MONTAGE

NEWS FROM THE CAMPUSES OF MONASH UNIVERSITY

Volume 3 – Issue 1 – 12 pages

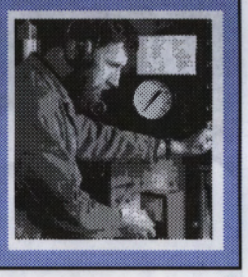
February 1992

SAVANT

Soviet studies after the revolution

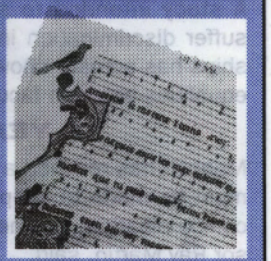
RESEARCH

Diagnosing sickness in machines



ARTS

Medieval music alive and well



Bushfire system a trailblazer

Firefighting in Victoria soon will have a new airborne electronic weapon.

FireScan, a computer imaging system developed at Monash by master's science student Mr Andrew Matthews, interprets information from infra-red scans of a bushfire area and then provides an accurate map for almost immediate use by ground firefighting crews.

A prototype of the system – developed jointly by the Earth Sciences department and the fire management branch of the Department of Conservation and Environment (DCE) – will undergo field trials this month. If successful, it is expected to be in service later in this year's bushfire season.

FireScan extracts more detail from infra-red scans of bushfires than previously possible by using specially developed computer software. This will mean that for the first time infra-red images, which show heat rather than visible light, can provide without delay the accurate information needed to fight bushfires.

Mr Matthews said that infra-red scans currently were used by the department only in longer-term fire planning and forest management because of the time involved in manually processing the information, and the lower resolution of the images produced by the existing system.

"You can see paddocks, roads and streams but the fire itself is just a dark patch," he said. "Then you have to match the image to a map to see where the fire is.

"We are using the computer to analyse these images and define the fire boundaries and other fire features. We should be able to tell where the fire front is to within a few metres."

The FireScan project is also investigating the most efficient way to deliver this information electronically to firefighting crews on the ground. At present, one method used is to drop a canister containing the fire map from the aircraft.

Eventually, the new system could be completely digital. Using satellite communications, radio modems or radio fax, up-to-the-minute fire maps could be transmitted directly to portable receivers in fire trucks or fire-bombing aircraft.

In addition to accurately plotting the boundary of the fire, the system 'sees' the hot air plume generated by the fire front, ground water and landmarks, including individual houses.

Picture: RHONDA JOYCE

Master's student Mr Andrew Matthews at the FireScan controls views a plotted fire image.

The computer image generated by Firescan from an infra-red picture of a fire at Warburton.

"It also shows burnt areas, so you can determine what's still burning and what already has been burnt," Mr Matthews said.

The high-powered Macintosh computer was last month connected to a duplicate of the line scanner installed in the DCE's twin-engine Beechcraft fire-spotting plane, Fireboss I.

"The aeroplane flies in a bumpy path, which causes distortions in the scanning, so you can't overlay the resulting computer image directly on to a map," Mr Matthews explained. "The aim is to get all the available information from the scanner because it has the ability to tell exactly where the fire is in almost real time."

The FireScan software developed by Mr Matthews, a physics and computer science graduate, 'warps' the scanned image to a scale map using an interactive plotting system. It has been designed – complete with helicopter and bulldozer icons – to be used by operators with no special training.

Mr Matthews said the data collected could be stored and analysed later in more detail for use in research into fire behaviour, forest management and the effect of fire on the environment.

INSIDE

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Clinic stresses relaxation

Community care reaches out

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5 A new angle on HIV

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NOW & THEN

THIS MONTH LAST YEAR

One of the founding academics of Monash, Emeritus Professor Bill Scott, died after a long illness. He was 74.

5 YEARS AGO

A study intended to show that the humanities suffer discrimination in the allocation of scholarships has actually shown that there are no real inequalities between faculties.

15 YEARS AGO

Monash has reached a size where a special effort must be made to keep open the internal lines of communication, the new Vice-Chancellor, Professor Ray Martin, said.

"There is a real danger that groups could become isolated and, in particular, that the administration could appear to become more and more remote," he explained.

25 YEARS AGO

The Alexander Theatre was officially opened by the Minister for Education and Science, Mr John Gorton, The opening was followed by a performance of *Much ado about nothing*.

THE SPIKE

■ Saucy students

An invitation to relish a taste of Creative Source, an exhibition of work by graduating Caulfield graphic design students, arrived atop a bottle of tomato ketchup.

The card (tomato red, of course) tantalised the taste buds with a pinch of individuality, hot juicy ideas and a dash of imagination, all blended well and matured for three years.

The exhibition was proud to acknowledge its major ingredients (er, sponsors), which included H. J. Heinz Co. Australia.

■ The buck stops ...

A letter addressed to The Editor, Montage, began with the somewhat sombre salutation "Dead Editor".

■ What's your problem?

"I just want to settle a wager," said the inquiring caller to the Public Affairs Office. "What was the name of the first dog in space?"

Answer: Laika, in 1957. No provision was made for her return. Next question?

■ Gobbledegook department

Item 1: *An investigation of the robustness of the day-of-the-week effect in Australia.*

Is Monday-morning-itis alive and well?

Item 2: *The Muslim-Christian dialog in the 12th century.*

In other words, the Crusades?

MONTAGE
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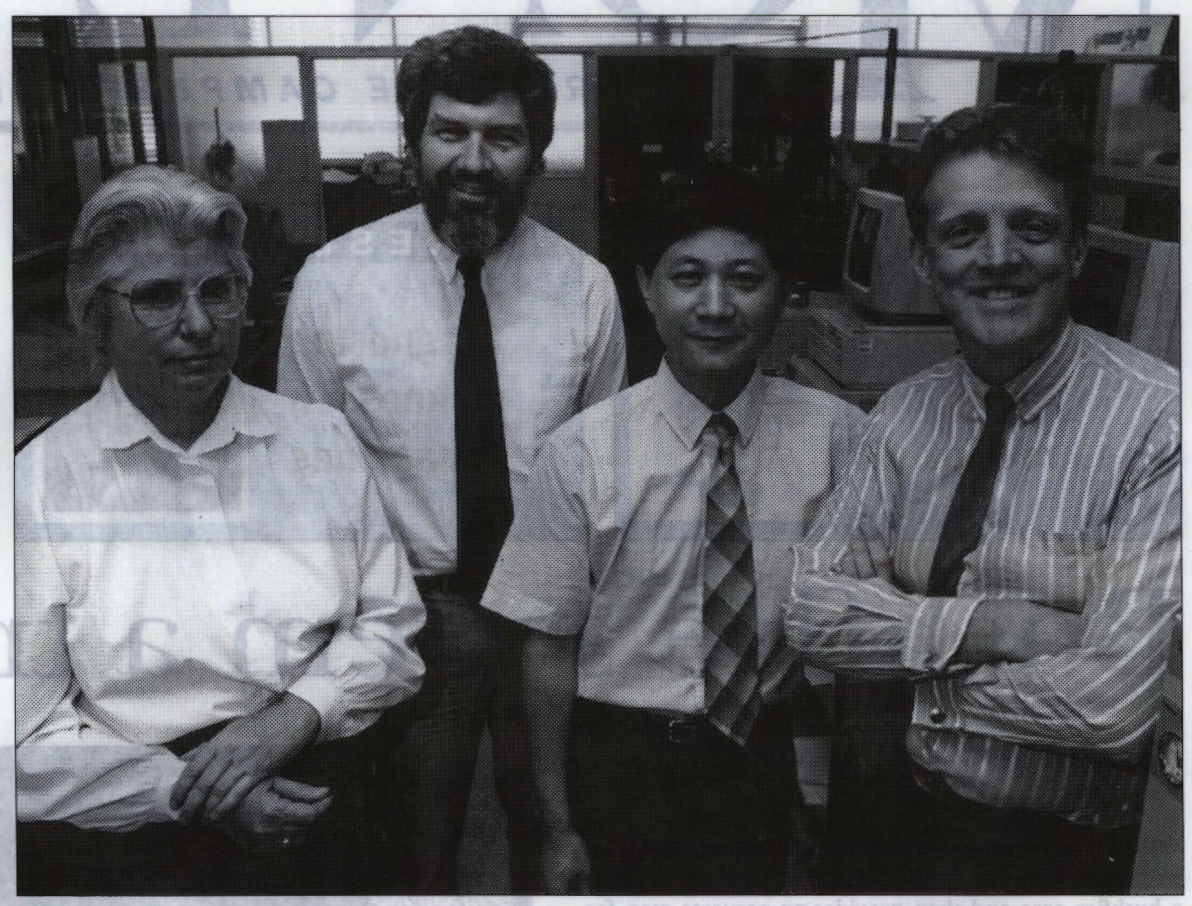


Members of the Advanced Ceramics Processing CRC are (from left) Dr Mary Gani, the centre's head, Professor Paul Rossiter, Dr Yibeng Cheng and Dr Jeff Sellar.

Five CRC grants awarded to engineering faculty

Five new Cooperative Research Centres (CRCs) are to be set up at Monash following the second round of Federal Government grants aimed at combining public and private research expertise.

More than $11 million will be given to the Monash CRCs, all of which are to be based in the Faculty of Engineering. The centres will research advanced ceramics processing, polymer blends, hardwood fibre and paper science, catchment hydrology and maritime engineering.

The Federal Government announced the 20 new CRCs in December after considering 74 applications from all major Australian higher education institutions. The first two rounds account for 35 of 50 CRCs to be funded by the Government under a $100 million a year program. A third round is expected to be announced this year.

About $40 million will be spent on the 20 new centres this year, with their funding expected to total $250 million. Initial funding from the Government will be for seven years. Remaining funding will be provided by business, the university, Commonwealth departments and agencies including the CSIRO, State departments and agencies, as well as medical research institutes.

The Dean of the Faculty of Engineering, Professor Peter Darvall, said that the announcement would provide a much needed boost for the engineering profession, which may finally be getting the recognition it deserves.

In addition to the CRCs, the Government would be establishing three Advanced Engineering Centres in 1992–93. These would be joint ventures between industry and universities, providing high-level training in industries of strategic advantage to Australia, such as mineral extraction, manufacturing and mining equipment.

"We cannot be a viable economy by buying and selling bits of paper," Professor Darvall said. "Nor is there much future in selling primary products; we actually have to make something."

The centres are:

Advanced ceramics processing: Headed by Professor Pául Rossiter, it will design new polymers and alloys for domestic manufacturing and export. Partners: Monash University, Swinburne Institute of Technology, Centre for Ceramic Fuels Ltd, CSIRO Division of Materials Science and Technology, and ICI Advanced Ceramics.

Polymer blends: Also headed by Professor Rossiter, the centre will help develop Australia's advanced ceramic sector into a fully integrated industry and develop new compounds. Partners: Monash University, RMIT, CSIRO Division of Chemicals and Polymers and Division of Materials Science and Technology, ICI Plastics, and Chemplax Australia Ltd.

Hardwood fibre and paper science: Headed by Dr Peter Nelson and Dr Geoff Gartside, it will help develop an internationally competitive pulp and paper industry. Partners: University of Melbourne, Monash University, CSIRO Division of Forest Products, the Australian Pulp and Paper Institute, and the Pulp and Paper Manufacturers Federation of Australia.

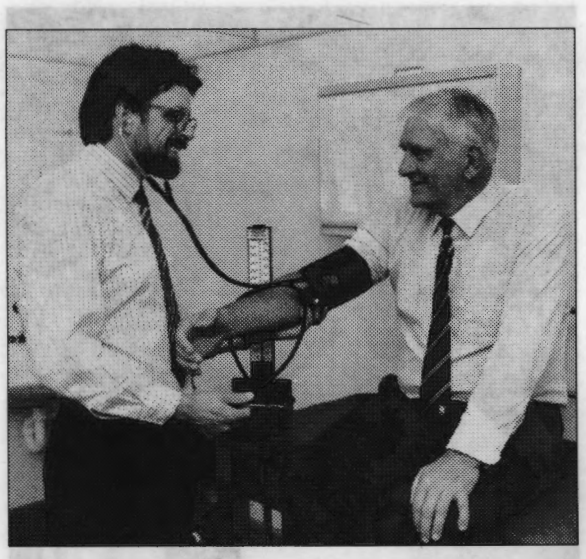
Catchment hydrology: In Canberra and Melbourne, researchers will help develop solutions to intractable land and water management problems. Partners: Monash University, University of Melbourne, CSIRO Division of Water Resources, Bureau of Meteorology, and the Murray-Darling Basin Commission.

