

MONTAGE

NEWS FROM THE CAMPUSES OF MONASH UNIVERSITY

Volume 2 Issue 10

November 1991

SAVANT

**Marcia Neave
on women and
the male law**



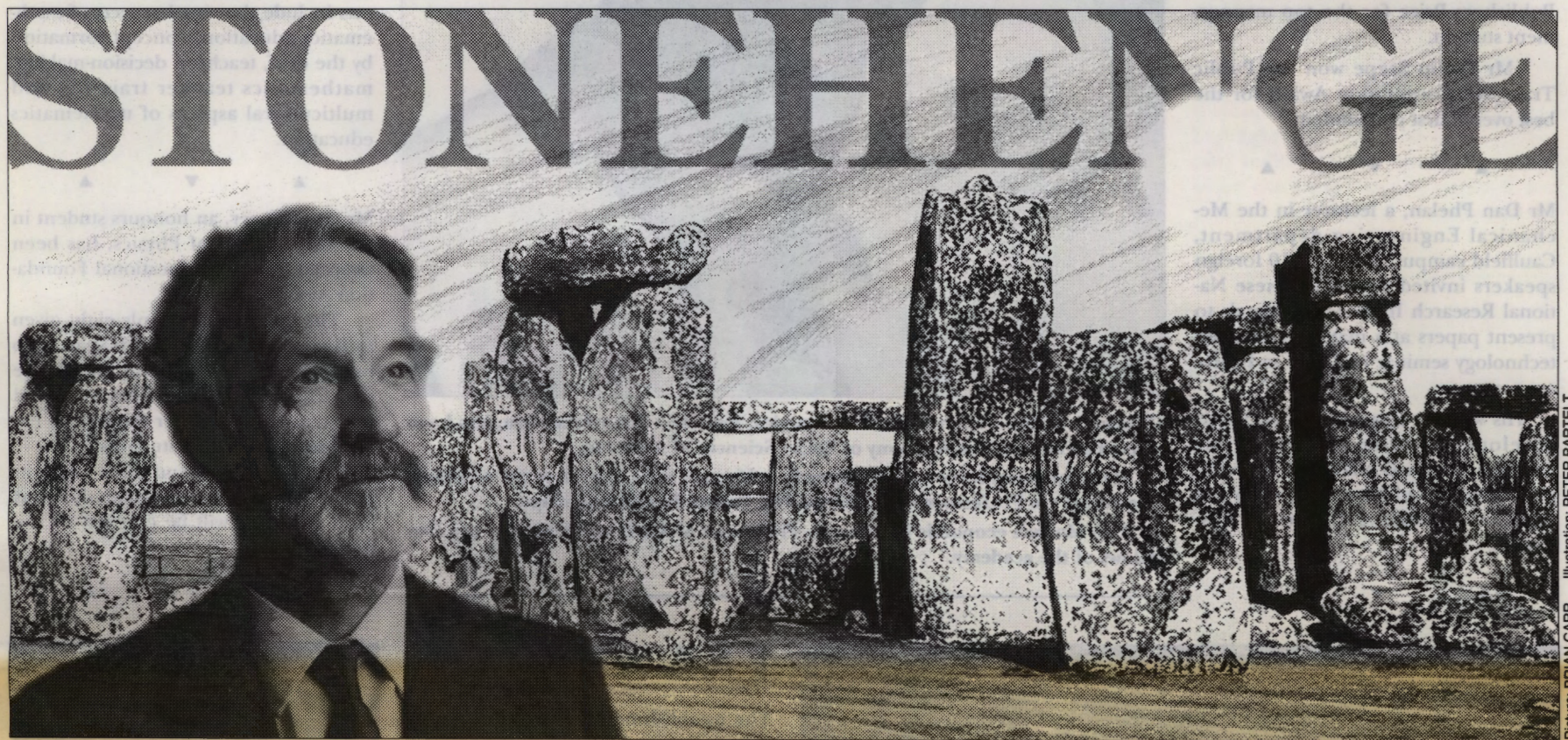
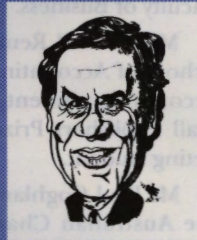
RESEARCH

