pyne, S G, 'Asymmetric Synthesis of Chiral Amines and Alkaloids Using Chiral Sulfur Reagents', R W Johnson Pharmaceutical Research Inst., Springhouse, USA, April 1990.

Pyne, S G, 'Asymmetric Synthesis of Chiral Amines and Alkaloids Using Chiral Sulfur Reagents', Department of Organic Chemistry, University of Adelaide, April 1990.

Pyne, S G, Bloem, P and Griffith, R, 'Stereoselective Additions of Nucleophiles to Chiral (E) and (Z) Vinyl Sulfoxides', 11th National RACI Conf., Organic Chemistry, Townsville, July 1989, p 53.

Pyne, S G and Dikic, B, 'Addition of Chiral Sulfoxide Anions to Imines: Diastereoselective Reactions under Kinetic and Equilibrium Control', 11th National RACI Conf., Organic Chemistry, Townsville, July 1989.

Rovere, C E, Crisp, P T, Ellis, J and Korth J, 'Chemical class separation of shale oils by low-pressure liquid chromatography on thermally-modified adsorbants', Proc.

5th Australian Workshop on Oil Shale, Lucas Heights, December 1989.

Wallace, G G, 'Conducting Polymers on Sensor materials', AET Symposium on Sensors, Sydney, February 1989.

Wallace, G G, 'Conducting polymers - opportunities for development in the Electronics Industry', AET Symposium on New Materials in the Electronics Industry, Sydney, January 1989.

Wallace, G G, 'An electrochemical reactor for on-line derivatisation in flowing systems', Pittsburgh Analytical Conf., New Orleans, March 1989.

Wallace, G G, 'New polymers for electrochemical sampling', Pittsburgh Analytical Conf., New Orleans, March 1989.

Wallace, G G, 'The electrochemistry of gold at polymer modified electrodes', Pittsburgh Analytical Conf., New Orleans, March 1989.

Wallace, G G, 'A new high performance chemically modified thin mercury film electrode for stripping voltammetry', Pittsburgh Analytical Conf., New Orleans, March 1989.

Wallace, G G, 'New electrochemically prepared polymeric stationary phases', Pittsburgh Analytical Conf., New Orleans, March 1989.

Wallace, G G, 'Commercialising Discoveries', RACI, Newcastle, April 1989.

Wallace, G G, 'Polymer based analytical devices', Workshop on Low Cost Instrumentation, Singapore, June 1989.

Wallace, G G, 'Opportunities for Diagnostics in Conducting Polymer Research', Scimedica Symposium, Wodonga, Australia, July 1989.

Wallace, G G, 'Characterisation Techniques for Electrochemically generated Polymers', 10AC Conf., Brisbane, August 1989.

Wallace, G G, 'The Development of a Portable Water Quality Monitor', 10AC Conf., Brisbane, August 1989.

Wallace, G G, 'Chemically Modified Microelectrodes', 10AC Conf., Brisbane, August 1989.

Wallace, G G, 'Low-cost Electrochemical Instrumentation', 10AC Conf., Brisbane, August 1989.

Wallace, G G, 'The Use of Metscan for Environmental Monitoring', 10AC Conf., Brisbane, August 1989.

Wallace, G G, 'The Use of Conducting Polymers in Antibody-Antigen interactions in Immunoaffinity Techniques', 10AC Conf., Brisbane, August 1989.

Wallace, G G, 'A New Dimension in Chromatography Electrochemistry on Conducting Polymers', 10AC Conf., Brisbane, August 1989.

Wallace, G G, 'On-site and on-line Analysis using Chemically Modified Electrodes', 10AC Conf., Brisbane, August 1989.

Wallace, G G, 'An Overview of Research and Development', DITAC Workshop on New Electrode Material, Wollongong, February 1990.

DEPARTMENT OF GEOGRAPHY

BOOK EDITED

Beck, W, Clarke, A and Head, L, *Plants in Australian Archaeology*, St Lucia, Anthropology Museum, University of Queensland, 1989, pp 213.

BOOK CHAPTERS

Beck, W, Clarke, A and Head, L, 'Plants in Hunter-Gatherer Archaeology', in Beck, W, Clarke, A and Head, L (eds), *Plants in Australian Archaeology*, St Lucia, Anthropology Museum, University of Queensland, 1989, pp 1-13.

