Journeys to the centre of the earth

Science is now making journeys to the hidden worlds that used to be the exclusive domain of science fiction.

Unlike the fictional travels of Jules Verne, these forays are taking place not in the imagination but in the digital realm of the supercomputer.

At Monash's Department of Earth Sciences, senior lecturer Dr Greg Houseman is recreating the structures and forces at work beneath the surface of the planet. Using one of the world's most powerful supercomputers, he is modelling heat flow by convection in the Earth's unexplored interior.

What is known is that beneath the Earth's rocky crust lies the mantle—a 3000 kilometre deep layer of hot, semi-plastic silicate rock. Below this is a liquid layer of iron and nickel enveloping a solid nickel-iron core.

By studying what's happening inside the mantle, Dr Houseman hopes to understand the fundamental forces at work behind the geological evolution of the Earth.

A model proposed recently by researchers at ANU depicts a volatile system in which giant mushroom-shaped plumes of hot material periodically well up through the mantle, creating long chains of volcanoes on the Earth's surface.

In this scenario, the broad head of the plume thrusts beneath the Earth's crustal plates, causing floods of basaltic magma to erupt. When the head dissipates, the stem of the plume continues to function like a blow torch as the crust moves over it, creating the volcano chains.

"Mantle plumes are part of the system, but they don't necessarily dominate it," Dr Houseman said. "The ANU group have taken one part of a general convective system and considered it in isolation. There is an arbitrariness in their model about the way these plumes fit into the rest of the circulation."

Dr Houseman is building up a very different picture of the mantle from the complex equations and three-dimensional data sets he is using to model the flow of heat and matter. He is consistently producing computer images of a chaotic, but relatively stable system by analysing the convection in an idealised layer.

His model shows hot material rising in sheets from the base of the mantle. These sheets converge and coalesce to produce localised hot spots as they progress upwards and encounter colder material descending from the cooler upper layer of the mantle.

The convection patterns that are cell-like in horizontal cross-section (see right); hot material forms a warm core, surrounded by the colder material. "There is an equilibrium in this system," he said.

"The blobs of hot material in my model have little impact on the overall behaviour of the system, and the spatial patterns they produce are very different from what one would obtain by injecting a big blob of hot material into the base of the mantle.

"You could think about these hot spots as a form of mantle plume, but they are plumes rather different from the ones proposed by the ANU group," he said.

It is not yet possible to draw conclusions about what effect these patterns might produce at the top of the crust. However, Dr Horsemans sees structures in his calculations similar to geological features in the real world, known as subduction zones and intra-plate volcanic hot spots.

"The outer 100 kilometres or so of the Earth consists of a set of large rigid plates that move horizontally at rates of centimetres per year," he said. "Where two plates are separating (e. g. Australia and Antarctica), hot mantle wells up in the middle of the ocean and gets frozen onto the edge of the plate.

"Where two plates come together, one of them is usually forced to sink back down into the mantle in what is known as a subduction zone. Plume tectonics is relatively well understood, but these thick rigid plates apparently prevent us from seeing what's going on inside the mantle."

The recent exploration of the Earth's sister planet, Venus, by the Magellan radar-mapping probe could provide important evidence for the validity of Dr Houseman's convection models.

"The lithosphere— or rigid outer layer— of Venus is much thicker than that of the Earth, and the surface expression of convective flow patterns are likely to be more obvious.

Dr Houseman has obtained images of Venus's surface from NASA, and is looking for large-scale features that might indicate the presence of the cell-like convection patterns which appear in his own computer-generated images.

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NOW & THEN

25 YEARS AGO

Houses for sale: East Malvern. Excellent condition, timber home of three bedrooms, separate lounge and dining room, good study/sun-room, kitchen, bathroom, laundry, large garage with workbench. Gas hot water service etc. Carpets, some curtains, pleasant garden. Handy train, shops, schools. $12,800 or nearest offer.

1.5 YEARS AGO

To commemorate and continue the work in Aboriginal affairs of the late Dr Elizabeth Eggleston, the University Council launched a memorial appeal fund. The fund aimed to raise $25,000 to help finance an Aboriginal resource centre at Monash University.

5 YEARS AGO

The Accident Research Centre was set up to help reduce the road toll and the high number of traffic accidents.

The $1 million centre, jointly funded by the Transport Accident Commission and the Road Traffic Authority, involved the participation of Monash departments including engineering, education, science, law, and medicine.

THIS MONTH LAST YEAR

A National Korean Studies Centre, reflecting South Korea’s status as one of Australia’s major trading partners, was established as a joint venture between La Trobe, Monash and Melbourne universities and Seoul National University.

MONTAGE

Blood test detects cancers

A blood test for the detection of cancer has been developed by researchers at the Centre for Molecular Biology and Medicine.

The new test can be used to detect cancers of the digestive tract, particularly stomach and large bowel cancers, and will significantly boost rates of detection.

Cancers of the digestive tract are the most common worldwide, with 7300 new cases detected in Australia annually, compared with 6000 new cases of lung and breast cancer.

Professor Tony Linnane, who led the research team, said the potential overseas wholesale market for the test was worth at least $200 million a year.

Already, Japanese pharmaceutical company Eisai has bought the rights from the centre to market the test in Japan. Australian and overseas investors are being sought to develop and market the test elsewhere.

Present blood testing procedures can detect only 30 per cent of large bowel cancers, and even fewer stomach cancers. The new test detects 40 per cent of both types. Used in conjunction with an existing blood test, it raises the overall detection rate to more than 90 per cent.

At Monash last month, the Minister of Health, Mrs Maureen Lyster, announced a $100,000 infrastructure grant to the centre.

She said the blood test was a fine example of Australia’s potential to export medical technology. "There is a strong medical research community in Victoria, which the Government has been keen to foster," she said.

"Successes such as this prove just how strong we are in medical research, with its benefits not only in improved treatment, but also in export dollars earned," Mrs Lyster said. Such advances had pay-offs not only for the business and the community and reaffirmed Australia’s position as an important medical research centre.

The existing blood test, which has been in use since 1985, detects the presence of a marker substance known as CA, which appears in the bloodstream when certain types of cancer are present.

The centre’s simple new test uses monoclonal antibody technology to detect tumour marker molecules called mucins. The technology can be used to monitor levels of such markers in serum before and after surgery and chemotherapy.

During its research program, the centre developed monoclonal antibodies against a range of mucins that occur naturally and abnormally in the digestive tract. One of these was found to bind strongly to a small intestine mucin which is produced abnormally in certain cancers of the large intestine.
Joan's mystery man helps make the calls

The other voice on the line when you call the Caulfield campus is Joan's mystery man. His identity is as mysterious as Joan herself. He is the man who is often referred to as Caulfield campus switchboard operators Ms Joan Groves (left) and Ms Eileen Cieslak.

Word gets around fast on Monash designer clothing

Sales figures for the Monash clothing range keep soaring upwards, despite the economic downturn. The original US collegiate-style crest design by university graphic designer Mr Peter Bartels is still the most popular, and so far has sold 6,000 long- and short-sleeve variations.

Along with fellow operator Ms Eileen Gielak, a more novice with only 15 years service, she handles the hundreds of direct and redirected calls that pass through the system each day. However, three to four years ago, a new computerised system was installed, especially for the operators.

This system brings up a visual image for Ms Gielak and also provides audible information on where the call is coming from for Ms Groves.

"It's good having the information about the direction of the call and who is calling," she says. "The man is sometimes a bit slow, but I can always shut parts of him off if I want."

Joan's Australia's leading uni by 2000 – VC

Monash needs to take advantage of emerging opportunities while at the same time maintaining its high academic standards, according to the Vice-Chancellor, Professor Mal Logan.