**Deciphering
secrets of
Stonehenge**



VIEWPOINT

**VC's vision:
enterprising
and global**



Picture: BRIAN CARR Illustration: PETER BARTELT

Sun signs of the ancient world

A Monash researcher has produced a radical – perhaps definitive – explanation of the design and purpose of Stonehenge, as well as other great prehistoric monuments.

Dr Neil Thomas (above), a retired engineer turned classical scholar, says Stonehenge and other prehistoric circles in Europe and Ireland were built to observe the annual cycles of the Sun and the Moon, and functioned as giant calendars.

In his PhD thesis, 'The Proto Civilisation of Albion and Erin', he has described a pre-Celtic culture which had a sophisticated grasp of mathematical concepts usually credited to civilisations several thousand years younger.

Far from being herdsmen and hunter-gatherers, the inhabitants of Ireland and Britain performed prodigious feats of surveying, design and engineering.

They devised a 16-month calendar and probably worshipped – in addition to the Sun and the Moon – three gods equivalent to Odin, Thor and Freyr in the later Norse pantheon.

Dr Thomas, who received his PhD in October, developed an interest in the pre-Celtic culture of Britain and

Ireland while investigating his Celtic ancestry. Based on 12 years research deciphering ancient symbols, he believes that 4500 years ago the ancient Britons had:

- discovered the special properties of right-angled triangles, supposedly defined by students of Pythagoras around 550 BC;
- known about the relationship between a circle's circumference and its diameter (π);
- devised a system of symbolic writing that pre-dated the cuneiform script of Sumeria and the hieroglyphs of ancient Egypt by 1500 years; and
- developed a reliable system of measuring distances and angles.

With accurate tools of measurement based on these, they became skilful surveyors, designing their monuments, aligning their tracks and placing settlements according to precise mathematical rules centred around special numbers – notably 3, 9, 11, 22 and 33.

Their solar calendar divided the year into 16 months – each of four five-day weeks – supplemented by 45 intercalary days to make up a 365 day year. Such calendars apparently were still in use at least into Roman times.

The four pagan festival days of their calendar are still celebrated today. They survived the Roman, Anglo-Saxon, Viking and Norman invasions, eventually being adopted by the Roman church as Christian festivals.

Although their original names have probably been lost or changed, the prehistoric week's five days probably honoured the Sun (Sunday), the Moon (Monday), Woden (Wednesday), Thor (Thursday) and Freyr (Friday).

Dr Thomas's supervisor, Dr Peter Bicknell, of the Department of Classical Studies, describes the core ideas of the thesis as "very convincing", and believes it is a major contribution to modern understanding of human activities and beliefs in pre-Bronze age Ireland, Britain and Europe.

Among his original insights, Dr Thomas has described the likely role in pre-Celtic society of the enigmatic Long Man of Wilmington, a giant

figure holding two staves, carved into the chalk of a hillside in Sussex.

Dr Thomas argues, on the basis of the ancient units of measurement that recur in Britain's megalithic structures and the precision of those measurements, that the Long Man was a surveyor, and he is holding the tools of his profession.

He has calculated that the staves were used to measure a 2.073 metre length: the megalithic rod. The Long Man measures 33 megalithic rods from head to toe.

All the ancient British units of measure are related by multipliers of 2.5 and 33. Dr Thomas says the Long Man's height, which he calls one dod, is significant because when multiplied by 33 it yields another recurrent unit of distance – the megalithic mile.

He has found, using modern survey maps, that the prehistoric systems of angular and linear measurement were used to set out megalithic circles, engineering works and a complex network of connecting alignments.

The full story starts on page 3 of *Research Monash*.