Australian maritime engineering: Based in Launceston, Melbourne, Perth and Sydney, it will help solve ship design and construction problems. Partners: Australian Maritime College, Curtin University, Monash University, University of NSW, BHP Transport, Hercus Marine Designs, Maritime Dynamics International, Phil Curran Designs, Ship Design & Management, Tasman Shipbuilding and Offshore Engineering, and Thomson Sintra Pacific.

So far, the CRC program has brought together 17 universities, the CSIRO, 32 State and Federal bodies and more than 30 company or industry groups.

Pictured (from left) are Professor Paul Grundy, Offshore Engineering program; Professor Peter Darvall, Dean of the Faculty of Engineering; Professor John Hinwood, Offshore Engineering program; and Emeritus Professor Tom Fink, Director of the Australian Maritime Engineering CRC.

Rural medical unit first in Australia



Senior lecturer Dr John Tognow checks the blood pressure of Professor Geoff Vaughan at the opening of the unit.

Community medicine has reached out into rural areas with the opening of a new hospital-based unit in Bendigo.

The Bendigo Rural Medicine Unit is the first of its type to be established by a university in a regional centre. The unit, to be operated jointly by Monash's Department of Community Medicine and the Bendigo Hospital, was opened officially by the Deputy Vice-Chancellor, Professor Geoff Vaughan.

Head of the Department of Community Medicine, Professor Neil Carson said the unit – funded by the hospital – would provide extended medical services for the area and a base for undergraduate teaching, as well as develop a rural research program.

"In addition, we will be developing programs to upgrade country doctors' skills, especially educational units for local GPs," he said.

"Developing a research program is an area of particular importance, given that very little health research has been done in rural Australia."

Professor Carson said the department had been approached by the hospital, which needed to set up a primary care service. Despite an over-supply of doctors nationally, the Bendigo region has a shortage of GPs, placing extra and inappropriate demand on the hospital's accident and emergency service.

The unit's primary care clinic will be open seven days a week, including an after hours service, and will be staffed by the hospital, community GPs and medical students.

It will operate from the former TB Chalet, which is being leased by the community medicine department. The department has appointed two senior lecturers, one full-time and one part-time.

Professor Carson said Monash medical undergraduates would work at the unit as part of their two-week rural attachment. The hospital would provide accommodation for those unable to be billeted with a Bendigo GP. Student attachments would start in a few months, he said.

Cut-off scores rise

School leavers make Monash their choice

Monash is attracting more applicants to its courses than other tertiary institutions, as well as more first preference choices.

An analysis of figures from the Victorian Tertiary Admissions Centre (VTAC) shows:

- first preferences for Monash courses increased by 32 per cent this year, compared with 15.6 per cent for all other Victorian institutions;
- first preferences from school leavers with a VCE entrance score rose 29.3 per cent for Monash and 17.2 per cent for all VTAC courses.

Cut-off scores at Monash have risen across the board, with marked increases in science, engineering, medicine, law and arts. This has been caused by the huge increase in the number of Year 12 students eligible to apply for tertiary courses, and the reduced number of places on offer.

The Registrar, Mr Tony Pritchard, said last year Monash carried 1300 unfunded students overall. "This year, total and commencing targets have been reduced with Department of Employment, Education and Training approval to tackle the over-enrolment problem," he said.

"Monash was given 205 extra places, but compared with last year, the actual number of places offered has fallen by only 120 to make a total of 3966. Our sympathies are with students, but we tried to be responsible about the 'cut' this year. However, the universities cannot be expected to offer more places without funding.

"Tertiary places are still geared to a system of supply and demand. The number of places overall is increasing, but not as fast as the number of eligible applicants."

He said school leavers had been affected less than other applicants, with the brunt of the reduction probably felt by those who finished their secondary education in a previous year.

"Because of the likely high acceptance rates in this recession year, we have had to offer conservatively to avoid a blow-out, but we expect to meet our targets," he added.

He said that focusing solely on cut-off scores did not give the full picture on tertiary places and comparisons between institutions. "Maybe the message is getting through that choice of a course on its own merits is more important," he said.

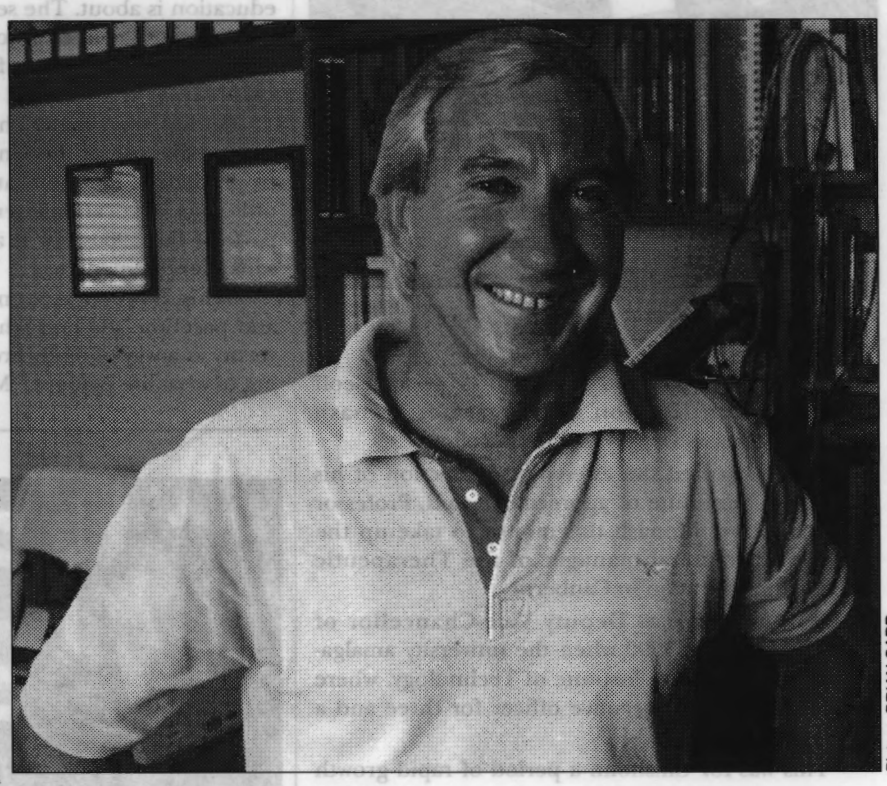
Science cut-off scores at Monash showed the biggest increase: from 270 to 302. There was strong continued interest in the science–engineering degree and a cut-off of 350 for the new arts–science degree. The Dean of the Faculty of Science, Professor Ian Rae, said this vindicated the decision to introduce the new combined degree.

He said the improved performance of science relative to other faculties could be attributed to the faculty's attention to teaching and its strong research performance. "Publicity given to the work of Monash scientists conveys to students something of the excitement of university education," he said.

The Dean of Engineering, Professor Peter Darvall, said that for the first time the faculty's school leaver first preference scores passed those of the University of Melbourne, increasing by more than 48 per cent. Business first preferences overall increased by more than 40 per cent.

	1991	1992
MONASH		
Arts	301	320
Law	358	370
Medicine	353	370
Engineering	300	329
Science	270	300
LATROBE		
Commerce	277	295
Humanities	250	280
Social sciences	260	288
MELBOURNE		
Arts	310	326
Science	284	300
Engineering	326	333
Law	368	378
Medicine	366	374

A comparison of cut-off scores. Source: VTAC



Picture: BRIAN CARR

Dr Chris Sharpley: Simple breathing techniques are often the most effective way to relax.

Clinic stresses relaxation

Psychologist Dr Chris Sharpley has gone into the stress business. He has established a stress management and counselling clinic on the Clayton campus as a direct result of his recent research.

The research by Dr Sharpley, associate professor in the School of Graduate Studies, into the effects and control of stress was funded by the National Heart Foundation and the National Health and Medical Research Council. The clinic has attracted funding from three major industry sponsors: Trust Company of Australia, Brockhoff Foundation and Collier Foundation.

According to Dr Sharpley, most people are aware of the adverse effects of stress, but awareness alone is often not enough to prompt them to change damaging lifestyles.

"Most of the participants of brief, one-shot stress management training sessions find it hard to maintain the techniques taught," Dr Sharpley said.

Dr Sharpley has developed a stress control program that shows people how stress affects them, and how they can control their supposedly autonomic reactions. Participants are connected to monitors that measure their heart rate, tension or skin conduction (how much they perspire). A computerised graph illustrates their responses.

"Often people think they are relaxed, but the screen shows their pulse is racing," Dr Sharpley explained. "This method takes the guesswork out of stress management because participants can see their reactions.

"We then try a variety of relaxation techniques so that participants can see on the monitor which works best for them. Simple breathing techniques are often the most effective way to relax.

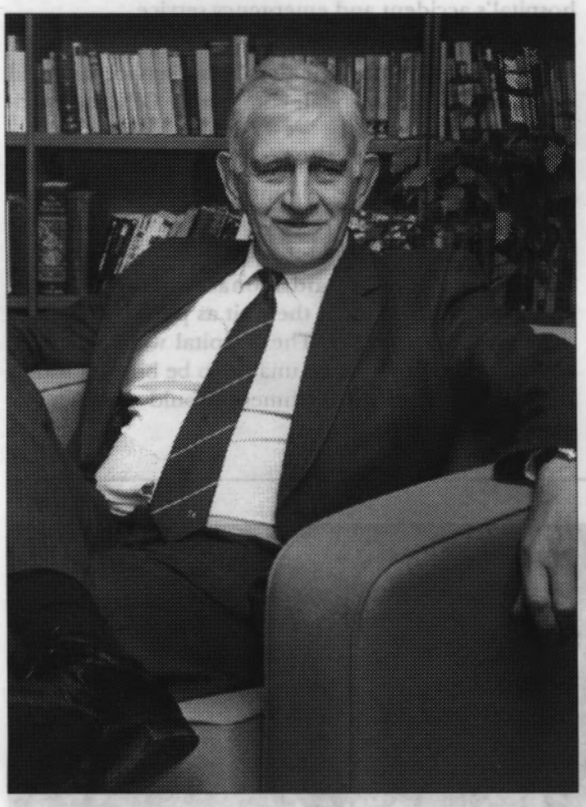
"Most people hold their breath when stressed. Taking a few deep breaths can very steadying. Other people find imagery techniques are effective. For example, imagining that they are lying on the beach.

"Once people realise they can control their heart rate, they can deal more appropriately and calmly with stressful situations, whether it is a crisis at work or peak hour traffic."

He said research with more than 300 volunteers had shown that stress could be effectively treated at an individual level by psychotherapy, relaxation training, diet and exercise management, biofeedback and meditation.

The clinic, on the ground floor of the Education building, will be open from 9 am to 5 pm Monday to Friday. Phone extn 75 5469 for appointments.

Board's tribute to professor's achievements



Professor Geoff Vaughan.

Academic Board has paid tribute to Professor Geoff Vaughan's contribution to the greater Monash during his term as Deputy Vice-Chancellor.

"He has earned the esteem and affection of his colleagues," a minute of appreciation said. Professor Vaughan leaves Monash this month to take up the position of national manager of the Therapeutic Goods Administration in Canberra.

He took office as Deputy Vice-Chancellor of Monash on 1 July 1990 when the university amalgamated with Chisholm Institute of Technology, where he had been chief executive officer for three and a half years.

"This was for Chisholm a period of rapid growth and expansion during which research was galvanised, course development accelerated and the cooperation of industrial leaders obtained in the institute's curriculum," the Academic Board said.

"Links with TAFE were initiated and maintained, and merger discussions with Monash were successfully concluded. The institute acquired under Professor Vaughan's leadership a number of valuable properties, and strengthened its links with local councils, schools and industries."

Before his period at Chisholm, he was the dean and director of the Victorian College of Pharmacy for nine years.

"He came to Monash with the reputation of a strong and humane administrator with an especial capacity for building on an institution's strength and inspiring loyalty in his colleagues."

As Deputy Vice-Chancellor, Professor Vaughan took on a broad portfolio with responsibilities including student affairs, general staff matters, the development of the Chisholm campuses and, latterly, research.