If it can, the university would become Australia's leading university before the end of the decade, he said.

The Vice-Chancellor's comments were made in an address to a Future Deans and the Executive in the Monash City Offices last month.

"The amount of cultural change that has occurred at Monash over the past five years should not be underestimated," Professor Logan said. "Monash established itself very quickly as one of Australia's leading universities, especially on the national and international scenes, and has recently undergone a very significant development."

"If the strengths of the different elements of the university can be brought together and the vitality of its early development preserved in the now much larger and more diverse institution, the potential is enormous."

Perhaps the most important single achievement has been the willingness of academic leaders to approach the management of their faculties and departments in a more strategic way. Individual deans do plan the futures of their faculties, taking advantage of opportunities that arise in a very uncertain environment but maintaining and enhancing academic excellence.

He said a willingness to approach issues more strategically had contributed to what is generally regarded as a successful merger of four institutions: Monash University, Chisholm Institute of Technology, Gippsland Institute of Advanced Education and the Victorian College of Pharmacy.

Although this had been an enormously difficult and time-consuming exercise, it had produced an institution different to each of the four original parts. "It is this different institution that provides the basis for future planning," he said.

"We now have a large multi-stand institution of excellence catering to the needs of a wide population of students, as well as maintaining high reputations in consultancies and research. We offer a diverse range of courses for different purposes."

"In these respects we are closer to the model of the most prestigious of the North American public universities. It is the multifaceted nature of Monash which must be recognised as the distinctive element upon which its greatness can continue to be built."

"Through the university's diverse programs of instruction, research and service and its geographically dispersed network of campuses, Monash is uniquely placed to respond to community expectations. Faculty and administrative leadership must manage the university in such a way as to ensure balance among the diverse functions."

A distinguishing feature of the merger had been a reinforcement of the integrated organisational and academic structure of the university. "The basic building blocks remain departments or schools which are aggregated to faculties, each managed by a full-time dean who is appointed by Council," Professor Logan said.

"This must continue to guide the academic and administrative organisation of the university. It is only within an integrated structure that a multifaceted institution can ensure adequate quality control; structural integrity makes diversity possible."

He said that given the size, diversity and multicampus nature of Monash, a devolved management style based on academic units – just campuses – was probably the only possible form of efficient management.

"It promotes efficiency, relevancy, responsibility and accountability," he said. "It encourages academic involvement in decision making and puts the process close to the 'coal face'."

Montage – 3
Talking careers in schools

By year's end, Monash will have visited more than 100 schools throughout Victoria.

The schools visits program, organised by the Course and Career Centre, is part of a strategy to provide information about courses and careers to prospective students.

The program includes visits to university campuses, visits to schools by Monash staff, student and parent evenings, workshops and practice sessions, faculty visits, country visits and a Junior University Program.

The most recent school visit was to Mount Scopus Memorial College, Barwood (right), from which Monash draws more than 100 students.

"We want to make sure those applying for tertiary courses will be fully informed on career outcomes for graduates, content of courses, and selection procedures," manager of the centre, Mr Bryan Barwood, said.

Monash currently draws students from more than 320 schools throughout Victoria. The university is committed to expanding access for students from rural and isolated regions, and from disadvantaged socioeconomic groups.

Publish and be digital!

The words and pictures on these pages are created and manipulated using the latest in computer publishing systems.

"Monash is only one of the publications produced by the university's Publishing Office, located at the Caulfield campus.

All university statutory publications, as well as student handbooks, Course at Monash, Events Victoria and Etcetera, are taken from editing to final layout using Macintosh computers.

Manager John Wilkins and two publications officers work on this diverse array of high-quality products for audiences within the university and the wider community.

The Publishing & Advertising Unit is part of the Office of University Development, which produces more than 250 publications each year.

"We recognised the potential impact of computers in publishing as an early stage in its development," Mr Wilkins said.

"Through these methods we have achieved large reductions in both production time and overall costs. In the past three years alone, we have seen savings in the order of $300,000." The office has continued its commitment to technology with the implementation this year of a database system for the university's handbooks.

Senior publications officer, Mr Tim Mansour, has overseen the design and installation of the system in faculty offices. It has standardised the formatting of subject listings, further streamlining production.

This form of database publishing is still in its infancy, and we have few sources of reference. The challenge has been to develop our own software and procedures," Mr Mansour said.

"As well, it provides the faculties with an up-to-date ready reference source. The next step is to make it available in an electronic form. "Students and teachers would then be able to obtain the information needed simply by tapping into a central database."

Earthquakes, dinosaurs and science on show

Dinosaur printmaking, interactive engineering experiments, an earthquake simulator, the Walk-in Womb and computer-generated photos to take away are some of the features of the Monash stand at this year's Great Australian Science Show.

Organisers expect about 30,000 people will attend the show at the World Trade Centre from 14 to 19 July.

The show has again attracted exhibits from the Commonwealth, Government and private companies.

Last year, Monash's exhibit at the show — with displays from science, engineering, education, medicine and computing — received overwhelming public interest.

Marketing Manager Ms Susanne Hatherley said this year's presentation promised to be even more exciting, with a stand exclusively designed for Monash located prominently at the entrance to the show.

"The Science Show is a perfect forerunner to Open Day," she said. "This sort of activity supplements our Open Day program as well as provides the public with a positive image of the university."

Apart from displays and exhibitions, on 17, 18 and 19 July some of Australia's leading scientists will talk about their work. Among them, Professor Ray Cas, Head of the Department of Earth Sciences, will present "Understanding Volcanoes" and Dr Andrew Prentice, reader in mathematics, will talk on the mysteries of our solar system.

Organiser Mr Michael Pickford said the show included the latest and best advances in Australian science and technology and showed how they would affect every aspect of our lives. "Representatives of science, industry and organisations nationwide join and share their work and visions," he said.
Ancient kiln fires modern imagination

Spending five days stoking a brick kiln in hot and dirty conditions with little or no sleep is a long way from the traditional white-coated image of university research.

But for a ceramics lecturer, a visiting artist-in-residence and a small band of volunteers at the School of Visual Arts at Gippsland last month, this was the only way to get the results.

"The way the kiln is prepared and the positioning and type of the wood used determines what will look like," said Dr Rye. "Preparing the kiln takes four or five days because the positioning of the pots, space around the work, and the areas for firewood to be placed are important for the right effect."

The four-metre-long kiln is packed with pots stacked against one another at different angles. This creates different markings depending on the way the wood ash falls and the flames move around the kiln.

"Minimal spaces between pots produce soft subtle colours, while open spaces tend to form ash deposits for texture," Dr Rye said.

"The presence or lack of oxygen in the kiln atmosphere opens a wide range of colours the flame can create on the pots."

"The kiln is fired several times a year to carry out research and, according to Dr Rye, the results can take several months to assess. "There is so much learning and new ground to cover with every firing," he said.

"Sometimes we even have to create new terminology for the work because of the different results that are produced," he said. "The wood firing method produces unique work - no two pieces are the same. The fire patches and irregularities, the different colours, all show the unpredictable results."

Overseas-trained doctors have a high level of unemployment and few have been registered to practise in Australia, a Community Medicine report has found.

The report examined the problems encountered by 206 Victorian-based doctors who had migrated to Australia from overseas. They were encountering significant financial difficulties, problems with English language and racial prejudice.

The report was prepared for the Bureau of Immigration Research by Dr Michael Kidd, a senior lecturer in Community Medicine, and Ms Felicity Braun, a research assistant in the department.