**SPECIAL
RESEARCH
EDITION**

Eight page

RESEARCH
M O N A S H

NEWS – PAGE 8

- Professor Vaughan on CADRES
- Review invites staff comment
- ARC large grants: full list

AROUND THE CAMPI

CAULFIELD

The first annual awards for the AIM Diploma in Management were presented late in September.

The diploma is a two-year course organised jointly by the Australian Institute of Management (AIM) and the Faculty of Business.

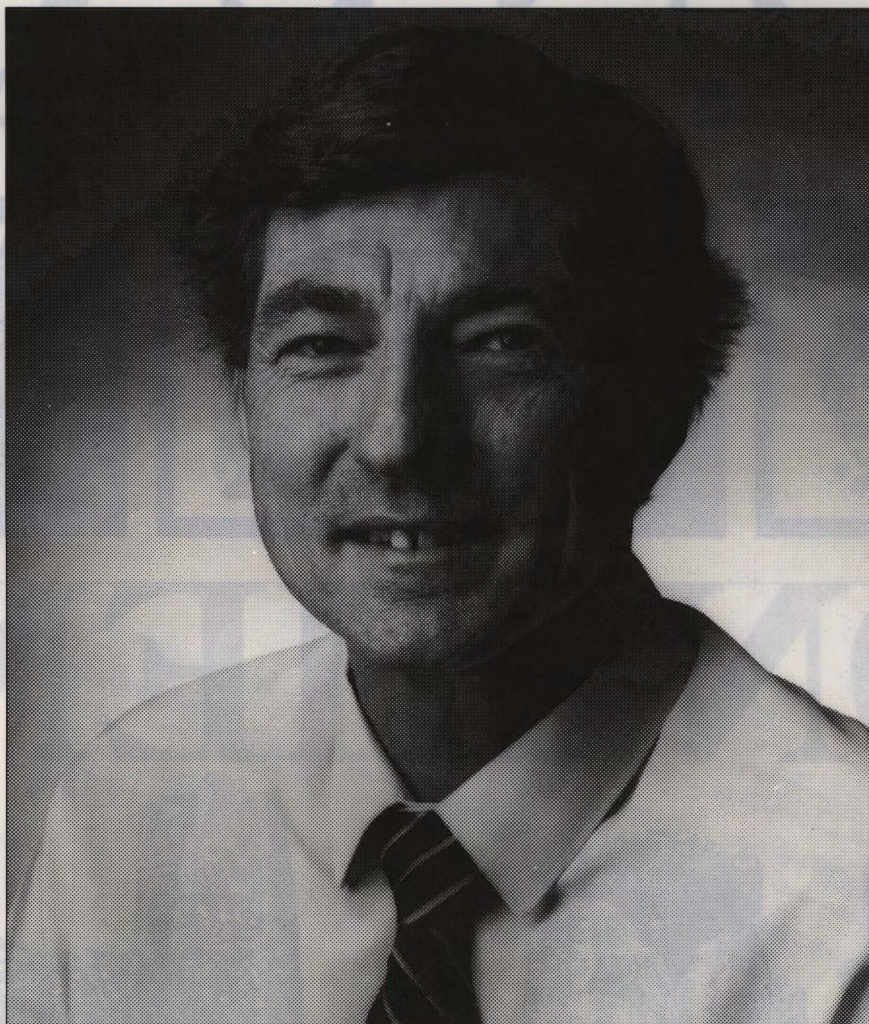
Mr Michael Renfree won the Syme School of Accounting Prize for the top accounting student, and the Prentice Hall Publishers Prize for the top marketing student.

Mr Paul Coghlan was the winner of the Australian Chamber of Manufacturers Prize for the top student in macroeconomics and the Prentice Hall Publishers Prize for the top management student.

Mr Philip Szepe won the Public Transport Corporation Award for the best overall first year student.

Mr Dan Phelan, a lecturer in the Mechanical Engineering department, Caulfield campus, is among 10 foreign speakers invited by the Japanese National Research Institute for Metals to present papers at a materials database technology seminar in Tokyo in February next year.