Head, L, 'Pollen', in Beck, W, Clarke, A and Head, L (eds), *Plants in Australian Archaeology*, St Lucia, Anthropology Museum, University of Queensland, 1989, pp 111-135.

Winchester, H P M, and Ogden, P E, 'France', in Champion, A G (ed), *Counterurbanization*, London, Edward Arnold, 1989, pp 162-186.

JOURNAL ARTICLES

Dayal, E, 'Land and Labor Productivity in Bangladesh Agriculture', *Asian Profile*, 17, 1989, pp 337-350.

Dayal, E, 'Sources of Labor Productivity in Bangladesh Agriculture', *Geo Journal*, 20, 1990, pp 293-299.

Head, L, 'Prehistoric Aboriginal impacts on Australian vegetation: an assessment of the evidence', *Aust. Geogr.*, 20 1, 1989, pp 36-45.

Head, L, 'Using palaeoecology to date Aboriginal fish traps at Lake Condah, Victoria', *Archaeol. Oceania*, 24 3, 1989, pp 110-115.

O'Neill, A L, 'Landsystem mapping using Landsat Multispectral Scanner Imagery in the Willandra Lakes region of western New South Wales', *Aust. Geogr.*, 20 1, 1989, pp 26-35.

Rust, B R and Nanson, G C, 'Mud as bedload in modern and ancient rivers', *Sedimentology*, 36, 1989, pp 291-306.

Short, S A, Lowson, R T, Ellis, J, and Price, D M, 'Thorium-uranium disequilibrium dating of late Quaternary ferruginous concretions and rinds', *Geochimica et Cosmochimica Acta*, 53, 1989, pp 1379-1389.

Wilson, M G A, 'The end of an affair? Geography and fertility in late post-transitional societies', *Aust. Geogr.*, 21, 1, 1990, pp 53-67.

Winchester, H P M, 'Women and children last: the poverty and marginalization of one-parent families', *Transactions of the Institute of British Geographers*, 14, 1990, pp 70-86.

Woodroffe, C D, Chappell, J, Thom, B G and Wallensky, E, 'Depositional model of a macrotidal estuary and floodplain, South Alligator River, Northern Territory', *Sedimentology*, 36, 1989, pp 737-756.

Woodroffe, C D, McLean, R F, Polach, H A and Wallensky, E, 'Sea level and coral atolls: Late Holocene emergence in the

Indian Ocean', *Geology*, 18, 1990, pp 62-66.
Young, R W, 'Geomorphology in Australia', *Transactions of the Japanese Geomorphological Union*, 10B, 1989, pp 23-27.
Young, R W, 'Crustal constraints on the evolution of the continental divide of eastern Australia', *Geology*, 17, 1989, pp 528-530.

Young, R W 'Geomorphology in Australia', *International Geomorphology Newsletter*, 5, 1989, pp 9-10.

CONFERENCE/SEMINAR PAPERS

Bryant, E, 'Sea level and Greenhouse: Tales of the unexpected', Conf., Planning for the Greenhouse, Macquarie University, 17-18 July 1989, pp 40-62.

Bryant, E, 'Living in a Global Greenhouse: Seeking Solutions', Coastal Planning and Development Workshop, Newcastle University and Hunter Environmental Institute Board of Environmental Studies Occasional Paper no. 13, 1989, pp 1-20.

Bryant, E and Blong, R, 'Sea levels', in Planning for the Greenhouse Conf., opening address, 'Workshop Reports and Participants', McCracken, K. and Blong, R. (eds), Macquarie University, 17-18 July 1989, pp 8-12.

East, T J and Nanson, G C, 'Prediction of geomorphological stability of rehabilitated uranium mine sites', Second International Conf., Geomorphology, Frankfurt, September 1989, Würzburg, D B (ed), Geoöko-Plus, vol 1, Abstracts, Bensheim, pp 80-81.

Ewan, C, Bryant, T and Calvert, D, 'Health implications of longer term atmospheric change', Conf., Integrating Health and Environment, Griffith University, April 1990, 3 pp.