Only 54 per cent of the 206 overseas-trained doctors surveyed had found any form of employment since arriving in Australia. Twenty-eight per cent had been employed as doctors, but only 16 per cent had passed the Australian Medical Council (AMC) examinations and been registered to practise in Australia.

Of the 25 doctors who were practising, but had not passed the AMC examinations, 14 had worked or were working as resident medical officers in psychiatry, obstetrics and gynaecology. Ten were working as junior medical officers in other medical specialties.

"Many of these doctors have little knowledge of the Australian medical education system and have not formally demonstrated their competence through assessment of their medical knowledge or clinical skills. In one case, a doctor did not even have proven English language communication abilities."

The doctors surveyed migrated from 47 different countries between 1977 and 1990, with most coming from Egypt, India, Sri Lanka, the Philippines, Poland and Yugoslavia.

World asthma study probes our habitat

The larger worldwide study of asthma and the environmental factors that cause lung health problems is now under way in Australia.

A questionnaire has been distributed to 5000 residents living in the electorates of Goldstein, Higgins and Hotham as the first phase of the study, which is being coordinated by senior lecturer in the Department of Social and Preventive Medicine, Dr Michael Abramson.

From these residents, more than 600 people will be randomly invited to undergo a thorough breathing and allergy test, and be interviewed about their smoking habits, home environment and occupational exposures.

The study, developed in London by Dr Peter Burney, aims to determine the extent that allergies, occupational exposures and other risks contribute to asthma and general lung health problems.

The local findings will be combined with those from countries including Belgium, Denmark, Holland, Ireland, England, Greece, New Zealand, Spain, India and France.

Dr Abramson says that "asthma is a cause of death that could be prevented in Australia. In Victoria, 24 per cent of children seven years of age have had asthma at some stage of their life. Wheezing currently affects 22 per cent of children in Melbourne and 22 per cent of adults."

Also involved in the study is Dr Abramson's research assistant, Ms Julica Kulin, allergy and respiratory immunologist, Dr Dan Czarny and Professor Hayden Walters of the Alfred Hospital.
A major player in the education field

In his paper ‘Monash towards 2000’ the Vice-Chancellor, Professor Mal Logan, reviews the university’s achievements over the past five years.

Challenges for the future

The future environment will present a number of problems and opportunities for the university. Expressed in the simplest terms, the main issues will be:

- Greater awareness of Australia’s economic future and, more closely related to the Asia Pacific region and the challenge of achieving this stability in a country whose cultural and intellectual history is so different from ours.
- Likely continued rapid growth in demand for entry to the university arising from higher retention and participation rates, although this observation needs to be tempered by demographic reality.
- Greater demand for multiple entry points to the university – through foundation years, distance education, twinning arrangements, television or open learning, and via TAFE.
- A continuation of the long term decline in Government funding of universities despite the huge demand, which will increase pressure for alternative sources of income.
- Greater emphasis on the system of more focus on student market forces as the engine for growth and decline, which will create pressures to better inform the market about what we have to offer, and for us to understand the market and the stakeholders we serve.
- There is no issue of greater concern to the population generally than education, especially in Victoria where the VCE has figured prominently on the public agenda. The population is now genuinely confused about what universities stand for, and about the differences between institutions. Hence, the need for better communications between the university and all of its constituencies.
- The shortage of Government resources plus continued strong demand for entry and higher retention rates to student numbers in universities will make it more difficult to protect quality, let alone enhance it. And this at a time when there is a greater acknowledgment of quality in the community than ever before.
- It will become even more imperative to get greater flexibility in our funding. The profile exercise, while an improvement on previous forms of Commonwealth funding, is simply not flexible enough, and we would welcome opening up the system to diversify the revenue base.
- There is a danger of a real policy collision between the universities on one hand and TAFE and the ‘competency’ movement on the other.
- Given the need for diverse funding sources and the greater emphasis on quality of students, both graduate and undergraduate, the university must continue to attract high quality overseas students.
- Monash has won considerable recognition and support from the business community for its academic staff and there is every reason to continue this association.
- There will be more emphasis on outcomes at all levels.
- We are aware that the university is two services – the service of the nation and on research outcomes that not only advance knowledge but also apply it to the nation’s benefit.
The advent of the contraceptive pill in the 1950s ushered in a social revolution. The resulting decrease in the number of pregnancies also profoundly altered the average number of fertility cycles that women experience in a lifetime.

Dr Lois Salamonsen, a researcher at Prince Henry's Institute of Medical Research, says that where their grandmothers spent most of their reproductive lives pregnant, and may have had as few as 100 periods during their lives, today's women typically had only one or two children and may have 2400 periods. Because women are having more periods, if they have bleeding problems they are much more aware of them, she said.

Dr Salamonsen is studying the biochemical mechanisms involved in menstruation, a subject which she says has received little attention from medical science. It has assumed new importance with the World Health Organization’s (WHO) efforts to reduce birth rates in developing nations with modern contraceptive techniques.

As the recipient of an R. Douglas Wright Fellowship, Dr Salamonsen's basic research into the hormonal control of menstruation is sponsored by the National Health and Medical Research Council. More applied aspects of her work are funded by a grant from the WHO.

She says many contraceptive methods modulate menstruation in some way. Women using intrauterine devices tend to get heavier bleeding, whereas women on the pill tend to get lighter bleeding. If a woman who has been on the pill comes off it, she may perceive that she is experiencing much heavier bleeding. Some women have bleeding problems with the pill.

What constitutes a bleeding problem is rather subjective. Some women lose as little as 6 millilitres per month, others may lose up to a litre. That's a huge range, so doctors have defined a figure of 80 millilitres, above which a woman is considered to have a bleeding disorder.

The WHO's interest in Dr Salamonsen's research stems from the fact that, with the uncertain availability of contraceptives in developing nations, the emphasis is on long-acting contraceptive devices that are implanted just beneath the skin of the inner upper arm.

Dr Salamonsen says these implants can provide contraception for up to six years, but they can also lead to hormone imbalances that result in heavy periods — a significant disadvantage.

Her research is focused on a recently identified peptide called endothelin, a naturally occurring substance that is the most potent vasoconstrictor (blood vessel constrictor) known to medical science. Endothelin causes the smooth muscle surrounding arteries and arterioles to contract, sharply reducing blood flow.

At an international conference not long after the 1988 discovery of endothelin, a senior researcher at Prince Henry's Institute, Associate Professor Jack Findlay, first advanced the idea that endothelin might play some role in limiting menstrual bleeding. Subsequently, an Italian research team showed that when endothelin was present in the endometrium of the rabbit, the lining that prepares the uterus to receive a fertilised egg, heavier bleeding occurred.

In human females, the endometrium is renewed each month and, if pregnancy does not occur, is shed during menstruation. Dr Salamonsen is investigating the possibility that changes in hormone levels caused by long-acting contraceptives may induce a deficiency of endothelin, resulting in increased menstrual bleeding.

Dr Salamonsen says the hormonal events of the monthly cycle are very complex. Oestrogen dominates the first part of the cycle, when cells are proliferating rapidly and renewing the endometrium.

In the second half of the cycle, the corpus luteum, a special secretory body formed in the ovary from the follicle that released the egg, secretes progesterone, which stimulates cells in the endometrium to secrete a range of substances that would be needed to sustain pregnancy. In the absence of fertilisation and implantation, proges­terone is withdrawn, and menstruation occurs.

Dr Salamonsen's research is looking at patterns of endothelin production throughout the menstrual cycle. Because endothelin produces its vasoconstrictive effects in such tiny concentrations, it has been a challenge to determine which cells are producing it, and what tissues it may be targeting.