His work in this area has included development of an IBM PC metals database, which is marketed throughout Australia and New Zealand by the Institute of Metals and Materials Australasia.



Chairman of the Department of Economics, Professor John Freebairn, has been elected a Fellow of the Academy of Social Sciences of Australia.

He is the seventh economist currently at Monash to be elected to the academy. The others are Professors Dixon, Head, Ng, Parish, Powell and Snape.

Two Monash economic historians – Professors McCarty and Sinclair – are also fellows of the academy.

CLAYTON

International authorities on mathematics education, and econometrics have been appointed to chairs at Monash.

Dr Alan Bishop will take up a Chair of Education next September. Professor Alan Powell, Monash's foundation professor of economics, took up a personal Chair in Econometrics last month.

Professor Powell, who has held the Ritchie Chair of Research in Economics at the University of Melbourne since 1979, has a national and international reputation for his research in economics and econometrics.

Dr Bishop was a visiting professor at Monash in 1985. His research interests include the visual aspects of mathematics education, concept formation by the deaf, teachers' decision-making, mathematics teacher training, and multicultural aspects of mathematics education.

Mr Cenk Kocer, an honours student in the Department of Physics, has been awarded a Mitsui Educational Foundation Award.

The award, one of only eight given to Australian students each year, is to help develop and expand knowledge and friendship between Australia and Japan, as well as further the tertiary education of Australian students.

Mr Kocer will spend three weeks in Japan. All travel, accommodation and food expenses will be covered by the foundation.



Pictured at the 'Multiculturalism: images of contemporary Australian life' conference last month at the University Gallery, Clayton campus, are Dr Dean Forbes of the Australian National University; conference organiser and Geography and Environmental Science research assistant Ms Tania Stokes; Professor Nigel Thrift of the University of Bristol; and Head of the Department of Geography and Environmental Science, Professor Gordon Clark.

FRANKSTON

The establishment of an intercampus bus service and greater autonomy on local initiatives were among issues discussed during the Vice-Chancellor's recent visit to Frankston campus.

Professor Logan visited Frankston to consider the campus master plan, inspect new buildings and meet with the Campus Development Committee and members of general and academic staff.

Responding to concerns raised at the staff meeting, Professor Logan said he would look into the issue of communication between Clayton and Frankston campuses, particularly in the areas of transport and provision of resources for local initiatives.

He said he was pleased with the progress of the amalgamation so far, and assured staff that Frankston would continue to remain a distinctive and integral part of the university.



A farewell recital to mark the retirement of Mrs Lilli Allgood was attended by more than 100 staff and students at Chisholm Hall last month.

Mrs Allgood has been a part of the School of Accounting (formerly the Department of Business Studies) for the past 22 years. Mr Anton Stavik (left) and Ms Margaret Manwaring (right) accompanied.

MONTAGE

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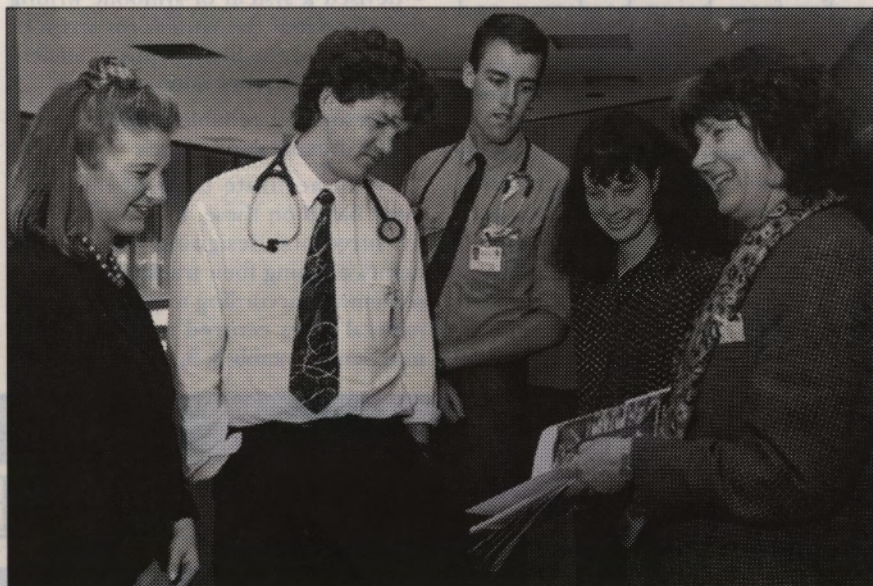
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Final year medical students at Monash were presented with a health care manual by SmithKline Beecham Pharmaceuticals at the Monash Medical Centre last month.