Maroulis, J C, 'Mud transported as bedload, Cooper Creek, central Australia', Second International Conf., Geomorphology, Frankfurt, September 1989, Würzburg, D B (ed), Geoöko-Plus, vol 1, Abstracts, Bensheim, p 186.

Maroulis, J C, Nanson, G C and Gibling, M R, 'Mud bedload in central Australia; flume and field data', 4th International Conf., Fluvial Sedimentology, Barcelona, Sitges, October 1989, Program and Abstracts, p 176.

Nanson, G C et al, 'Alluvial evidence of Quaternary environmental change from the tropical, arid and temperate regions of Australia', Second International Conf., Geomorphology, Frankfurt, September 1989, Würzburg, D B (ed), Geoöko-Plus, vol 1, Abstracts, Bensheim, p 203.

Nanson, G C and Croke, J, 'Floodplains: their character and classification on the basis of stream power, sediment type, boundary resistance and antecedency', Second International Conf., Geomorphology, Göttingen, W. Germany, September 1989, Hagedorn, J (ed), Abstracts Symposium S9: Floodplain Evolution, Göttingen, p 27.

Nanson, G C, Hean, D S and Erskine, W D, 'Gradual, cyclical and neocatastrophic change in fluvial geomorphology', Second International Conf., Geomorphology, Frankfurt, September 1989, Würzburg, D B (ed), Geoöko-Plus, vol 1 Abstracts, Bensheim, p 200.

Nanson, G C and Price, D M, 'Thermoluminescence dating of Quaternary alluvium; recent developments', Second International Conf., Geomorphology, Frankfurt, September 1989, Würzburg, D B (ed), Geoöko-Plus, vol 1, Abstracts, Bensheim, p 202.

Price, D M and Nanson, G C, 'Thermoluminescence dating of Quaternary sediments; the thermoluminescence technique', Second International Conf., Geomorphology, Frankfurt, September 1989, Geoöko-Plus, vol 1, Abstracts, p 202.

Roberts, R G and East, T J, 'Thermoluminescence dating of late Quaternary deposits in northern Australia', Second International Conf., Geomorphology, Frankfurt, September 1989, Würzburg, D B (ed), Geoöko-Plus, vol 1, Abstracts, Bensheim, p 235.

Rust, B R and Nanson, G C, 'Transport, deposition and compaction of mud in modern and ancient fluvial systems', 28th International Geological Congress, Washington, DC, July 1989, Abstracts, 3/558.

Spencer, T, Stoddart, D R, Woodroffe, C D and Harmon, R S, 'Lithospheric flexure and raised reef limestones, S Cooks - Austral Islands', Proc., 6th International Coral Reef Symposium, 3, Townsville, August 1988, pp 485-489.

Woodroffe, C D, 'Mangroves and sedimentation in reef environments: indicators of past sea-level changes and present sea-level trends', Proc., 6th International Coral Reef Symposium, 3, Townsville, August 1988, pp 535-539.

Young, R W, 'Evolution of Tertiary landscapes in Southeastern Australia' (invited paper) 28th International Geological Congress, Washington DC, July 1989, Abstracts, 3/417.

DEPARTMENT OF GEOLOGY

JOURNAL ARTICLES

Chenhall, B E, Carr, P F and Jones, B G, 'Fluorapophyllite from potassic endoskarns at Murulan South, New South Wales', *Aust Mineral.*, 4, 1989, pp 126-131.

Claproth, R, 'Magmatic affinities of volcanic rocks from Ungaran, central Java', *Geol Indon.*, 12, 1989, pp 511-562.

Pemberton, J W, 'The Ordovician-Silurian stratigraphy of the Cudjegang-Mudgee district, New South Wales', *Proc Linn Soc NSW*, 111, 1990, pp 169-200.

Wright, A J, 'Acastid trilobites from the Baton Formation (Early Devonian), New Zealand', *NZ J Geol Geophys*, 33, 1990, pp 49-54.

CONFERENCE PAPERS

Cook, A C, 'Source potential and maturation of hydrocarbon source rocks in Indonesian sedimentary basins', Proc Sixth Regional Conf. on the Geology, Mineral and Hydrocarbon Resources of Southeast Asia, Jakarta, 1989, pp 319-344.