The picture is complicated by the fact that since the original discovery in 1988, two other forms of endothelin have been identified. The three forms appear to have subtly different actions and, possibly, different target cells.

Dr Salamonsen and the uterine physiology group at Prince Henry's Institute has been using a technique called immunohistochemistry to identify endothelin-secreting cells. Slices of endometrial tissue are exposed to antibodies which recognise all three forms of endothelin. The antibodies are linked to a complex, which stains red when treated with a specific enzyme.

Under a microscope, the red stain reveals where endothelin occurs in cells. With this technique, they have shown that the endometrium produces almost no endothelin during its proliferative phase, when the cells are dividing rapidly. During the progesterone phase, when cells are actively secreting compounds that prepare the uterus for pregnancy, certain cells stain strongly for endothelin.

Treating endometrial tissues with a special compound called mosenin halts the transport of proteins as they proceed through the membranes of the Golgi apparatus, prior to export through the cell membrane. In this way, Dr Salamonsen has been able to identify the cells that are secreting endothelin.

The outer epithelial cells of the endometrium and the blood vessels that permeate endometrial tissues appear to be the strongest sources of endothelin, but Dr Salamonsen wants further confirmation of the identity of endothelin-secreting cells.

She plans to look for the molecules, called messenger RNAs, which carry the instructions from the gene to the cellular factories that synthesize endothelin. Cells producing messenger RNAs for endothelin would be identified as the source of the peptide beyond any reasonable doubt.

The next step will be to compare endometrial tissues from women who are identified as heavy bleeders, to see if there are significant differences in their endothelin production. In this phase, Dr Salamonsen will be assisted by PhD student Dr Marion Marsh.

Dr Salamonsen has developed tissue-culture techniques which allow her to grow the various cell types of the endometrium, including the secretory cells, so that they can study in vitro how hormones like oestrogen and progesterone switch endothelin production on or off. In this way, she may be able to identify whether long-acting contraceptive implants are altering hormone levels in a way which disturbs the normal production of endothelin, resulting in heavy bleeding.

Ultimately, a treatment for abnormal menstrual bleeding may depend on a more intimate understanding of the actions of the three different forms of endothelin.

Endothelin-2 differs from the originally described endothelin-1 by two amino acids; endothelin-3 differs by six amino acids. All are potent vasconstrictors, which poses interesting questions: why does the body need three subtly different vasconstrictors? Do they work differently, and do they have different target cells?

These questions will require answers before any effective therapy can be developed to control abnormal bleeding. The acceptability of long-term contraception for population control may hinge upon the answers.
A computer model of thermal convection in the Earth's solid silicate mantle. Light regions are hot (the mantle Plume); dark regions are cold (the cold mantle sinks). The horizontal levels at depths of about 100 km, 350 km and 700 km are shown. The side of the cell is about 5600 km long.

Dr Greg Houseman, of the Department of Earth Sciences, uses one of the world's most powerful supercomputers, a Cray YMP, to model heat flow in the Earth's interior. Even so, the scale and complexity of the structures and processes he is modelling, still could make good use of a considerably more powerful computer.

"For a long time the standard value, based on European and North American measurements, has been 2 x 10²⁴ Pascal seconds, whereas my model suggests a value almost an order of magnitude lower, at 3 x 10²³," he said.

"My findings are that the upper mantle is less viscous than has been predicted by other measures, such as the rate at which the continental crust of North America rebounded after being freed of the weight of glaciers after the last ice age," he said.

"In the past, journeys to the centre of the earth were shown. The side of the cell is about 5600 km long."

"The two-layer school bases its view on the fact that there is a seismic discontinuity about 670 km down in the mantle where pressure and temperature combine to produce a change in the crystal structure of the silicates. This depth also coincides with the deepest observed earthquakes."

"The other problem is that we don't really know how the mantle is structured, and that effect this structure might have on flow patterns. With my model I have simulated a three-dimensional region about 700 km wide. But you immediately run into the problem of whether the mantle is layered and of what thickness are the layers."

"The two-layer school bases its view on the fact that there is a seismic discontinuity about 670 km down in the mantle where pressure and temperature combine to produce a change in the crystal structure of the silicates. This depth also coincides with the deepest observed earthquakes."

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Saving the old generation

Western nations built hundreds of fossil-fuel fired power stations during the 1960s to provide energy for an intense phase of industrialisation. Most are now more than a quarter of a century old, and nearing the end of their working life. How are they holding up?

Aging power stations, built with the steels and welding techniques of years ago, are showing signs of their age and incipient failure. Ruptured boilers, headers or high-temperature steam lines already have caused fatalities overseas.

Utilities seeking to expand capacity and extend the life of their power stations face enormous capital costs, to be passed on ultimately to consumers, if ageing stations must be shut down, replaced or completely refurbished. A more economical alternative would be to find some way of identifying only those components that actually need repair or replacement.

In the Department of Materials Engineering, PhD student Mr Stuart Mann has been studying how the steel pipes and welds used in power station construction have aged under different service conditions. Mr Mann, whose PhD study is supervised by Dr Barry Muddle, says the need for life assessment procedures will grow during the next decade as the decay of power station infrastructure accelerates. Adequate procedures are required so that failures, unnecessary replacements and the need for frequent inspections may all be avoided.

Maintenance or replacement decisions are further complicated by the fact that different components in the same power station have different life histories; different regimes of temperature and pressure can produce different rates of ageing in identical steels. Different batches of the same steel can also exhibit quite different behaviour.

Some components, such as the huge headers which distribute superheated steam to turbines, are of complex construction. If they need replacement, plans must be made up to two years in advance so that new component can be fabricated and a suitable shutdown time scheduled for installation.

To assess the residual life of any international problem, Mr Mann said. "It affects all power utilities and many chemical companies, which have similar problems because of the aggressive materials they are working with."

Since 1990 Mr Mann has been analysing the microstructure of samples of retired steel pipe, recently taken out of service in Australian power stations operated by the Electricity Commission of New South Wales (ECNWW) and the State Electricity Commission of Victoria (SECV). The research is sponsored by these authorities, their counterparts in Western Australia, Queensland, South Australia and New Zealand (SECV, QEC, ETSA, Elericorp WA and Alcoa Australia (WA). He works jointly in the SECV's Herman Research Laboratory at Mulgrave, which has the special high-temperature testing equipment he requires, and in the electron microscope facility at Monash. The creep test assesses deterioration in steels that have been subjected to constant stress and high temperatures. Creep-fatigue testing superimposes repeated loading cycles on the basic creep test, in which stress is applied and then reversed, simulating startup and shutdown cycles.

Dr Muddle says such tests have to be carried out at accelerated rates to provide results within a reasonable time. They may be performed at temperatures between 550 and 650°C, compared with the typical service temperatures of 450 to 550°C.

Moderate changes in temperature can significantly alter the behaviour of steels, so researchers must be confident that they can extrapolate from their test results to provide a reliable assessment of the residual life of a component in service. Mr Mann's research is aimed at developing an objective model that, when validated by other researchers, may reliably predict component failure.

Research in the department has already defined a way of tracking the thermal history of steels, and of predicting residual lifetimes, from changes in the composition of carbide precipitates. The technique could allow a materials scientist to take a small sliver of steel from a component and, given a knowledge of its thermal history during fabrication, to predict how much longer the component will last before it needs to be replaced.

Dr Mann's research is also investigating how the distribution of various precipitates influences a steel's creep properties. Precipitate distribution changes as the steel ages and might reliably indicate how much longer a component will last.