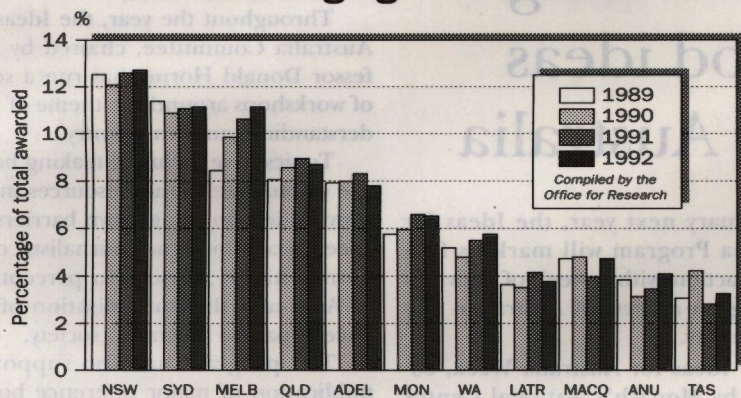
A Manual for Primary Health Care, prepared by Dr Selwyn Carson and Dr Edward Gawthorn, published in 1990, was offered to GPs early in 1991 for \$25. The proceeds have been donated to the Australian Cancer Society.

The manual is divided into 10 chapters, each covering aspects of primary health care, such as emergency care, obstetrics, chronic illness and adult health care. Copies were also given academic staff members involved in the teaching of primary health care.



Seventy new ARC research grants approved

ARC large grants 1989-92



The results of the 1992 round of the Australian Research Council (ARC) large grants, approved last month by the Minister for Higher Education, Mr Baldwin, saw an increase in the ARC budget from \$67m in 1991 to \$77m in 1992.

Monash received a total of \$5,101,000 for all new and continuing multi-year grants, representing 6.6 per cent of the total national allocation. The university was given 70 new large grants, a success rate of 32 per cent, compared with the average rate of 25 per cent.

Under the ARC Large Equipment Grants Scheme for items of equipment costing a minimum of \$200,000, the university received ARC support of \$490,000 from a total of \$6.374 million allocated nationally. The successful submissions include \$370,000 towards the purchase of a 200 kV analytical transmission electron microscope and \$120,000 towards the construction of a glasshouse.

A breakdown of Monash's grants is on page 8.

Left: a comparison of total funds attracted by major research institutions from the Australian Research Council.

Seaborne study to probe earth's crust

A \$1.5 million survey of the ocean floor in treacherous waters off Papua New Guinea next year is expected to provide new insight into the way continents are formed.

The survey, funded by the US National Science Foundation, involves scientists from Monash, the prestigious Lamont-Doherty Geological Observatory of Columbia University, The University of Toronto and CSIRO.

More than 20 technicians and scientists, including Professor Gordon Lister of the Department of Earth Sciences, will take part. They will build up a picture of the ocean's crust using deep seismic imaging techniques.

The work is based on award-winning geological research in PNG by Monash PhD student Ms June Hill (see story page 5). Over the past three years, while doing field work in the D'Entrecasteaux Islands off PNG's eastern tip, she has found what are believed to be the world's deepest, youngest rocks.