He was instrumental in obtaining substantial research funds for the university, particularly the Cooperative Research Centres and the Australian Research Council Mechanism C submissions.

He chaired the Union Board, the Committee of Associate Deans (Research), the Board of Management for University Theatres, the Occupational Health and Safety Committee and the Computing Committee.

"To all these activities he brought clear-sightedness, determination and good humour, and became known in particular for his approachability and his unending energy," the Academic Board said.

"He has earned the esteem and affection of his colleagues at the greater Monash during his service as Deputy Vice-Chancellor."

First Union warden bows out

One of the original staff members of Monash retired at the end of last year after 30 years as warden of the university Union.

Mr Graeme Sweeney has seen the university grow from little more than mud-strewn fields to a diverse, multicampus institution. However, it is this growth that has prompted him to move on in search of new challenges.

The excitement of being part of an entirely new university first drew Mr Sweeney to Monash from the University of Melbourne where he was chairman of the Union board of management.

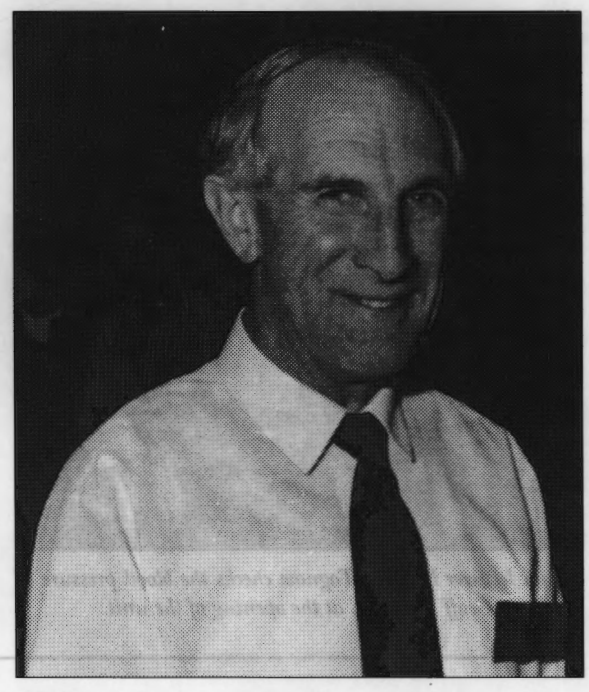
He says the warden is often caught in a no-man's land between administration and students. "I see the warden's job as being one of encouraging students to see that a university education is different from an academic education," he said.

"A university education consists of both academic and non-academic activities. It is really worthwhile giving some priority to it in the decision making of how to spend time while at university.

"So, the first part of the warden's job is to encourage students to have a broad view of what university education is about. The second part is to manage the funding and facilities which together provide a whole range of opportunities for students to enter into cocurricular activities and to receive helpful services."

He has seen many changes in the way that students make use of the Union's facilities and services. In particular, he says that students of the 1990s see university in vocational terms, whereas their counterparts of the 1960s saw it as a step towards their personal development.

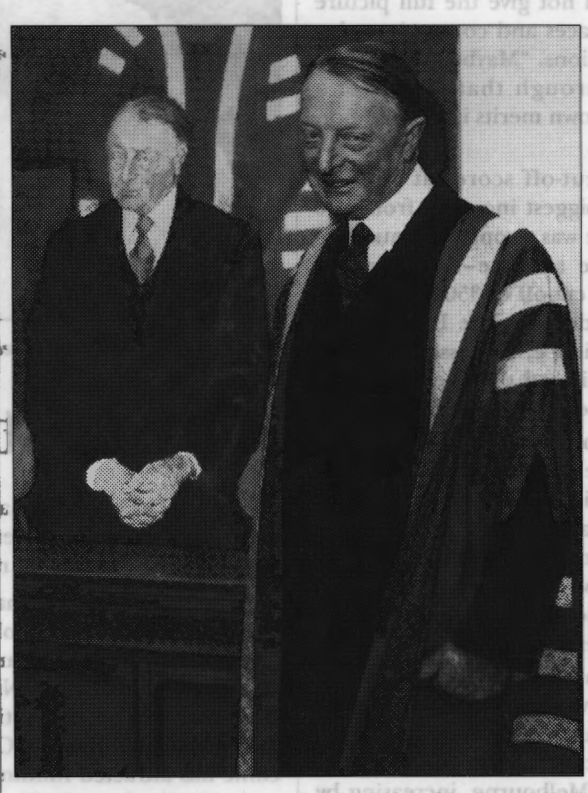
"This, however, does not relate to a lot of mature and part-time students who still look at being at university as a way of really broadening their understanding of what life is about," Mr Sweeney said.



Mr Graeme Sweeney.

While he is reluctant to draw attention to any particular achievements as warden, he looks back with pride on the development of extensive facilities for Monash students.

"I'm sad about leaving so many people who I've got to know well, enjoyed working with and tackled challenges with. But I'm also relieved, in the sense that 30 years is a long time, and that which drew me to the university in the first instance is clearly a different set of circumstances to that which now prevails," he said.



Sir George Lush at the unveiling in Robert Blackwood Hall of his portrait by Clifton Pugh.

Chancellor's term finishes

Sir George Lush, Chancellor of Monash since 1983, has not sought a further term this year.

A dinner at the Hyatt-on-Collins hotel last week paid tribute to his service to the university, spanning more than a decade. He was also a member of the Council from 1969 to 1974.

Sir George served as a judge of the Supreme Court of Victoria from 1966 to 1983, following a distinguished legal career. A Queen's Council, he served as chairman of the Victorian Bar Council, president of the Australian Bar Association, and was a former commissioner of Overseas Telecommunications Commission.

The new chancellor, approved by Council late last year, is Mr David William Rogers, a well-known figure in business and legal circles.

Mr Rogers, 65, is the senior partner with the law firm Arthur Robinson and Hedderwicks, and chairman of Woodside Petroleum and the AMP Society's Victoria Board of Advice. He holds other directorships, including membership of the BHP board.

Arts precinct to link venues

Planning for a new Performing Arts Building is well under way, with tenders expected to be completed by September this year.

The building, which will be adjacent to the Main Library, will form a central component of the planned Monash arts precinct, linking up with Robert Blackwood Hall on one side and the Gallery and Alexander Theatre on the other.

The arts precinct idea was put forward by Head of the Department of Music, Professor Margaret Kartomi, in her letter to *Montage* in October last year.

Extensions to existing buildings housing the Law, Arts and ECOMAN faculties will be made to alleviate overcrowding and take account of departmental shifts within those faculties.

- In addition, several landscaping projects are under way on the Clayton campus:

The stand of pine trees west of the Eastern Science Lecture Theatre, and shrubs in the Forum have been removed in the first stage of an upgrading plan.

Landscaping of the area next to the science theatres will take place over two years. It will include seating, several pergolas, raised garden beds, a fountain and new paving.

In the grounds in the Forum, between the Union and Menzies buildings, advanced native trees have been planted in the existing garden beds and a new watering system installed.

RESEARCH MONASH

Untangling a genetic mystery

Up to half a million children die in developing nations every year from bacillary dysentery, contracted from water contaminated by pathogenic strains of Shigella *bacteria. Research at Monash into how the virus works will point the way towards methods of controlling the disease.*

Dysentery induced by the *Shigella* bacteria is not just a problem in developing nations with contaminated water supplies.

In developed nations, it is a problem among minorities that suffer from poverty, malnutrition and poor hygiene. American Indians living on reservations are at risk, as are the Australian Aboriginals.

Dysentery is 30 times more common in Aboriginal communities in the Northern Territory than in the general population. In its most severe forms, dysentery can kill a child weakened by malnourishment or without access to appropriate medical care, within two days.

The disease responds to a combination of antibiotics and simple fluid-replacement therapy to counter dehydration, but *Shigella* bacteria vary in their capacity to cause illness. Some strains cause acute shigellosis, while others cause only mild infection.

The genetic basis for this variation remains a mystery. If scientists could trace the series of genetic events that allow the bacterium to attach to and infect the cells lining the human gut, and link those events to the activity of specific genes, they might be able to develop novel ways to block or inhibit *Shigella* infections, or could develop powerful new vaccines through genetic engineering.

For his PhD study in the Department of Microbiology under the supervision of Dr Ben Adler, Dr Kumar Rajakumar has been investigating mutant strains of *Shigella flexneri*, a species of intermediate virulence.

He is collaborating with a microbiology research team headed by Drs C. Sasakawa and M. Yoshikawa at the University of Tokyo. The team has artificially generated the mutant strains in an attempt to define key genes – called virulence genes – involved in the infection process.

Shigella bacteria have proved difficult to study because they do not infect laboratory rats or other rodents – only humans and some monkeys. However, they do cause a mild inflammatory reaction in guinea pigs, allowing researchers to discriminate between potentially virulent and harmless strains. Selected virulent strains can then be tested by infecting special cultures of human cells.

Dr Rajakumar says the Tokyo team used a 'shotgun' mutation technique to produce more than 9000 mutant strains of *S. flexneri*. Like most other bacteria, *Shigella* keeps some of its virulence-genes – as well as genes which confer resistance to some of the antibiotics commonly used against it – on loops of DNA called plasmids.

Plasmid genes can be duplicated readily and passed around with other bacteria, facilitating the spread of genes that enhance survival. A plasmid's encoded genes are a variable kit of survival tools that can be passed between bacteria, or disposed of when they no longer serve a useful purpose.

"A great deal of work has been concentrated on a large plasmid which is known to encode a number of virulence determinants that are common to *Shigella* and certain strains of the gut-dwelling bacterium *Escherichia coli* that can also cause diarrhoea," Dr Rajakumar said.

"The plasmid genes have been quite extensively studied, and we are now beginning to understand how the virulence genes work. There is a fairly intricate pattern of self regulation, involving feedback control."

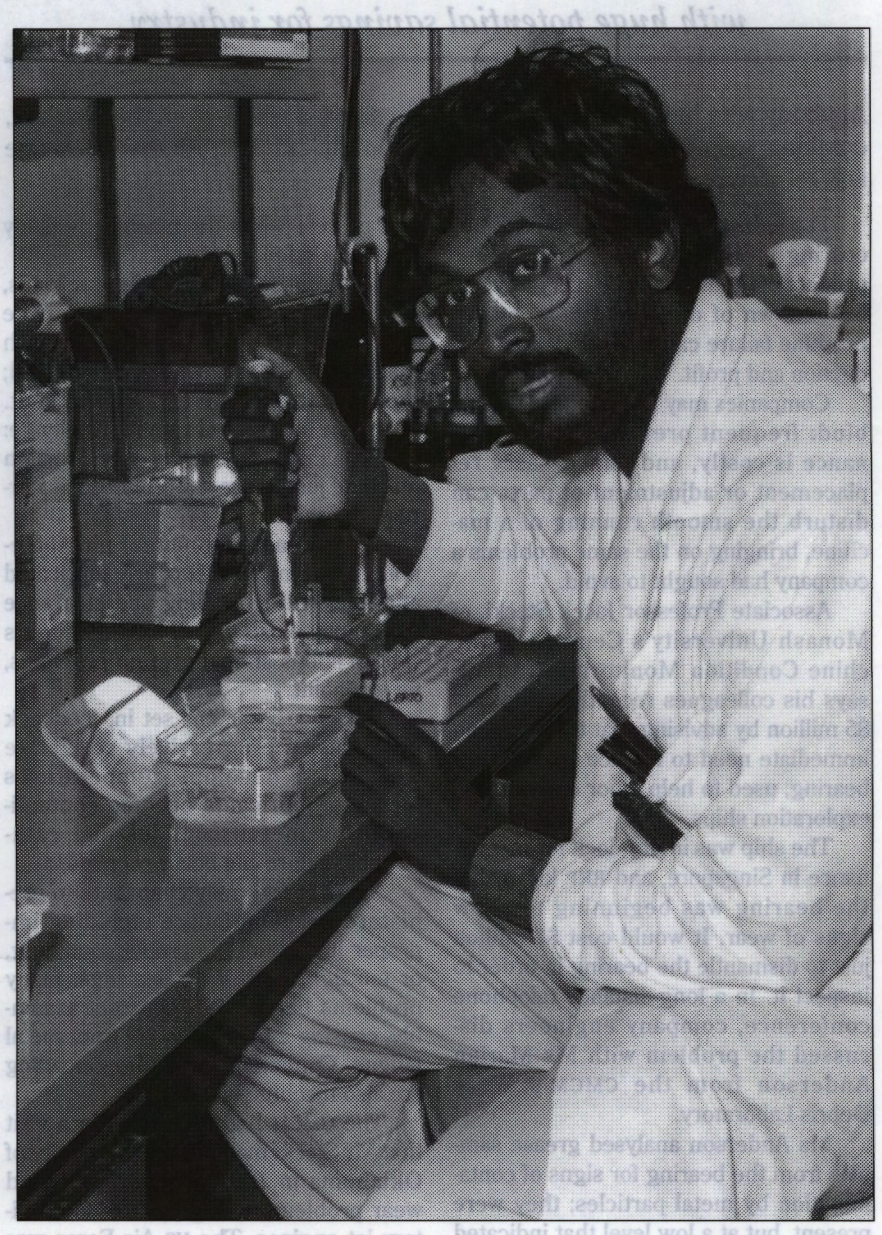
But Dr Rajakumar says other genes that are essential for the infection process are located more permanently on the bacterium's chromosome. There is constant crosstalk between chromosomal and plasmid genes.