The challenge is to develop assessment tests that can be applied to small slivers of material, which can be removed from pipes or boilers without compromising their structural integrity. Fortunately, such samples are not difficult to obtain. Millions of dollars are tied up in these maintenance decisions and the same problems will continue to arise in fossil fuel fired or nuclear and solar thermal installations.
In rear-end collisions with trucks, a car's roof may be sheared off by the force of the impact. Truck bumper prototypes are being designed to make the point of impact lower, so that the force is absorbed by the car's bonnet instead of its roof structure.

Designing for truck safety

A proposal to have rear bumper bars made standard equipment on all new trucks will be presented to the next meeting of state transport ministers.

Meanwhile, research at Monash is investigating the design and construction of bumper prototypes.

Cars under-running trucks in rear-end collisions are a major cause of fatalities on Victorian roads. Work is now under way to test a new bumper bar design that makes the car's energy-absorbing bonnet the point of impact, rather than the more vulnerable roof.

The prototypes of these side rear bumper bars for trucks have been designed by Mr George Rechnitzer, a senior research fellow at the Accident Research Centre (ARC).

The ARC was contracted by Vic Roads to design the bumpers, following a report by Mr Rechnitzer that recommended changes to the Australian Design Rules.

The report, 'Truck Involved Crash Study' found that 30 per cent of car occupants were killed or seriously injured in Victoria as a result of multi-vehicle collisions with trucks, which make up only nine per cent of the registered vehicles on Victorian roads.

The prototypes, which are being tested by a Civil Engineering research team led by Professor Noel Murray, weigh about 70 to 80 kg and cost $300 to produce and install.

Professor Murray said safety features such as the new bumper bars should be mandatory. He said despite some improvements in the crashworthiness of cars, little progress has been made in truck design. He hoped that the research and prototypes would ensure that "Australian design rules have real meaning in real crashes".

Other design safety features could include side panels and bars on trucks and energy absorbing front bumpers or bull bars. Research is continuing in these areas.

The Victorian Transport Minister, Mr Peter Spyker, has announced that he will submit a proposal to the next meeting of national transport ministers to have rear bumper bars made standard on all new trucks.

The ARC report, commissioned by Vic Roads, investigated more than 60 crashes involving trucks in Victoria in 1991, including collisions with cars, motorcycles, and bicycles.

Forty-six fatalities resulted from the crashes. There have been 300 fatalities over the past 20 years resulting from crashes between trucks and other vehicles.

Due to the unequal heights of the car and truck, the collisions resulted in direct occupant contact with unyielding parts of the truck, as well as intruding parts of the car, causing severe head and chest injuries. Trim on trucks and vans was also found to dislodge, spearing the occupants.

Crime victims research

Victims of crime in Frankston now have a trained, professional referral service to turn to for help.

The Frankston Victims of Crime Project was launched by Police and Emergency Services Minister, Mr Mal Scott, last month.

The $15,000 six-month pilot research and training program will involve Monash's Centre for Continuing Education, the Frankston citi, the Citizens Advice Bureau (CAB) and the Victorian Police victim liaison officer.

The executive director of the Frankston-based centre, Mr Dale Ingandallo, said the program would unite the local community to help people suffering the effects of being a crime victim.

"It is a cooperative effort between local groups to provide support, information and referral services," he said.

Mr Ingandallo said the centre had a history of responding to the community's needs.

"The program is really complementing and formalising an existing service which we have been working on for several years," he said.

"The centre has had a long association with the sequence of events program, and also other community groups that approach us for help and training needs."

He said CAB detectives would be given extra training at the centre to ensure they referred victims of crime to the CAB for advice and information.
TV Open Learning reaches out

The TV Open Learning Project reaches as many as one in 10 Australian families. A Monash proposal, now before the Federal Government, would see a dramatic increase in the scope of the project. The Registrar, Mr Tony Pritchard, reports.

On 5 May 1954, M. Thomas of Broken Hill wrote to the editor of The Australian Monitor:

"I would like to see an adult education series started, broadcast in the evening programs at about 7.30 ..."

Industry, Monash is a large and complex organisation, including the institutes under the auspices of a university a series of lectures for what other groups could register and eventually gain a diploma or degree.

This is, essentially, an accurate description of the TV Open Learning Project, except that programs are broadcast at 7.30 in the mornings.

The TV Open Learning Project was established in 1981 under the Minister for Higher Education and Employment Services, Mr Baldwin, with a grant which was soon to amount to over $2 million.

Monash won the project as the manager and lead university in a consortium which includes the University of New England, the University of South Australia, Deakin University and Griffith University. Seven study units are now offered.

The Commonwealth grant is allocated to television program acquisition, adaptation and production, and to recovering Monash's costs for project management and coordination.

The cost of study materials, library services, tutorial support and assessment is recovered from student fees, which are approximately $300 for each unit.

The early success of the project has encouraged the Minister to consider a further expansion. Monash has been invited to submit a proposal as part of the Commonwealth's Open Learning Initiative. Proposals for further participation have been received from eight of our faculties.

Dramatic expansion

Monash's submission proposes:

• an increase in the number of units to 20 in 1993, rising to 40 by 1995;
• the use of radio as the main medium for some units;
• a new generalist degree for candidates who wish to complete their studies through Television Open Learning or other forms of opening learning;
• that the Commonwealth fund 'transferred places' for candidates who wish to transfer to conventional face-to-face education in their second and subsequent year;
• the trial of other electronic forms of delivery.

The submission for an expansion of TV Open Learning includes proposals to trial electronic modes of teaching and learning. The Business faculty is proposing a degree using computer-based business simulation packages.

Course materials may be stored on videodisc, which is readily accessible to domestic users. A more efficient form of storage is CD-ROM, which also has the capacity to sort the material, but CD-ROM readers are not yet widespread domestically. Personal computers are increasingly common in the home, allowing the use of floppy disks.

In addition to broadcast television, TV Open Learning also uses radio and mail as delivery media. Mail may also be used to send computer discs, CD-ROMs, video and audio tapes, as well as printed material. The telephone network may be used for conference-call tutorials, delivery of images through facsimile, and computer-based information.

Satellite is suited to high-volume mass communications, but is expensive and not readily accessible. In Australia, pay TV will be delivered by a combination of satellite and cable. One may thus envisage using television free-to-air broadcasts for delivering educational material to a general audience, and pay television for advanced students.

At this stage of development, these alternative modes are not expected to completely replace more traditional methods. Rather, they may augment and automate significant parts of the teaching and learning process, allowing more time for them to concentrate on non-routine learning problems.

The emerging financial perspective

In an era of fiscal constraint, Monash is increasingly funding its activities from sources other than the Commonwealth. Its annual turnover now exceeds $350 million. The Comptroller, Mr Peter Wade, reports.

With a student load of some 27,000 EFTUS and nearly 5000 Equivalent Full-Time Staff operating on five main campuses and many other teaching and research activities, the university has assets in the form of land, buildings and equipment which were valued at $31 million in 1991 and returned $500 million to the university.

The land holdings of Monash total 170 hectares.

We now operate with a budget in excess of $300 million per annum and, when non-budget funds are included, the annual turnover of Monash exceeds $400 million. Increasingly, we are financing our activity from sources other than the Commonwealth Government, and in particular, from industry. In the Help scheme, "they obviously remain the largest source of our income.

With the amalgamation of the Playhouse in 1991, we operate four commercial or quasi-commercial theatres, as well as the banks, bookshops, travel agencies, pharmacies and other shops on our campuses. Together, they obviously remain the largest source of our income.

Our own sources of funding - student fees, grants, donations and outside earnings - are now very significant and will increase in importance over the remainder of this decade. This will place more challenges before us.