The rugged mountains of Goode-nough Island and Ferguson Island in the D'Entrecasteaux group are made up of rock that came from more than 70 kilometres beneath the earth's surface. This discovery, and work in the western US, points to the existence of deep faults in the earth's crust which have 'thrown' rock up to the surface.

This represents a major challenge to the traditional theory on how the continents separated. This model involves pure shear, with the continental plates torn apart by enormous forces. But the new theory envisages slippage along the faults (rifting), forming domes of contiguous crystalline rock from great depths.

The D'Entrecasteaux Islands are believed to have formed in this way;

other domes are beneath the sea in the survey area, the Woodlark basin, adjacent to the islands. This is one of the few places in the world where active rifting is still believed to be occurring, associated with the formation of core complexes.

The international project will criss-cross the region over 10 days in February and March, mapping the depth and location of the faults night and day. The waters are dangerous; infested by sharks, prone to giant whirlpools, and of greatly varying depths around the coral reefs. Local people will be enlisted to assist in navigation of the reef areas.

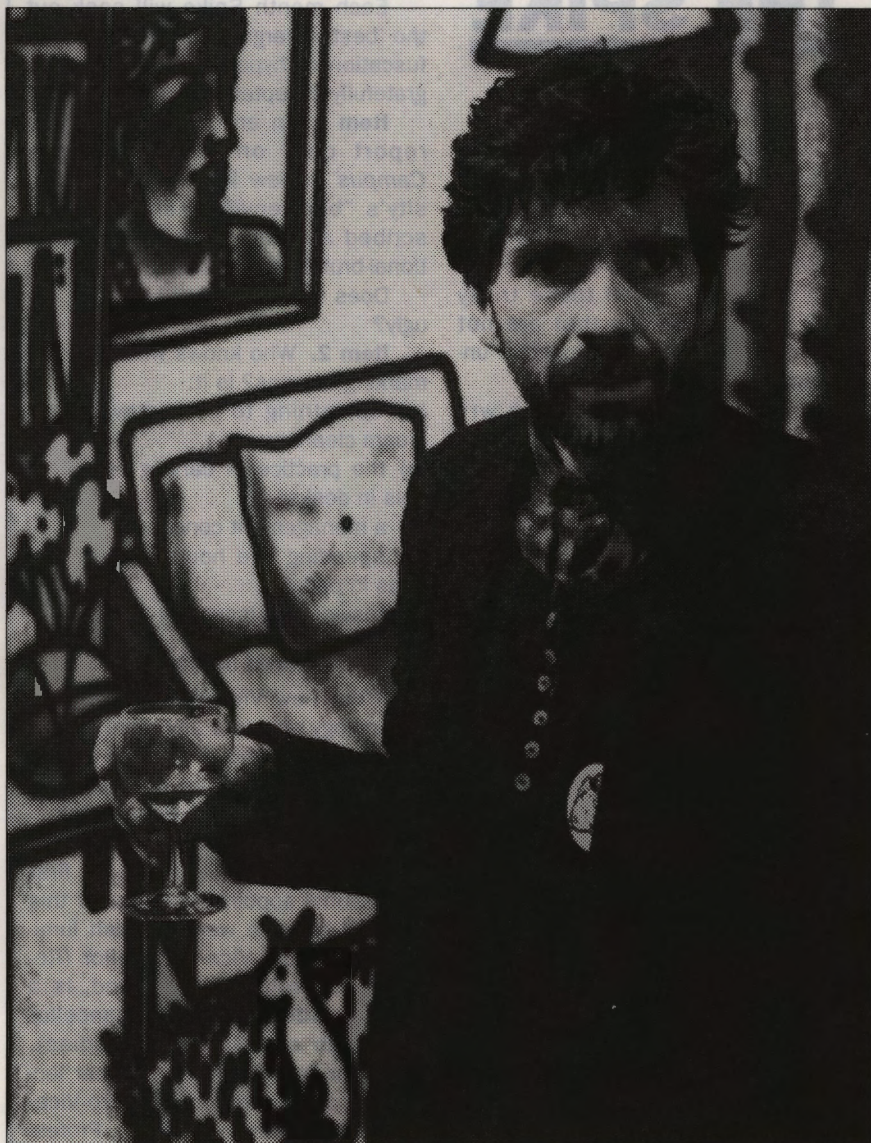
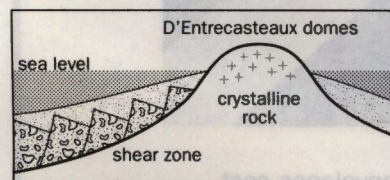
The team will use a reflection imaging method, in which an underwater air gun discharges regular sonic bursts. The reflections from the ocean floor are collected by a four-kilometre streamer towed behind the research vessel *Maurice Ewing*.