He and his Tokyo collaborators are seeking to identify and characterise genes on the main *S. flexneri* chromosome that mediate virulence. The Japanese team isolated 50 mutant strains of *S. flexneri* that were incapable of infecting tissue-cultured cells; strains that had obviously suffered mutations in critical genes.

The chosen mutation technique also provides a way of locating the genes that have been mutated. It employs a transposable DNA element – a transposon or 'jumping gene' – that jumps at random to other sites in the chromosome. If that site lies within an important gene, the transposon deactivates the gene or impairs its activity, rendering the bacterium non-virulent.

The jumping gene can be conceptualised as both a flag and a handle. Its own DNA code can be recognised, flagging its location within the unmapped genetic terrain of the chromosome; a location that must lie within the deactivated gene.

It also serves as a handle because the molecular biologist can use a DNA probe complementary to the code of the jumping gene to recover it from the chromosome. Typically, the probe brings with it some of the chromosomal DNA flanking the site where the jumping gene was inserted, providing the molecular biologist with segments of the disrupted gene.



Dr Kumar Rajakumar: infections could be blocked or inhibited, and powerful new vaccines developed via genetic engineering.

These segments can in turn serve as DNA probes to recover flanking regions from further along the disrupted gene. Step by step, the molecular biologist can recover and reconstruct the entire code of the gene by matching up shared DNA sequences on different fragments.

Dr Rajakumar focused his efforts on one particular strain, and one mutant gene. He employed a technique that cut the chromosomal DNA into fragments about 6 kilobases long (1 kilobase equals 1000 letters of DNA code). The fragments are duplicated and inserted into *E. coli* bacteria.

These are then grown on media containing the antibiotic, kanamycin. Ingeniously, the transposon has a gene embedded in it, which confers resistance to this antibiotic. Logically, any bacterial colony that survives exposure to kanamycin in its growth medium should contain the resistance gene and the transposon, and some of the original *Shigella* chromosomal DNA.

But *S. flexneri* has two other small plasmids apart from the main one and – after a frustrating lack of early success in which he consistently recovered one small 3.3 kilobase fragment of DNA – Dr Rajakumar established that the troublesome small fragment came from one of these plasmids. Apparently a transposon had jumped from the main chromosome into the small plasmid and escaped detection.

Dr Rajakumar had selected a cloning technique that generally accommodated fragments no larger than about 12 kilobases – roughly enough to accommodate the transposon, plus some four kilobases of the disrupted gene attached to either end. He could not have known that the transposon in the main chromosome was embedded in a DNA fragment exceeding this size, and was too large to be cloned into *E. coli* by the method he had chosen.

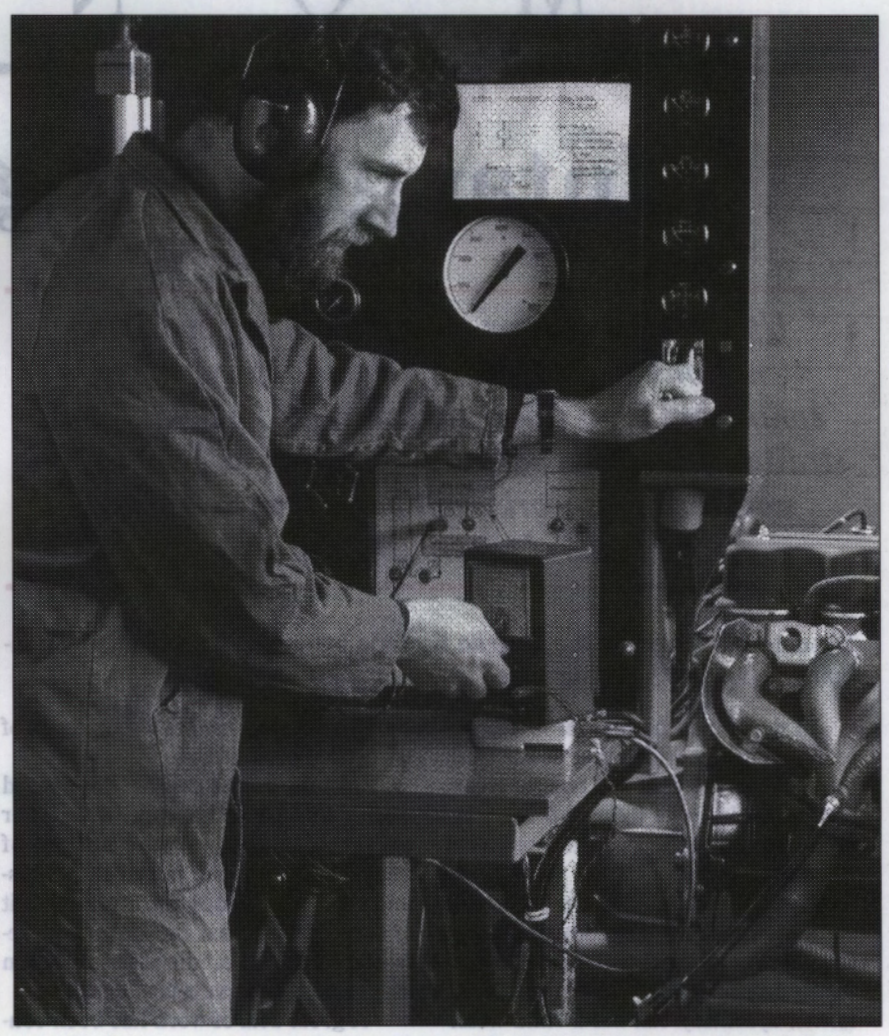
He was able to find his way round the problem by moving to a cloning technique that generated much larger DNA fragments – up to 24 kilobases. At last, the elusive transposon showed up in a kanamycin-resistant *E. coli* colony, with its flanking segments of the disrupted *S. flexneri* gene.

Dr Rajakmuar has recovered about 13 kilobases of the *S. flexneri* chromosomal DNA, which he is now decoding.

Continued on Research Monash 4

Diagnosing sick machines

All machines break down. Saying what went wrong is easy, compared to predicting future failures on the basis of wear and tear. The Centre for Machine Condition Monitoring has been working on the science of diagnosing individual machines – with huge potential savings for industry.



Performance monitoring, one of the facilities of the Centre for Machine Condition Monitoring.

Anybody who has driven a car knows the signs: a whine from the gearbox, creaking suspension, telltale blue smoke in the exhaust. All machines age and require costly repair or replacement.

For industries that rely on machines costing millions of dollars, or whose production lines could be halted by the breakdown of one small component, machine failure can seriously affect production and profit.

Companies may find themselves in a bind: frequent preventative maintenance is costly, and unnecessary replacement or adjustment of parts can disturb the smooth running of a machine, bringing on the same problems a company had sought to avoid.

Associate Professor Jacek Stecki, of Monash University's Centre for Machine Condition Monitoring (CMCM), says his colleagues recently saved BHP $5 million by advising that there was no immediate need to replace a large slew bearing, used to help moor one of its oil exploration ships.

The ship was in dry dock for maintenance in Singapore, and BHP knew that the bearing was beginning to show signs of wear. It would cost $1 million just to dismantle the bearing in order to inspect it. In a long-distance telephone conference, company engineers discussed the problem with Ms Marian Anderson from the CMCM's Wear Debris Laboratory.

Ms Anderson analysed grease samples from the bearing for signs of contamination by metal particles; they were present, but at a low level that indicated the bearing would not fail for about two years.

Mr Bruce Kuhnell, who heads the CMCM, says the advice given to BHP highlights the major difficulty in machine fault diagnosis and prognosis. Detecting and quantifying wear is one thing, but predicting from the current rate of wear when the machine is likely to fail is a science in itself.

Different materials, different loads, and different types of wear influence how soon the component will fail. Each machine behaves like an individual; prognosis must take this into account. Research into prognosis is a challenge: "We can't experiment with a $50 million machine just to see if a prognosis is correct," he said.

Wear is an exponential phenomenon. A bearing kept properly lubricated and kept within loading and clearance tolerances close to the manufacturer's specifications should give no problems, up to a point.

But once wear has set in, feedback mechanisms progressively accelerate wear: 'slap' develops, temperatures increase, lubricants become contaminated by metal particles and catastrophic failure can occur soon after.

Many factors may contribute to premature machine failure including improper lubrication, improper mounting, or too tight a fit. With bearings, many problems begin with incorrect assembly, causing a bearing to fail from metal fatigue. Contamination and overloading are also machine killers.

The CMCM had its origins in a visit that Mr Stecki made to the University of Oklahoma in 1981, where he studied wear problems in highly-stressed military jet engines. The US Air Force was experiencing a high engine failure rate due to metal fatigue; each engine cost $2 million to replace, $200,000 to remove for inspection, or just $20,000 to take lubricant samples to analyse for wear.

In industry, the loss of a machine may affect production for a few hours or days. In a military jet aircraft, the loss of an engine can mean the loss of the aircraft and possibly, of human life. Because of the rapid onset of metal fatigue, there is little margin for error in maintenance or replacement schedules.

After 200 hours, a jet engine begins to show signs of wear. Just five hours later, the wear has become so pronounced that it would be dangerous to fly the aircraft. This exponential rate of decay is typically due to metal debris entering bearing systems – a common problem in industry.

"Pushing 20 micron metal particles through the clearances in a typical bearing causes stress similar to that which a human would experience if he tried to push a football into his ear," Mr Stecki said.

Returning to Monash, he talked to several colleagues in the Department of Mechanical Engineering, including Mr Kuhnell, and Associate Professor Robin Alfredson.

They founded a machine-condition monitoring group, with support from the Australian Minerals Industry Research Association (AMIRA). It proposed a new approach to machine maintenance. Instead of scheduled maintenance at regular intervals, which can see machines failing between service intervals, regular monitoring would ensure that maintenance was carried out only when signs of incipient failure dictated.

Apart from eliminating sudden breakdowns, the approach would also help companies reduce their spare parts inventories. Mr Stecki says one large Australian company keeps $200 million worth of spare parts.

Dr Joseph Matthew joined the new group in 1982, and eight companies in AMIRA began to support research, including BHP, Alcoa, several CRA-group companies, Ranger Uranium and Mt Isa Mines. Mr Stecki says that apart from an $80,000 establishment grant from the university, the group has been funded solely by industry.

Two years ago the research group gained independent status as the Centre for Machine Condition Monitoring. Its research focuses on three modes of machine failure:

- Fatigue – involving scuffing, wear or spalling (the lifting of small surface patches of metal);
- Abrasion – involving the interaction of two or three components, when metal particles find their way into the gap between working surfaces;
- Adhesion – metal to metal contact results in a kind of spot-welding after lubricant failure.

"What is unique about our activities is that we combine vibration studies with wear debris analysis," he said.

"Other groups may specialise in one or the other, but if you go to the doctor and he tells you there is only one method of checking your health, you'll probably want a second opinion. By using integrated techniques, rather than regarding them as competing with one another, you can offer the best mix for a given problem."

While studying how metal fatigue influences the service life of roller bearings, CMCM researchers made a disturbing finding.

"Roller bearings are sold with manufacturer's ratings which are supposed to ensure that if they are not loaded beyond a specified limit, they should not fail within a certain service lifetime," Mr Stecki said.