If the experience in the US can be taken as a guide, students who pay significant fees understandfully become more critical of the quality of teaching and service they receive for their money, and we can therefore expect increased pressure in this regard.

If there is a change in the Commonwealth Government after the next election, operating income will be directed to universities via a system of vouchers, under which the student may transfer to another institution. The pressures upon us to provide a high quality of teaching and service to students will therefore increase and directly affect our funding.

Approval has already been given for facilities to establish foundations that may earn interest as an incentive to obtain increased grants and donations, and also to hold a faculty reserve of student fee income for the time when market conditions deteriorate.

We will find it necessary to increase our outside earnings. It will be important that this is done professionally in a well-planned manner. Two things are unavoidable if we are to increase our outside earnings. First, it will initially involve more through support for proprietary patents, the search for commercial partners, support for development work beyond the original research and the like. It will be important that such work is properly coordinated and it will be important that Monash makes a successful contribution to this.

Second, it is almost inevitable that some moves for additional outside earnings will fail. Hopefully, by good sense and by good management the failures will be few and the amount involved small. But if we are not prepared to contemplate some failures, then the university should not seek to increase its income from commercial ventures. We must, of course, ensure that we use that income efficiently and effectively for the benefit of our purpose: the provision of high quality teaching and research.

The combination of our efforts on income and good budgetary control of our expenditure has meant that we have been able to balance our budget for 1992 while also including significant funding for new initiatives, such as through the Monash Development Fund.
The Faculty of Medicine will be scrutinised by the Australian Medical Council (AMC) at the end of the year as part of its accreditation review.

One of the Faculty of Medicine, Professor Robert Porter, said the review was one of the most important events in the 30-year history of the faculty.

"I believe that the work we have taken in the past few years, we are well positioned to be viewed by the AMC as one of the most forward-looking and innovative medical schools in Australia," he said.

Initial documentation will be sent to the AMC in September to allow members of the assessment team to study the definition of the curriculum. The review will be completed during a site visit to Monash in March next year.

During the visit, members of the assessment team will meet with staff and students in all teaching centres. They will also consult with senior administrative and academic officers of the university, associated institutions and the Department of Health, and inspect resource facilities including laboratories, libraries, hospitals, clinics and community settings.

Since it was established in 1985, the AMC has been responsible for the accreditation of medical schools in Australia to assure the continued satisfactory standard of graduates.

The AMC accreditation team (from left) Associate Professor Graham Taylor, Mr Neil Paget, Ms Jenny Birrell, Mr Ed Marshall, and Mr Mike Luttenberg.

Research under threat: AVCC study

Research at universities across Australia is threatened by a shortfall of infrastructure funding, according to a survey commissioned by the Australian Vice-Chancellors' Committee (AVCC).

The survey concluded that the shortfall of infrastructure funding was "seriously affecting the present capacity of university research as an internationally competitive level". Inadequate funding was the major shortcoming, and the results of the survey will go to the Government to provide a cost-effective solution.

The study recommended a protocol be built into Government practice to provide full-cost funding for all research contracts to universities. Equipment maintenance budgets should be built into equipment allocation, and grants that are provided by the Government should be used to support maintenance.

Infrastructure support was an issue in the AVCC's recent policy statement, Australian universities in a changing world. The statement recommended an increase in funds for infrastructure support from $51.7 million this year to $100 million by 1993.

The study has recommended a further review of research infrastructure needs throughout the Australian universities system. Dr Peter Duke, a former member of the University of Western Australia, conducted the study.

Radiation training standards improved

Training in the safe handling of ionising radiation sources has been stepped up in response to the findings of an internal safety review.

The University Council last month approved a policy statement based on the findings of a review committee set up by the Vice-Chancellor in 1990.

It found the standard of radiation protection in the university was variable, with some areas of excellence and others in which practices were unacceptable. Insufficient attention had been paid to compliance with statutory requirements and standards.

However, the report said this did not mean that staff had been exposed to immediate risk. "The current standards against which the university's performance has been judged place great emphasis on maintaining radiation risks at a very low level," it said.

The review was initiated following concerns raised by the Occupational Health and Safety (OH&S) Branch about the standard of handling radioactive waste, because "radioactivity is not immediately destructive when it is no longer required" the OH&S manager, Dr Cheryl Tillman, said.

"The OH&S branch has undertaken to reduce stocks of waste substantially and to build a long-term waste store for those items that cannot be disposed of. The existing short-term waste stores are about to be modified so that they will meet the stringent Government requirements."


**BRIEFS**

### Studying students and teachers

University staff are set to reap the benefits of two studies by the Higher Education Advisory and Research Unit (HEARU) into teacher effectiveness and student assessment methods.

By next year, a uniform method of assessing teacher effectiveness, and detailed reports on student assessment methods will be available.

The teacher effectiveness study, conducted by Dr Malcolm Eley and Ms Michelle Thomson, is developing a set of questionnaires to be used as a common measure of teacher effectiveness. With this, and a method to demonstrate competence in various teaching tasks, the promotion system could take better account of teaching, they believe.

Dr Eley's project is to bring together comment from staff, students and the literature to develop questionnaires directed at particular teaching tasks such as demonstrating, lecturing and consulting with students.

Part of the project is also to develop a software package that will generate reports from questionnaire results, and an optical mark reader format for quick and easy completion and analysis of the questionnaires.

### Music degrees to begin next year

The Faculty of Arts will introduce a new Bachelor of Music degree and a Graduate Diploma of Arts (Music) in 1993.

The Bachelor of Music - unique in Australia - will emphasise a greater degree of specialisation in practical music and musical craft than that expected of undergraduate students studying music through the Bachelor of Arts.

Head of the Department of Music, Professor Margaret Kartomi, said the degree would be excellent preparation for professional musicians as well as performers, composers and scholars.

"The prime objective of the course is to create thinking, self-motivated musicians of a high standard with a broad range of knowledge and skills," she said.

Professor Kartomi said the course had been structured to develop a high level of performance ability, style awareness, knowledge of musical craft (theory, composition, arranging and analytical skills), and an awareness of music in various social, historical and cultural contexts.

The Bachelor of Music involves three years of full time study or four years for honours. Students will have the opportunity to do performance music and a choice of one other major, in either composition, musicology and ethnomusicology.

In the first year of the performance major, students may take the orchestra and chamber ensemble courses, with the opportunity to participate in chamber music ensembles, the new Monash Orchestra or one of the bands established in the Music department this year.

The Graduate Diploma in Arts (Music) will be offered to students with three-year tertiary qualifications in music or dance who wish to upgrade their qualifications.

"The course is particularly suited to those interested in preparing themselves to do research in dance, as well as qualified primary and secondary teachers wishing to upgrade their qualifications," Professor Kartomi said.

### Business computing seminar

The rapid evolution of the computer over the past 30 years has arguably outstripped any other product development.

But according to a seminar presented by Monash University's Department of Business Systems last month, further advances are still to come.

About 90 senior executives from 25 major companies including BHP, Shell, Mobile, BP, National Australia Bank and the ANZ Bank were given an insight into the new horizons of parallel processing. Put simply, parallel processing is a new technology which links a company's computers together, resulting in a huge increase in power.

Speakers from Myer Stores Ltd, IBM, Digital, NCR and the Gartner Group made presentations exploring which of the emerging technologies, including parallel processing, will provide the biggest impact on the computer industry and business practice.

Pictured below are (from left) Dean of Computing and Information Technology, Professor Cliff Bellamy; Digital corporate technology consultant Mr Max Burnet; Gartner Group Pacific managing director Mr Andrew Brooks, IBM senior system strategist Mr Keith Frampton; NCR branch executive officer, Mr Bart Grotegoed; and Bachelor of Business Systems director of studies Mr Ed Wilson.