DEPARTMENT OF PHYSICS

JOURNAL ARTICLES

Foster, T J, Leadbeater, M L, Eaves, L, Henini, M, Hughes, O H, Payling, C A, Sheard, F W, Simmonds, P E, Toombs, G A, Hill, G and Pate, M A, 'Current Bistability in Double-Barrier Resonant Tunnelling Devices', *Phys. Rev. B* 39, 1989, pp 6205-6207.

Mundt, R, Zinnecker, H, Zealey, W J, Ray, T, Williams, P M and Geballe, T, 'Fabry Perot observations of the H2 S(1) line in Herbig Haro objects and T Tauri stars', *Astrophys. J.*, 342, 1989, pp 337-344.

Nulsen, P E J, 'The dynamics of shell formation', *Astrophys. J.*, 346, 1989, pp 690-711.

Wood, P R, Nulsen, P E J, Gillingham, P R, Bessell, M S, Dopita, M A and McCowage, C, 'Speckle interferometry of SN1987A up to one year after the explosion', *Astrophys. J.*, 339, 1989, pp 1073.

Zealey, W J, Williams, P M, Sandell, G, Taylor, K N R, Mundt, R, Zinnecker, H and Geballe, T, 'Infrared observations of jets', *Proc. Astron. Soc. of Aust.*, 8, 1, 1989, pp 62-68.

CONFERENCE/SEMINAR PAPERS

Duff, K J, Vickers, R E M, Fisher, P, Freeth, C A, Takacs, G J, Warner, A D and McLean, N A, 'Theoretical and Experimental Piezo-Zeeman Studies of Shallow Acceptors in Germanium', Thirteenth A.I.P. Condensed Matter Physics Meeting, Wagga Wagga, February 1989.

Duff, K J and Hass, K C, 'Multi-band Envelope Function Calculations for Sawtooth Superlattices', Fourth Int. Conf. on Modulated Semiconductor Structures, Michigan, July 1989.

Eaves, L, Leadbeater, M L, Hayes, D G, Alves, E S, Sheard, F W, Toombs, G A, Simmonds, P E, Skolnick, M S, Henini, M and Hughes, O H, 'Electrical and Spectroscopic Studies of Space-Charge Buildup, Energy Relaxation and Magnetically Enhanced Bistability in Resonant Tunnelling Structures', Int. Conf. on Hot Carriers in Semiconductors, Arizona, July 1989.

Fisher, T A, Simmonds, P E, Martin, A D, McLean, N A, Hayes, D G and Skolnick, M S, 'Magnetoluminescence of Modulation Doped Quantum Wells and Resonant Tunnelling', 14th A.I.P. Condensed Matter Physics Meeting, Wagga Wagga, February 1990.

Harper, B M, Wilson, M. and Lewis, R A, 'The use of CML in Physics Tutoring', 7th Annual Conf. of Aust. Soc. for Computers in Learning in Tertiary Education, Bond University, December 1989.

Lewis, R A, Piao, G, Fisher, P and McLean, N A, 'Optical Absorption Spectra of Boron and Indium in Silicon', Thirteenth A.I.P. Condensed Matter Physics Meeting, Wagga Wagga, February 1989.

Piao, G, Fisher, P and Lewis, R A, 'Spectroscopy of Singly Ionised Acceptors

in Germanium', Fourteenth A.I.P.
Condensed Matter Physics Meeting,
Wagga Wagga, February 1990.

Warner, A D, Duff, K J, Fisher, P and
Freeth, C A, 'Zeeman Spectroscopy of
Gallium in Trigonal Germanium', 13th
A.I.P. Condensed Matter Physics Meeting,
Wagga Wagga, February 1989.

Wilson, M, Harper, B M and Lewis, R A,
'Computer Managed Assignments in First
Year Tertiary Science: a Component in
Effective, Efficient Teaching', Aust. Assoc.
for Research in Educ. Conf., Adelaide,
November/December 1989.

Zealey, W J, 'An Australian astronomical
data centre', ASA Meeting on The Future
of Australian Astronomy, before repre-
sentatives of ATAC and ARC, Canberra,
June 1989.

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