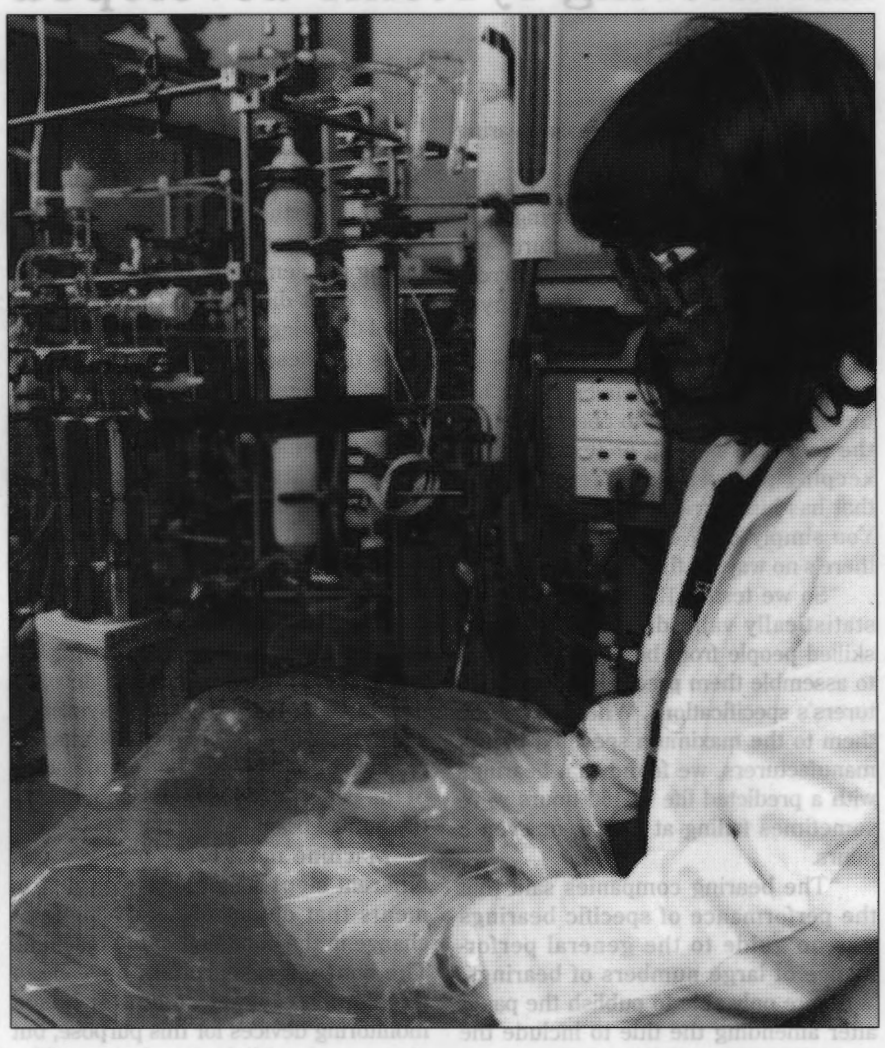
"We were originally trying to determine why so many bearings seem to fail prematurely, and we were testing to determine whether the lubricant enhancer molybdenum disulphide increases bear-

Continued on Research Monash 4

Centre for Machine Condition Monitoring staff (from left): Administrative Secretary Ms Anna Maltezos, centre founder Associate Professor Jacek Stecki, Principal Wear Analyst Ms Marion Anderson, Deputy Director Dr Joseph Matthew and Director Mr Bruce Kuhnell.

Orchestrating the new conductors

Atomically thin layers of semiconductors deposited on wafers could prove vital in future optical fibre telecommunications and remote heat sensing. At Monash, researchers are synthesising the compounds to be used in these and other applications of a technique called MOCVD.



A postdoctoral research fellow working with components which are sensitive to air. The transparent glove bag encloses a nitrogen atmosphere.

In the past quarter of a century, the manufacture of semiconductors has become one of civilisation's most important industries. Occupying a twilight zone between conductors and insulators, semiconductors conduct electricity when bathed in light.

Light-emitting diodes, diode lasers, transistors and complex microchips all are manufactured from semiconducting materials such as silicon and gallium arsenide. Ions can be implanted in silicon by exposing them to intense radiation in nuclear reactors, or by using electronic guns.

But the most flexible and accurate way of producing complex semiconducting circuits is to deposit atomically thin layers of metal-doped semiconductors by metal organic chemical vapor deposition (MOCVD). In the Department of Chemistry, Professor Bruce West, Dr Ron Dickson and Dr Glen Deacon are leading research into the synthesis of novel compounds for specialised microelectronic devices produced by the MOCVD route.

Professor Bruce West explains that the process involves the synthesis of volatile metal compounds that will decompose when heated in the gaseous state, and then condense as metal alloys on a substrate – usually a 5 cm wafer of gallium arsenide (GaAs). The deposited material grows in atomic layers, rather like a crystal growing in a supersaturated solution. This is referred to as the epitaxial growth of the semiconductor material.

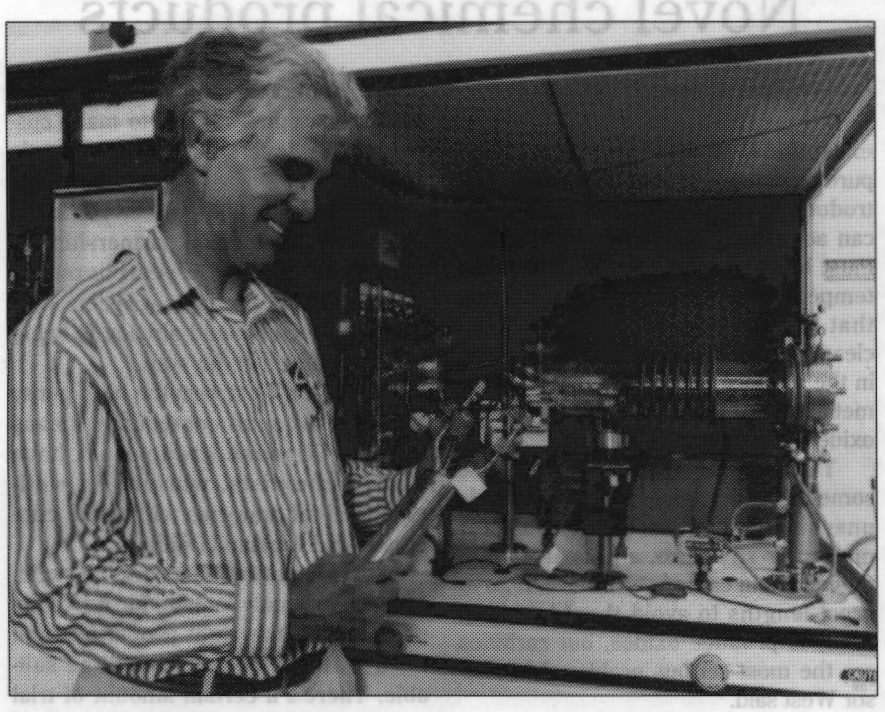
Monash graduate Dr Geoff Pain is doing this work at Telecom's Research Laboratories, just over the road from Monash University, using a commercial MOCVD reactor. Semiconducting devices, including a novel laser diode that projects its beam vertically instead of horizontally from the surface of a chip, have been developed by other Telecom researchers.

The group uses mercury, and volatile cadmium and tellurium compounds which are mixed and then are vaporised in a reducing atmosphere of hydrogen, condensing out on the GaAs surface as mercury cadmium telluride (MCT). MCT is a semiconductor with the novel property of being sensitive to light in the mid infra-red region.

Modern telecommunications use optical fibres to transmit information in the form of pulses of visible light; infrared light travels more efficiently along optical fibres than visible light, but the problem then is to detect it and transmit it across junctions. MCT devices mediate this conversion of optically-encoded information into electronic signals, underpinning the new technology called optoelectronics.

In the longer term, MCT sensors and switching devices will be important for the development of a new optical fibre telecommunications network based on ultratransparent fluoride glasses, being developed by other Monash and Telecom researchers. However, the momentum already acquired for the current generation of silica glass fibres means that fluoride glass optical fibres may not supersede them until early in the next century.

Professor West says that in any situation where remote heat sensing is important – medical, instrumentation, security – MCT is potentially important. Because of its continuously variable energy gap, and its inherently high operating temperature, MCT has become the leading intrinsic infra-red detector material. Certain compositions correspond to atmospheric transmission windows; hence its surveillance applications.



Associate Professor Ron Dickson holds a 'bubbler' container, which contains chemicals used in the MOCVD process. The bubbler is connected to the MOCVD reactor, which grows the conductor materials.

The research partners received funding under the Grants for Industrial Research and Development (GIRD) scheme in 1989 to pursue their research into the development of techniques to produce and characterise of optoelectronic materials and devices. Recently they were awarded a second GIRD grant to work on epitaxial growth of compound optoelectronic materials.

In each grant CIG and BHP are the commercial partners. Professor West says the project has been strengthened by an ARC grant to study the basic chemistry of these volatile organometallics, with Associate Professor Ron Dickson as principal investigator.

Research students involved in the work include Ms Kerryn Heagle and Ms Rebecca Berrogam.

"The thrust is towards providing the technology that will underpin the manufacture of devices for specific uses," Professor West said. "So we are now angling our chemistry towards special organometallic compounds – customised compounds – which can be used as dopants in the mercury cadmium telluride, to produce specific effects in semiconducting wafers.

"When a dopant has been targeted, the skill is to turn it into a volatile organometallic compound that will behave like the those of cadmium and tellurium in the MOCVD chamber. Some of the dopant element must take the place of the semiconductor metals in the material being grown."

Professor West says one interesting metal is manganese, which, used as a dopant, offers the promise of semiconductors whose electrical or optical properties can be 'tuned' by a variable, external magnetic field. A manganese compound prepared at Monash has aroused considerable interest overseas. It is superior to the compound presently used to prepare diluted magnetic semiconductors.

Another member of the Monash research group, Dr Glen Deacon, has been contributing his expertise in rare earth element chemistry. Rare earth elements, added as dopants, could produce electroluminescent or photoluminescent materials. In the former phenomenon a material emits light when an electrical current is passed through it; in the later, materials respond to light byemitting light of a different wavelength.

Depending on the nature of the rare earth dopants, it may be possible to produce devices that will emit pure colours for use in flat screen televisions, computers and other display devices.

Professor West says researchers are seeking to build tiny switches, called n-p junctions, into optoelectronic devices. The MCT grown in this project is intrinsically n–type. To create a n–p junction, selected regions of the material must be converted to p–type. The most promising dopant elements for this purpose are arsenic, antimony and bismuth.

"We are trying to synthesise volatile organometallic compounds to be used in MOCVD to produce MCT layers with one or other of these elements in them," Professor West said. "An antimony compound of considerable promise is being assessed.

"We synthesise the compounds, Telecom makes the materials, and the wafers are then analysed at the CSIRO Division of Materials Science and Technology by Dr Steve Wilkins and his group to determine their physical properties, topography and composition. Telecom then takes the wafers and builds up electronic components on them."

Professor West says the chemicals which are used in MOCVD need to be of

Continued overleaf

Computer-based machine monitoring systems developed

From Research Monash 2

ing life. It does: it can increase bearing life by up to 60 per cent.

"If the buyer picks a bearing with a particular rating and the bearing then fails prematurely, the manufacturer will usually claim it was due to incorrect mounting or lubrication. The buyer can't prove otherwise.

"Manufacturers will sometimes increase the rating of their bearings, but the buyer has no way to check whether the increase is real, or just a way of keeping pace with another company that has just increased its own ratings. You simply can't catch them because there's no way for the buyer to check.

"So we tested 120 bearings, to get statistically valid data, and we used skilled people from bearing companies to assemble them precisely to manufacturers's specifications. When we loaded them to the maximum specified by the manufacturers, we found that bearings with a predicted life of 150 hours were sometimes failing at 21, 15, or even 8 hours.

"The bearing companies said that the performance of specific bearings was no guide to the general performance of large numbers of bearings. We were only able to publish the paper after amending the title to include the words 'heavily overloaded bearings'."