### Learning to manage the arts

Arts administrators from Indonesia have spent five weeks at Monash learning how to manage cultural activities.

The 90 senior administrators from the Indonesian Ministry of Education and Culture attended an integrated 10-week arts management course, a joint project between Monash University and the University of Indonesia.

Coordinated by the Department of Music, the program was split between the two universities. Program Director and Head of the Department of Music, Professor Margaret Kartomi, said the course offered important advice and guidance to people involved in arts administration. "Members of the group are already involved in this field in local provinces in Indonesia, so the course provides ideal training to assist them with their planning and management of cultural centres and events," she said.

"Indonesia has a very diverse culture and the Government has a strong interest in promoting and managing the arts in an effective way," working with the theme 'Leaders and managers in tomorrow's arts administration', the participants examined current issues and future developments in the arts, and arts management. The course focused on planning, leading and managing, and covered motivation, delegation, interpersonal and conceptual skills, marketing and influencing the process of change.

From left: Pro-Vice-Chancellor Professor Leo West, Dr Sutomo, Dr Jeff Dunstan and Professor Margaret Kartomi.
Engineering awards
Mr Lindsay White, of the Department of Civil Engineering, has received the Ian Langlands medal and a cheque from the Institution of Engineers Australia as the top student in the Faculty of Engineering in 1991.

Mr White is pictured below receiving the award from the Dean of Engineering, Professor Peter Darvall. He was also presented with the Ove Arup and Partners Prize and was joint winner of the Scott and Furphy Prize.

Breaking new ground
The Mayor of the City of Caulfield, Cr Veronika Martens, officiated at a ground breaking ceremony for an $18 million development on the Caulfield campus.

Vice-Chancellor Professor Mal Logan attended the ceremony, which was held on the development site between the Boykett Building and the Technology Tower on Railway Avenue.

The General Teaching and Business School Development is to be completed in two stages. The first stage, which will start immediately, should be ready by August 1993.

Fulbright awarded
English student Mr Gillen Wood, 23, has been awarded a prestigious Fulbright scholarship for his first class honours studies.

Now completing his Master of Arts, he will go to Columbia University, New York, in September to complete his doctorate, probably majoring in romantic poetry.

The nationwide scholarship, offered to 12 students annually, is an American-Australian venture awarded for academic excellence. Each year, the scholarship has a theme; this year, it is the arts.

Mr Wood, a jazz pianist, has studied at the Victorian College of the Arts. He says being a musician offers balance to the solitary pursuits of a writer. He is also a cricketer and has performed in student productions of Cloud Nine and Waiting for Godot.

Senior appointments
Professor John Levett (above, right) has been appointed to the chair in the Graduate Department of Librarianship, Archives and Records.

In 1990, Professor Levett accepted responsibility for developing and teaching the masters program in the School of Librarianship at the University of Tasmania. In 1991 he became President of the Australian Library and Information Association.

Dr David Koch (above, left) has been appointed an adjunct professor in the Department of Chemical Engineering. He was chief of the CSIRO's Division of Mineral Chemistry from 1971 to 1988. From 1988 to 1991, he was an honorary professor in the Department of Chemical Engineering.

Technology centre launched
The Advanced Manufacturing Technology Centre (AMTC), which offers the latest research and development equipment for manufacturing, was opened last month by the Minister of Manufacturing and Industry, Mr David White, pictured at right with Deputy Chancellor Dr Geoffrey Knights.

The centre, situated on Caulfield campus, includes factory simulation models, teaching robots, computer controlled lathes, and the most recent computer-aided design and manufacturing equipment. Director of the centre, Mr Arvind Shrivastava, said the aim of the AMTC was to improve the competitiveness and viability of Victorian industry in both domestic and international markets by ensuring that training and development took place in commercially viable areas.

A range of short courses will be offered. It will also provide support to undergraduate and postgraduate manufacturing courses offered by Monash. A postgraduate diploma in AMT starts next month and a Bachelor of Technology is planned for next year. Collaborative, industrial and fundamental research will be undertaken at the centre, which also provides AMT consultancy services. The centre is partially funded by the Victorian Education Foundation and operates in partnership with Midden Pacific, Kambrook and CADDSMAN.

Joint prize winners
The 1991 J. W. Dodds Memorial Prize for best final year student in the Department of Mechanical Engineering has been presented to joint winners Mr Moses Khor (pictured below receiving the award) and Mr Richard Mills.

Clyde Babcock Hitachi representative, Mr Ray Austin, presented the prizes of $1000 and a medal. Selection criteria include scholastic achievement, potential as a practitioner, and insight and understanding of mechanical engineering in Australia.

Mr Mills also received the 1991 H. Vivian Taylor Memorial Prize in Acoustics.

Graduate IEE award
The winner of the 1991 Institution of Electrical Engineers (IEE) award for best final year thesis is Bachelor of Engineering graduate, Mr Simon Ryan (above).

Mr Ryan completed his studies in the Electrical and Computer Systems Engineering department last year. The winning thesis, which deals with security in communications, was entitled "Voice scrambler."
**Drug design lectures**

The Victorian College of Pharmacy is holding a winter lecture series to introduce the most modern methods and techniques in computer aided drug design, NMR Magnetic resonance spectroscopy, and recent developments in the pharmaceutical industry. The series, which costs $240 for full-time academics, will be held from 15 July to 17 July. Inquiries: Ms Eileen Lunckopoulou, telephone 589 9616 or fax 589 9582.

**Postnatal depression**

The Centre for Developmental Psychiatry is holding a seminar on postnatal depression on 24 July. The seminar, to be opened by the Minister for Health, Ms Maureen Lyster, M.L.C., costs $50. Inquiries: Mrs K. Kirpalani, Centre for Developmental Psychiatry, telephone 550 1354.

**Arts, crafts and tuition**

Radio production, millinery and batik are just some of the courses available at Monash Arts, Crafts and Tuition Centre in second semester.

Manager of Monash SMU stations, Mr Peter Freedland, will conduct a six-week introductory course into all areas of basic radio production, beginning on 1 September. Children, participating in the School Holiday Program will also be able to learn radio production skills.

A seven-session millinery (hat making) course will commence on 17 August, Miss Zita Summers, who has trained with Coco Chanel and worked extensively in television costume design, will run the course.

Artist of the longest piece of batik art in the world, Mr Raghun Menon, is to conduct a weekend course in batik on 5 and 6 September.

Other courses in the second semester program include wine appreciation, cooking in the Mediterranean, Thai, Vegetarian and South East Asian styles, shiatsu massage, car maintenance, blues guitar, calligraphy, drama, paper making and silk painting.

For further information on these and other courses, contact Ms Tess Mora on ext 75 5180.

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**Arts & Minds**

**THEATRE ON CAMPUS**

**The Alexander Theatre**

The Saturday Club for children aged 5-6 to eight years presents acclaimed folk singer and songwriter Link Wray in a musical mélange of more than 30 musical instruments. Children will be led on a whirlwind musical voyage around the world, with an emphasis on audience participation and the discovery of unusual musical instruments. Performances will play on Saturday, 1 August at 11 am and 2 pm.

Tickets are $10.90 for adults and $6.90 for children.

Willy Russell's masterpieces, Shirley Valentine, with Amanda Mugleston in the title role, comes to the Alexander Theatre for four nights next month. Shirley Valentine opens on 18 August and plays until 25 August.

Join Winnie the Pooh and friends during the school holidays from 7 to 18 July. This stage musical adaptation of A. A. Milne's classic book features original music, costume, focus, quality measurement and varied style, with an emphasis on audience participation and the discovery of unusual musical instruments. Performances will play on Saturday, 15 August at 11 am and 2 pm, then to Saturday 15 August at 4 pm.

Tickets are $18, $14 concession and $12 for Monash students.

For bookings to all Alexander Theatre productions, call the credit card hotline between 9.30 am and 8 pm on 665 9992 or book in person at the box office or mail your booking to: The Alexander Theatre, Monash University, Wellington Road, Clayton S1599.

**Robert Blackwood Hall**

The Melbourne Welsh Male Voice Choir's annual concert on 25 July at 8 pm features the Australian Army Band (Melbourne) and Chinese tenor Yu Jazong, who is returning to Australia to make his debut with the Australian Opera in Simon Boccanegra. Admission is $16. For further information and tickets, contact the choir on 876 3545 or 801 1292, or the Robert Blackwood Hall Box Office on ext 75 3691.

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**THEATRE OFF CAMPUS**

**Playbox, CUB Malthouse**

John Wood, best known for his portrayal of television QC. Rafferty in Rafferty's Rules, is soon to star in a role completely different to that of the likeable magistrate as he becomes a country and western hero in playwright Tim Gooding's King and Country.

King and Country tells the tale of Horace, Chook and Vikki - three generations of the Fowler family who have country and western music in their veins. Chook (John Wood) is stranded in suburban with his contraband father, Horace, and get-up-and-go daughter, Vikki. But after a family trip to the Tamworth music festival, the family gets their act together.

With music from the Blue Dogs Band, King and Country will open at the Playbox, CUB Malthouse, on 25 July. For information, phone 685 5111.

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**IN THE GALLERY**

The Territory: 'Eire Hemisphere' by Philip Hunter at the University Gallery: examines a series of cycles of Hunter's recent work in progress, consisting of paintings, drawings and prints exploring the ideas of self, place and history around the themes of the continent, the garden and the visit. The exhibition is open until 2 August.
Should science be the judge of animal welfare?

I

FEBRUARY this year, a scientist working at the University of Michigan had his office broken into and the records of 30 years' research destroyed. Although he worked with minks - and an incident has yet occurred in Australia. But there have been threats, even death threats, against scientists here. Scientists are naturally worried by a threat to their research - even to their personal safety - and worried too by the impacts of increased tensions may have on the way they live their lives.

There is also concern that non-scientists are apt to be thrown off balance by the emotional impact of procedures for balancing animal welfare against scientific or social benefit.

The practice of animal experimentation at Monash University, in Melbourne, is regulated by the scientific community - by ethics committees on which a majority of places are taken by professional scientists themselves involved in animal research. Doesn't this stack the balance against the animals? Are not the members of these committees likely to be hardened against the subject of animal welfare? Is it fair to think of experimental animals as disposable research tools? Viewed from this side, the secrecy and inaccessibility of information exacerbates the problem. Informed discussion of animal welfare is almost impossible.

The worries on either side of this divide ought to be taken seriously. The use of animals in scientific research raises moral issues that do not concern animal scientists only, and their training as scientists does not put them in any specially privileged position to determine what weight should be given to those issues. But scientific work has value that is apt to be underestimated by its antivivisectionist critics.

The fear that science would not get a fair hearing, and that biomedical research would be crippled, if ethical scrutiny were thrown open to the wider community, is real. Consider: the use of animals in scientific research is already far more tightly controlled than the use of animals in agriculture, or industry, or even in domestic practice.

What is special to the scientific case is that scientific values are not entrenched in the community at large, and so they are more easily outweighed by welfare concerns. But, about the permissible ways of destroying rats in the home and in the laboratory and you will see the difference. Surely there is scope for a charge of hypocrisy.

The tension exposed here is worrying. Let us ask how effectively it is dealt with in Australia, particularly at Monash, and whether there is scope for improvement. In Australia animal experimentation is regulated by a code of practice compiled by a joint committee of the NHMRC, the CSIRO and the Australian Agricultural Council. The code is revised periodically; animal welfare organisations and interested individuals have an input. The latest version (1999) runs to just over 70 pages of detailed regulations.

Under the code, experiments using animals can only be approved if "a decision has been made that they are justified, weighing the scientific or educational value of the experiment against the potential effects on the welfare of animals". The task of making these decisions is vested in Animal Experimentation Ethics Committees, which must be set up in any institution where animal experiments occur.

In fact, at Monash every experiment has to be cleared by two ethics committees, first by a committee in the department, and then by the University Boarding Committee on Ethics in Animal Experimentation. Ethics approval is not a formality. Applications are subjected to rigorous scrutiny; potential scientific value, experimental design, safeguards for safeguarding animal welfare are all looked at.

And it is not uncommon for applications to be returned for revision, sometimes more than once. The light of criticism from an ethics committee. The standards applied here are among the most demanding in the world - much more so than those in the United States, Britain and most of Europe.

If the guidelines are right - agreed upon by processes that give adequate access to all - and are applied seriously, then it should not matter that a majority of those involved in the decision-making are biomedical scientists. Indeed it cannot otherwise.

If there is agreement on the broad principles, then the detailed assessment of scientific value, experimental design, likely effects on animals, potential to cause suffering or stress, all raise issues that are more factual than evaluative.

So on the ethics committee it is invariably the working scientists who raise the most serious questions about the detail of any application. There are laypersons on the committee - I have been one since February - but their role is in practice that of observers, there to verify that research proposals are subjected to proper scrutiny.

If the guidelines are right what matters is accountability - the possibility of confirming that the task is seriously pursued. The task is seriously pursued. Believe me. The trouble is, if you don't believe me there is almost nothing you can do to satisfy yourself.

Proceedings of the animal ethics committees are subject to strict confidentiality. But, where allegations come in, they are not public records. Only sketchy reports go to the Academic Board. No detailed statistics on animal experiments are accessible. If the work of the animal ethics committees were not seriously pursued the appearance might well be unchanged. Though justice is done, it is not seen to be done. Some thing might be done differently.

- Statistics. The applications provide information on numbers of animals used, and categories of procedures applied, that could easily be made the basis for informative statistics. If they have been available, they could have been used to compile the data.

A single officer has to cope with the work of a dozen ethics committees, without adequate secretarial assistance. His main task is to assemble, interpret and make his reports. He is a trainer, not that of an administrative officer.

- Accessibility. Each application to an ethics committee has to include a description of the aims of the experiment and of procedures involving animals - both cast "in language that will be understood by members of the general public". When well done, these lay descriptions provide the most useful information on the project and they can convey very clearly a sense of the interest and excitement of scientific work.

But these statements carefully prepared for the notional lay reader are never read by such people - except, of course, for the lay members on the ethics committee. A remarkable recognition of the activity of a large part of the university, written for intelligibility to non-specialists, is locked away and ignored under state confidentiality.

It need not be so. With the development of a university-wide computer network, it should become possible to make these sections of the application accessible. Applications are already submitted in electronic form; editing them into a public database would be an easy matter. Sensitive information identifying researchers could still be blocked.

- Public reports. There has been a gradual evolution in the interpretation of the guidelines regulating animal experimentation. The permissible procedures for killing animals, for example, have received a lot of attention and new guidelines are to be developed.

It matters little whether principles rather than details of specific cases are prominent, ought to be reported.

There is, I am suggesting, scope for more openness about the work of the ethics committees. It could be achieved without compromising the security needed to protect scientists from unacceptable risks to their work and safety. Indeed, I think greater openness would help to reduce the level of misunderstanding and suspicion. But finally, openness is needed to discharge the obligation of accountability that goes with self-regulation.

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