The centre works very closely with industry, and has established a corporate membership scheme under which companies pay an annual fee that entitles them to monitor CMCM research and obtain privileged access to new diagnosis techniques and research data that could help them improve their machine condition monitoring programs and reduce maintenance costs.

Companies also gain access to the centre's expertise, and may offer suggestions for further research. Staff can be seconded to the centre for training, and companies also get computer software and hardware developed for machine monitoring.

Ms Anderson and other staff members also go out into industry to conduct technology transfer programs, explaining new techniques and teaching staff how to apply them. The centre also carries out consultancy and trouble-shooting work.

Several years ago Mr Stecki was called in by the Ranger Uranium mine in the Northern Territory, which was having problems with bacterial contamination of its diesel fuel. The bacterium, an oil-digesting species of *Pseudomonas*, turns the diesel fuel into a black slime that clogs engine fuel lines and injectors, requiring expensive maintenance of large ore-hauling machines.

Mr Stecki found that the contamination did not begin on the Ranger site. He showed it originated in the storage tanks of the company supplying the diesel fuel, and so the mine changed its supplier.

The CMCM's research programs have recently extended to the development of expert diagnostic systems, based on computer neural networks; sophisticated programs that mimic some of the pattern-recognition capabilities of the human brain.

Machine monitoring involves five different steps, beginning with instruments that detect the early signs of change in the condition of the machine. The centre's researchers have been developing special computer-based monitoring devices for this purpose, but also uses established techniques like analysing lubricants for metal or chemical contamination, or looking for temperature changes as a result of increased friction.

Diagnosis follows: Sick machines display certain syndromes – patterns of symptoms that may point to a specific cause. Continuing research to define specific syndromes underpins the development of expert systems.

The next step is the most difficult – prognosis: How long before the component or the machine fails? Each machine is different, and the cost of testing machines to destruction is prohibitive, so a visiting researcher from Shanghai University, Mr Luo MingFei, is applying mathematical techniques based on Gray's theory, which describes the underlying nature of catastrophic failure.

A technician carrying out lubrication and wear monitoring.

Then comes prescription: The client is advised on what to do, or sometimes, not to take any action. The final phase is the post-mortem: What was the outcome of the previous steps, and how could they have been improved?

The CMCM has been developing a computer-based vibration-monitoring system, called AVtech. This on-line system can monitor many different machines via fully automatic remote stations; each station can take data from up to 16 channels of data, and stations can be linked to produce a network of 4000 monitoring points, represented by vibration transducers.

Groups of personal computers, each monitoring up to 256 points, collect vibration data and send it to a host computer for analysis. An expert system called Prophet has been developed to diagnose syndromes indicating potential failure. The host computer sounds an alarm if it detects signs of failure, indicates which machine is involved, and offers a preliminary diagnosis of the nature of the problem.

The system is being marketed by the Monash Professional Group, and further development funds for a more advanced system, based on neural networks, are being sought through a corporate syndicate which is being organised by the university's commercial company, Montech.

CMCM researchers also are developing a low-cost hand-held computer, based on the AVtech system, that can be plugged into a transducer on a machine to collect data. It will be used where a machine is critical to a process, but the owner cannot afford to install a large, permanent AVtech network.

Mr Stecki has been investigating ways of monitoring contamination in hydraulic and lubrication systems. He is adapting a device called a nephelometer, developed by Dr Clive Coogan of the CSIRO, originally developed to monitor fat levels in milk.

The nephelometer, applied to monitor contamination in hydraulic systems, would monitor the scattering of infrared light off metal particles in hydraulic fluid, via optical fibres permanently set into the hydraulic line.

Aircraft designers currently use a system of magnetic plugs, which cause metal particles to signal their presence in hydraulic fluid via an induced electrical field. Such sensors are expensive; an order of magnitude more costly than the system proposed by Mr Stecki.

The CMCM has signed collaborative research agreements with key overseas institutes in the same field, including Krakow Technical University in Poland, the Israel Institute of Technology, the National Research Council Institute for machine condition monitoring in Italy, and the Vibration Institute in the US.

Mutant bacteria mapped

From Research Monash 1

On all indications, it plays some role in synthesising the lipopolysaccharide coat of the bacterium – a glutinous layer consisting of a complex of sugars and lipids. The mutant *S. flexneri* strain has a defective coat that may prevent it colonising the gut, or which makes it vulnerable to attack by the immune system's defensive arsenal.

The Tokyo University team has identified three different regions, or loci, in the main chromosome that play some role in synthesising the lipopolysaccharide coat. They are designated by the code names RFA, RFB and RFC.

Dr Rajakumar's mutant is in the RFC category. He has subsequently mapped five further RFC–type mutants with all of the transposons inserted somewhere within a 2.4–kilobase region of the chromosome.

"This region is of major interest, because we can now introduce small DNA fragments taken from a virulent wild strain of *S. flexneri* into the mutants, to see if they restore virulence," he said. In this way, Mr Rajakumar and his collaborators hope to identify the specific genes that confer virulence, and then correlate them with functional properties of the proteins or enzymes encoded by those genes.

These functional regions are simultaneously the bacterium's strength – they are essential for the process of infection – and its weakness. They can be targeted by vaccines or an emerging generation of drugs designed specifically to interfere with virulence mechanisms in bacteria and viruses.

"From a long-term viewpoint, it is of great interest to understand the specific mechanisms of pathogenesis, and to define critical elements that will indicate what approach you might use to control the disease," Dr Rajakumar said. "This is very basic research – the applications will come later."

Novel chemical products

From Research Monash 3

exceptional purity – 99.999 per cent pure or better – so that they will not introduce unwanted impurities that also can act as dopants. The pure material must be capable of vaporising at room temperatures. Another requirement is that the compound should undergo clean pyrolysis (decomposition by heat in the absence of oxygen) to yield pure metals, free of contamination by metal oxides or carbides.

This can be very tricky, because some of the organometallic compounds unavoidably contain oxygen in their molecular structure, and nearly all of them contain carbon. "We have to go to great lengths to avoid them breaking down to produce oxides, but carbides are the most serious problem," Professor West said.

The outcome of the Monash team's work will be novel chemical products, not previously available in the marketplace, that microelectronics manufacturers, semiconductor producers and research groups will use to make customised epilayers or microelectronic devices.

These compounds will be marketed through a commercial partnership between the Monash researchers and CIG's chemical products division. One manganese compound already is being commercialised in this way.

Professor West says the high purity required for such compounds means that the Monash group must have skilled chemists, working in well-equipped laboratories with fume cupboards and vacuum facilities.

"This is not routine work," he said. "We're constantly looking for new compounds with the right properties, and it's not always clear what will be suitable. There's a certain amount of trial and error until we get on the trail of something with the right composition and properties that give the volatility we're looking for."

Fibre and paper grant boosts APPI's research

The Australian Pulp and Paper Institute (APPI) has obtained research funding from the Federal Government worth $3 million for a Cooperative Research Centre (CRC).

The CRC for Hardwood Fibre and Paper Science has been established by the institute in collaboration with the CSIRO Division of Forestry Products, Melbourne University's School of Forestry and the Pulp and Paper Manufacturers Federation of Australia.

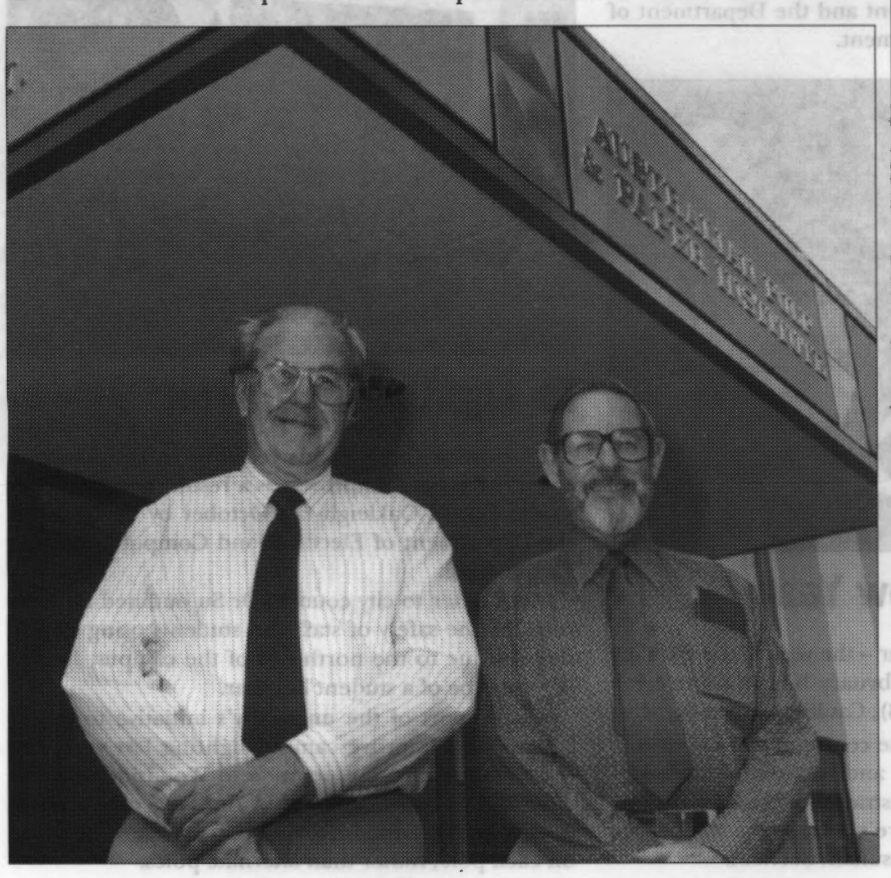
The CRC is to be housed in the $1.7 million APPI building, opened in June 1991 on the Clayton campus. According to the APPI's research director, Dr Peter Nelson, the CRC is just one of the institute's many achievements since it was set up in 1989.

He said the institute had advanced the international competitiveness of the Australian pulp and paper industry through research and by producing a more specialised workforce through graduates. About 10 graduate diploma, master's and PhD students graduate each year from APPI courses.

A founder of the institute, Dr Nelson said the aim was to increase this number to about 18 students per year. However, more funding was needed to both increase the output of specialists into the industry and to complete the new APPI building.

At present, the building has only one fully furnished laboratory. The other six – including a constant temperature humidity laboratory for measing fibre properties – are incomplete.

The two-level building also has six offices, one lecture room and a computer simulation room.



Acting director of the APPI, Professor Frank Lawson (left) and the institute's research director, Dr Peter Nelson.

Monash medievalists (from left) Dr Constant Mews, Dr Carol Williams and Ms Mary Atchison view a facsimile manuscript in the music department library.

Medieval sounds revisited

Three Monash medievalists are playing key parts in medieval music events. A workshop, concert and visit by a world-renowned musicologist have been organised jointly by Monash, LaTrobe and Melbourne universities.

Professor Hendrik van der Werf, an internationally renowned authority on medieval musicology, will be keynote speaker at the workshop, *Medieval music in theory and practice: Interpreting the manuscript record.*

Dr Carol Williams of the Department of Music, Dr Constant Mews, Department of History and Ms Mary Atchison, a doctoral student in music, will talk about their recent research of manuscripts in Australia and overseas.

Students will have the opportunity to study ancient manuscripts at the State Library of Victoria with Professor van der Werf – a leading figure in medieval troubadour music, as well as medieval plainchant and polyphony – and specialists from around Australia.

Professor van der Werf – author of *The Chansons of the Troubadours and Trouveres* and other books on both the secular and sacred medieval repertoire – is best known for his radical questioning of traditional assumptions about medieval music transmission.

In his second visit to Melbourne in five months, Professor van der Werf says he finds the intellectual environment in Australia exciting because of the opportunity for dialogue between different disciplines.

The workshop, from 25 to 27 February, will combine many disciplines including history, visual arts and Italian.

Dr Mews, an Australian Research Council grant recipient, is to speak about the influence of thinking about music in the Middle Ages. He is particularly interested in the ideas developed by a visionary of the 12th century, Hildegard of Bingen (1098–1179). Dr Williams has been studying an 11th century manuscript containing a treatise on music written by Boethius in the fifth century, and another on polyphony, written in the ninth.

In association with the workshop, Hildegard of Bingen's Ordo Virtutum is to be performed by Viriditas at Trinity College Chapel, Parkville, on 26 and 28 February at 8 pm.

RESEARCH BULLETIN

New angle on HIV study

A multimedia system for modelling AIDS biology is set to provide researchers with a new means of studying the HIV virus.

Computational Tools for Biological Research, a joint project between Monash University, the University of Milan and the Macfarlane Burnet Centre for Medical Research, will provide research biologists for the first time with a means of interacting visually with a model of the AIDS infection process.

According to information scientist and coinventor, Mr Henry Linger, of the Department of Information Systems, Caulfield campus, the new system has no parallel anywhere in the world.

The program – which consists of the latest documentary and animated information on AIDS – allows biologists to navigate the course of the HIV virus, from primary infection to its latter stages.

An initial overview depicts the methods of infection and means of virus integration. Each process of the disease is described in full and shown as a node on the computer map.

After highlighting the area of interest, users can browse through the information by choosing the amount of detail they require from explanatory text to abstracts derived from bibliographies on CD-ROM. Annotations also may be added at this point.

At each stage, users may also watch a fully animated version of the infection on an accompanying screen. The level of detail here may also be selected.

In time, says Mr Linger, biologists will even be able to use the program to conduct experiments on the computer model. A prototype of the program was demonstrated successfully at the Seventh International AIDS Conference, held in Florence in June.

China's waste dilemma

Waste water treatment in China could soon benefit from work done at Monash into a low-cost, low-tech alternative to modern sewage treatment plants.

Monash water pollution expert Mr Tom Davies, a senior lecturer in chemistry at the university's Caulfield campus, was one of two foreigners invited to attend a wetland conference in Shenzhen late last year. The wetland seminar was attended by about 80 delegates from universities and government agencies throughout China.

Mr Davies has been experimenting with reed bed purification systems – a sort of artificial wetland which removes biological wastes. *Research Monash* reported last year on the technique which uses a biological partnership between plant rhizomes (rootlike subterranean stems) and bacteria to trap and digest the wastes that remain suspended in the water after primary settling treatment.

"Two papers on our constructed wetlands work were given at the conference in English with a Chinese interpreter translating into Chinese," Mr Davies said. "They were well received and the technical information will be helpful in the application of constructed wetlands in China."

In addition, he gave two lectures to scientific and engineering staff of the South China Institute for Environmental Sciences, which conducts environmental investigations, designs waste water treatment systems and conducts research using pilot-scale constructed wetlands.

"Although the first constructed wetland in China was built early in 1990, there are about 70 small units either being constructed or at the design stage," he said. "The Chinese people have a great need for western knowledge to prevent and solve environmental problems which are just starting to show."

Mr Davies said problems had been caused by the rapid expansion of population and manufacturing, particularly in the new Economic Zones where foreign capital is welcomed for huge joint ventures. "Much manufacturing already has been transferred from Hong Kong, resulting in large numbers of people from the north relocating in these special zones," he said.

▼ Science teaching award

Mrs Christine Redman (below), a graduate of the School of Early Childhood and Primary Education, has won a $15,000 BHP Science Teacher Award.

The award was for her work at Somers Primary School and at other schools on the Mornington Peninsula. She was one of four national recipients, recognised for their efforts to support, contribute to and improve the teaching of science in Australian schools.

Mrs Redman completed her BEd after taking a Diploma of Teaching (Primary) at Frankston, and is taking a MEd by research and thesis at Monash.

"The award acknowledges my attempts to facilitate science teaching in primary schools," she said.

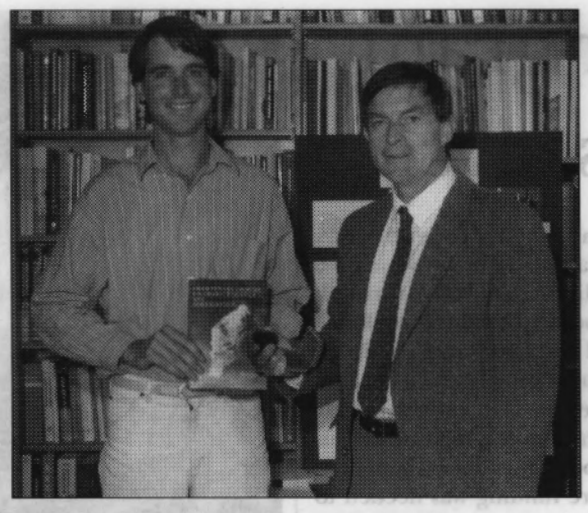
■ Libraries honoured

Three Monash libraries have been presented with certificates from the National Library of Australia, recognising their length of service and cooperation with other Australian libraries.

A senior representative from each library accepted a certificate from Director of the National Library of Australia's Network Services Branch, Mr Warwick Cathro, at a ceremony late last year at the Royal Melbourne Institute of Technology.

The libraries are the the Monash University Library, Caulfield-Frankston branch; the Monash University College Gippsland Library; and the Victorian College of Pharmacy Library.

Accepting the awards were Caulfield-Frankston cataloguing supervisor Ms Jean Tindall, MUCG cataloguing librarian, Ms Kay Steel, and VCP librarian, Mr Robert Thomas. The certificate honours the libraries for 10 years of contribution to the Australian Bibliographic Network.



▲ Publication medal

Mr Stuart Boucher (above left), an MA student from the Department of Geography and Environmental Science, has been awarded the Australian Society of Soil Science Publication Medal for 1991. He is pictured with the director of the Graduate School of Environmental Science, Professor Martin Williams.

He received the award for his monograph 'Field tunnel erosion: Its characteristics and amelioration', published by his department and the Department of Conservation and Environment.

▲ Chinese New Year

The 1992 Chinese New Year – the year of the monkey – was celebrated on 4 February by the Centre for International Students (CIS), Caulfield campus.

Staff and students of the centre welcomed visitors with a cup of Chinese tea and traditional food. Pictured above are CIS administrative oficer, Ms Daniele Hartridge, and the centre's Singapore agent, Mr Fabian Er, of Insworld Consultant Services.

▼ Korean exchange

Mr Edward Holdaway (below) of the Department of Asian Languages and Studies is the first Monash scholar to undertake a Korean exchange program.

Beginning this month, Mr Holdaway will complete the second year of his master's in Asian studies at Yonsei University. The university has granted him a $1000 travel scholarship.

A Monash science graduate, he holds a postgraduate diploma in tourism management. He said with Asian migration and trade with Australia increasing, a master's in Asian studies would be of great use.

"Although English is the most widely used language for international business, it is important to know the customs of the country you are doing business with," Mr Holdaway said. "Living in a country is very important for picking up these things."

■ Lighting upgraded

Lighting on three roads leading to the Clayton campus has been improved as a result of a letter sent to the City of Oakleigh last October by Dr Qi Su of the Department of Electrical and Computer Systems Engineering.

In a letter to city council, Dr Su outlined his concern for the safety of staff and students using Woodside Avenue to the north-east of the campus, following the rape of a student last year.

In support of the university's initiative to spend $190,000 to improve campus lighting last year, the council approved the upgrade to Woodside Avenue. The SEC has also upgraded lighting on Bayview Avenue and Gardiner Road. Lights are now installed on each pole, rather than alternate poles.

▼ Science summer

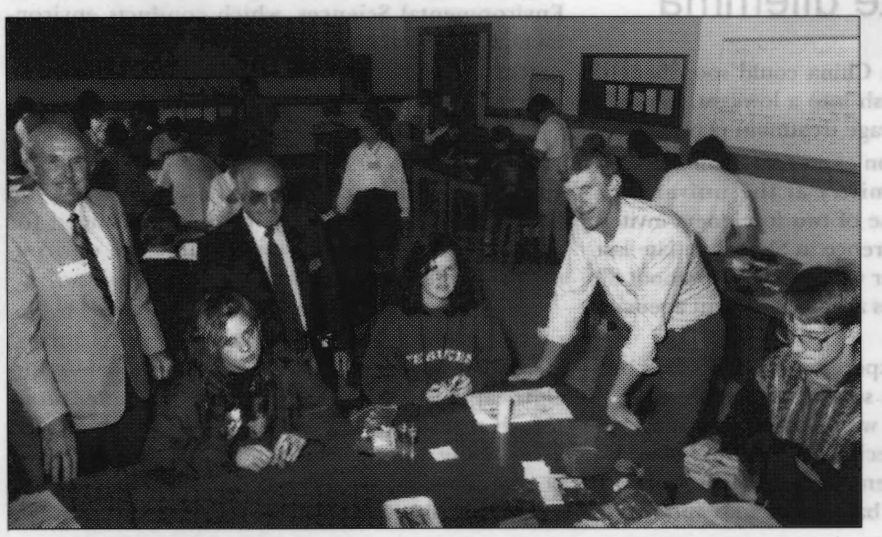
Almost 200 secondary students from the metropolitan area and schools in NSW, Tasmania and country Victoria attended a science summer school at Clayton campus last month.

The school for students beginning Year 10 was organised by the Australian Science Industries Association, Rotary and the Faculty of Science.

Its aim was to introduce students to the range of courses leading to careers in science and engineering.

Students attended lectures by Monash academic staff, including Associate Professor Ray Cas of the Earth Sciences department and Associate Professor Jim Dickson of the Chemistry department. They took part in laboratory work and excursions to CSIRO, Telecom, Dulux and BHP.

Pictured with students in the Physics department are (below, from left) Rotary district governor Mr Bruce Whitaker, Rotary representative Mr George Nixon, and physics lecturer Dr David Mills.



▲ Graphics summer

A computers and graphics summer school, sponsored by Australian Paper Manufacturers and the Gippsland paper industry, was attended this month by 25 students from eight regional high schools.

The school for secondary students about to enter Year 11 was conducted by the Digital Imaging Applications Centre (DIAC) at Gippsland campus. Over four days, students were introduced to a wide range of modern computer software and hardware.

DIAC director Professor Ken Spriggs (above, front right) said the emphasis of the course was to learn while having fun. "Each segment involved a hands-on activity, a target product and a competition between the students," he said.

Activities included a computer graphics poster competition, mathematical computer games, a competition to identify components of a dismantled computer, a physics problem developed in a maths design package and a spatial orientation computer game.

Recording Koorie dance

Introducing secondary students to Aboriginal music and dance is the main aim of a unique educational package from the Centre for Continuing Education.

The package is a general introduction to Aboriginal music and dance with emphasis on the owners, the practitioners, their beliefs and environments. It has been written for educators, especially those who teach music and dance, Australian studies and social studies in secondary schools.

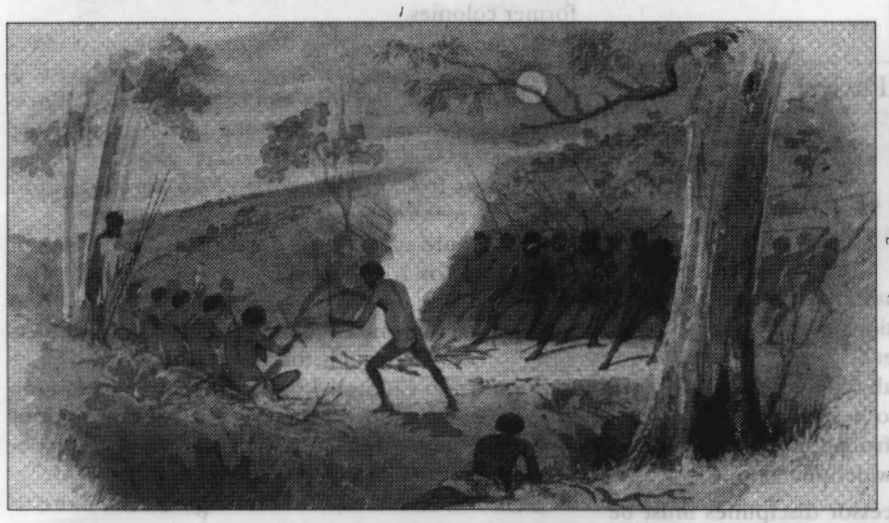
Music and Dance in Aboriginal culture was launched last month by the Deputy Premier and Minister for the Arts, Mr Jim Kennan, at the 6th Asian-Pacific Conference of Arts Educators at Frankston campus.

The author of the package is Dr Alice Moyle, the first student to gain a PhD in musicology at Monash. She is now researching Aboriginal music as honorary visiting fellow at Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra.

The package includes Dr Moyle's annotated sound recordings, collected during many research trips to the Northern Territory, north Queensland and Western Australia's Kimberley districts. The traditional songs on two audio cassettes are for learning and accompanying dance steps.

A video cassette contains selected film clips of traditional dancing and five illustrated talks, and teacher and student handbooks are also included.

For more information, contact the Centre for Continuing Education, Frankston campus, on extn 74 4240.



Detail from the cover of the resource kit.

Frames from the Thinking about drinking *comic book.*

Comic warns youth on drinking dangers

Rosa, Con, Geoff, and Jodie are normal teenagers feeling the weight of peer group pressure. They are also a major part of a new Monash and YMCA initiative entitled *Thinking about drinking*.

The national awareness campaign informs teenagers about the dangers of alcohol abuse. It aims to minimise the personal and social harm resulting from excessive drinking.

A comic, produced by the YMCA and the Centre for Continuing Education in Monash's Education Faculty, spearheads the campaign.

"Professionals and parents need more assistance in educating young people on this topic," the director of the Centre for Continuing Education, Mr Dale Ingamells, said.

Aimed at increasing the safety of teenagers in social situations, the comic uses characters based on real people to outline health risks from alcohol abuse and problems of peer pressure and how to cope.

A number of themes are presented with various focal points and teaching techniques. The project emphasises that there are alternatives to alcohol use for coping with pressures, stress and in leisure time. The development of the program involved teenagers from the Frankston area who modelled for the drawings, suggested plots and advised on dialogue and clothing.

Before its release, the comic was evaluated in about 12 Victorian schools. A detailed questionnaire was distributed to students in the target age group, and to teachers, police and other professionals.

The evaluation was carried out by Monash University and funded by the National Campaign Against Drug Abuse. Monash will continue to play an active role in the project through its distribution of the *Thinking about drinking* comic and resource kit

The finished product was endorsed by Victoria Police Chief Commissioner, Mr Kel Glare, at the launch late last year. The *Thinking about drinking* materials will be introduced in the Police in Schools program this year.

For further information, contact the Centre for Continuing Education on extn 74 4240.

Cheap thrills of yesteryear

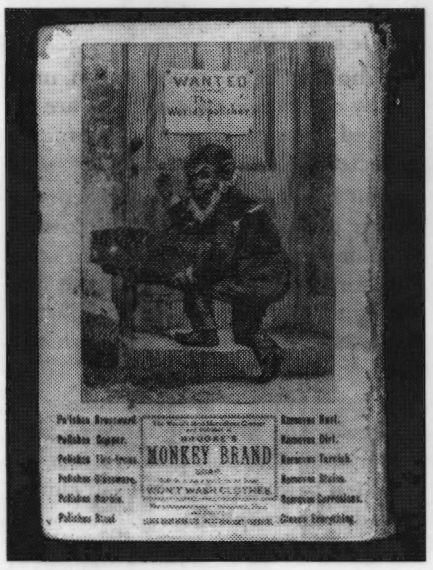
Seekers of thrilling fiction in the late 19th century often turned to tales between the covers of yellowbacks to pass idle hours while travelling.

Yellowbacks – so called because of their yellow cardboard covers – were known for their lurid pictures and sensational stories. According to rare books librarian, Mr Richard Overell, they were the down-market paperbacks of the day and were more or less disposable.

The books sprang up in response to the introduction of rail travel in the UK in the 1840s. Cheap series were written to cater for this new breed of traveller and sold in railway station bookstalls.

"The titles published in this form, and later as yellowbacks, were usually light reading but also contained non-fiction and literary classics," Mr Overell said. Their appeal lay in their low price and in their distinctive covers.

Below and above right: advertising from the back covers of Yellowbacks late last century.



"The standard yellowback cost two shillings, much cheaper than the 31/6d charged for 'three-deckers', the typical three-volume Victorian novel, or the five shillings for the single volume editions," he said.

"The cover scenes were often lurid and must have caused the yellowbacks to stand out from the more expensive cloth-covered books of the period."

Mr Overell said yellowbacks were a significant example of an important stage in publishing history. "They mark a response by the publishers to the greater demand for cheap reading matter resulting from the increase in literacy during Victoria's reign."

The yellowbacks on display on the first floor of the Main Library, Clayton campus, are all from the rare books collection. The exhibition runs until the end of March.

Language study crosses spheres

The science of language in Australia has taken a strange turn over recent years.

According to the head of the linguistics department at Monash, Professor Michael Clyne, about 75 per cent of professional linguists now work in departments other than linguistics.

This piece of information, contained in a new book edited by Professor Clyne, means that representation of linguistics in our tertiary institutions is often underestimated. But, judging by the contents of *Linguistics in Australia: Trends in research*, the work of the subject's practitioners is not.

The chapters trace the rapid development of the discipline in recent years, particularly during the late 1980s when in the space of two and a half years six professors of linguistics were appointed and the National Languages Institute of Australia established.

Given such growth and the recent spate of amalgamations, it was time to consider exactly where the study of linguistics in Australia was going, Professor Clyne said.

"Among the most important challenges facing linguists is the demonstration of the significance of their discipline to most other spheres of life and learning, and to prepare for the effects on language and communication of the advent of fifth-generation computers," he said.

Linguistics in Australia: Trends in research consists of contributions from some of the country's most influential linguists. It covers the gamut of language study, from Australian English and Australian Aboriginal languages to Australian studies of other languages, and first and second language acquisition. Also included are chapters on linguistic theory and linguistics and language policy in Australia.

SAVANT

by Marko Pavlyshyn

The old Soviet Union is dead, but its former republics are very much alive. They are now independent states with distinctive interests, historical and cultural profiles, resources and mixes of social, cultural and economic problems.

Their emergence from colonial eclipse after 70 years of Soviet domination – and, in many cases, centuries of tsarist domination before that – poses a complex task for what used to be the discipline of Soviet studies.

Gone is a reassuringly remote and seemingly unitary object of study; vast and variegated, but unified by its centralism and by the singleness of its party, army, secret police and bureaucracy. Gone is the assumption that everything of importance in the USSR went on behind the Kremlin walls and was the proper subject for the arcane science of Kremlinology. Gone is the comfortable belief that a knowledge of Russian is an adequate linguistic qualification for scholarly encounter with a territory inhabited by more than 100 ethnic groups.

Even accustomed patterns of research behaviour have been shaken. Soaring market prices for books and confusion in the distribution systems have made it difficult for libraries to keep their Sovietica and post-Sovietica up to date, while the paper crisis has rendered many journal subscriptions – the life-blood of the traditional Soviet studies expert – all but meaningless.

More fundamentally, the profession of Sovietology is – or at least ought to be – in the midst of a legitimation crisis. It would be unfair to criticise Sovietology for having failed to predict the outcome of the chain of events from Gorbachev's reforms to the fall of the USSR, just as it would be foolhardy to insist on a predictive function for the humanities and social sciences. But the profession did fail, by and large, to discuss the possibility of what happened, and to subject to its scrutiny those forces at work in the collapsing Union which proved to be the determining ones: nationalism and grass-roots rejection of authoritarianism by the masses.

Nationalism, by convention, was regarded as the domain of a group of minority intellectual movements firmly under the Centre's thumb, and many scholars did not even suspect the grass-roots rejection to be a political factor. Sovietology has mostly failed to engage in research and discussion that would contribute to a present understanding of, say, the more remote Central Asian republics and the ethos of their political elites.

In retrospect, one might accuse Sovietology of having inquired too little into the various cultures of the old Soviet Union: not merely national, but also mainstream and opposing political, economic, bureaucratic and military.

Perhaps there should have been more consideration of such difficult questions as which values were strong and which were weak in the former Union; what various groups actually believed and desired, and what they pretended to desire and believe; what were the real, as distinct from the apparent, structures of authority in the now defunct empire?

It is clear that the successor disciplines must be more broadly based, and must take account of a much enlarged spread of phenomena. Ukrainian studies must, for example, take a place that corresponds to Ukraine's weight as Europe's fifth largest country. Monash, which established a Ukrainian program in 1983, has been one of only two Australian universities to recognise this. Due attention needs to be paid to Belarus, the Caucasus and the Baltics, and the discipline of Asian studies should not fail to notice the presence in Asia of Siberia and the former central Asian republics.

Russian studies need to be maintained and developed. Naturally, this is a program for the discipline world wide, and not all parts can be implemented at every Australian university. But we should at least be aware of the scope of the assignment, and have a view about its ideal level of implementation.

Furthermore, post-Soviet studies might benefit from the emerging model of European studies, which are interdisciplinary, culturalist and comparativist in their approach, and oriented especially toward the understanding of contemporary processes. The recognition and interpretation of common patterns, and the study of inter-relationships needs to be balanced by a sharp focus on the new independent states.

Finally, post-Soviet studies must be post-colonial, both in their intellectual purview and in their ethos. They must recognise that the new nation-states will have to come to terms with a heritage both totalitarian and imperial. Although scholarship (however objective) can never be value-free, the discipline of post-Soviet studies might do worse than sympathise with its object at least as much as liberal scholarship in the West does toward the post-colonial aspirations of its former colonies.

It goes without saying that one of the most effective pragmatic ways to initiate such developments is personal contact between scholars of like disciplines: contact that is not limited to the privileged elites of the old imperial centres. We should welcome academic visitors from various parts of the former Union and make provision for their economic situation.

We should make the effort to establish links of our own. Monash has been something of an Australian pioneer in this respect, hosting long-term academic visitors from Ukraine and Russia through its Slavic section. Through the Centre for Comparative Literature and Cultural Studies, the university has initiated a collaborative research project on environmentalism and culture in Europe involving research throughout the former Union.

There is, of course, room for a great deal more to be done.

• *The first conference of the Ukrainian Studies Association of Australia was held at Monash last month. Sixty participants, including five scholars from overseas, attended: two from Ukraine and three from North America. Participants included the president of the International Association for Ukrainian Studies, Professor George Grabowicz of Harvard Unversity and President of the Association of Ukrainian Studies in Ukraine, Mr Ivan Dziuba.*

Dr Marko Pavlyshyn is a senior lecturer in the Department of German and Slavic Studies.

DIOGENES

A first-rate holiday, Ernest Hemingway once said, should be like a bullfight without the attendant hurly-burly, such as the smell, noise, dust, people, overcrowding, horses, vendors, swords, death and bull.

Two years later he changed his mind, and said a good holiday should be like a fishing trip without the bait. He then recanted once more, declaring it could be compared to a hunting expedition minus the artillery.

Hemingway may have known a lot about machismo, but he knew very little about a few days off.

Had he lived long enough to discover that busman's holiday euphemistically titled 'the conference', Papa would have been on even shakier ground. The new wave holiday, designed especially for skiers and sunlovers, may have been beyond even his powers of comprehension.

The conference, at least the way it is practised in this country during summer, seems to be an exercise in lack of exercise, always held within dozing distance of a swimming pool.

The ambient temperature hovers around the 28 degree mark, dropping off to about 20 degrees at night. The surrounding vegetation is always lush, the river beside the conference hotel wide, and the taxis cheap.

Timetabling is important. Sessions should start at 10 am and then disintegrate until the only person left standing at 1 pm is the audio technician with a faulty mike and a pocketful of flat batteries. No one turns up for the after-lunch sessions on principle.

Dinners are always well attended, however, for that is when the real work is done. Business cards are shuffled and exchanged, confidences swapped, lies told and trusts are broken.

The whole fabric of workaday life is laid bare, and, under the authority of two or three cocktails resembling liquid Hawaiian tee-shirts, participants take to the thing with a knife.

Jobs and reputations are sliced, and the pieces kicked under tables. At 2 am, delegates waft home on a cloud of alcohol. It is messy and complicated.

The next day, when the whole shebang is scheduled to begin, most people have lost sight of not only their reason for being there but also their reason for being.

By this stage it has become even messier and more muddled. Twenty per cent of participants have forgotten they are married, and another 30 per cent are trying very hard to do the same.

The morning after the dinner before is not attractive. It is like a scene from a Fellini movie – everyone knows they have to be somewhere, but no one is quite sure why.

Wholesale memory loss sets in, until one by one conference satchels are recovered from bins and their contents inspected.

But by this time the conference is up for grabs. The colourful tourist brochures in the satchel begin to compete for reading time during the first session that day. By lunch, most participants have booked a cruise on the river.

That evening they are gambling on the coast. The following morning they are far away. The only person left at the hotel is a bewildered technician clutching a dead microphone.