Professor Lister, who is also an Adjunct Professor at Columbia University, will help synthesise the data collected and provide a search strategy while on board the vessel.

"We have made educated guesses about what's there," he said. "We expect to make some fundamental advances in knowledge on how the continental crust of the Earth was formed."

"We want to prove that these big faults exist and find out about their properties and how deep they go. We may also be able to prove that this part of PNG has fragments of what is now Canada."

Left: Slippage along faults in the earth's crust form domes of contiguous crystalline rock from great depths. The D'Entrecasteaux Islands may have formed in this way. Below: the survey area.



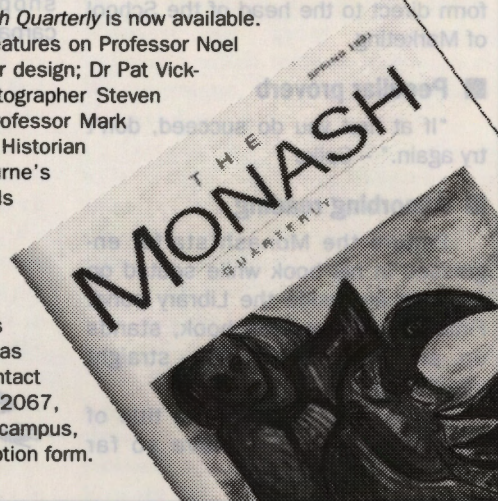
Picture: BRIAN CARR

Portrait of the artist at home

Howard Arkley is pictured in front of 'Suburban interior '83', at the opening of an exhibition of his work at the Monash University Gallery. The exhibition runs until 30 November and is open Tuesday to Friday, 10 am to 5 pm; Saturday, 1 to 5 pm.

Cars, Kakadu and cameras

The Spring edition of the *The Monash Quarterly* is now available. The new 34-page edition includes features on Professor Noel Murray's concerns about modern car design; Dr Pat Vickers-Rich and her dinosaur dig; photographer Steven Morton's panorama camera; and Professor Mark Walqvist's food facts and fallacies. Historian John Arnold wanders down Melbourne's memory lanes, Dr Joan Grant recalls the tensions in China leading to Tiananmen Square, and PhD student David Curl captures the spirit of Kakadu on film. Dr Ian Turner's unique view of football is remembered and Campbell McComas recalls an infamous legal hoax. Contact the Public Affairs Office, extn 75 2067, first floor, Gallery Building, Clayton campus, for a copy, which includes a subscription form.





THE SPIKE

■ Introducing ...

In newspaper parlance, the spike is the traditional resting-place for both unusable and used items. It's a sort of filing system and too-hard basket all in one.

It's also where all those tricky little bits and pieces that are not quite news, and yet not altogether unnewsworthy, wind up.

These items may elicit a wry smirk, a chuckle, a groan, or sail just a little close to the wind.

Many a newspaper chief has been heard to say: "If the columnist doesn't want it, spike it!"

■ Shooting the leader

RMIT's newsletter *Openline* set something of a record recently when it published seven photographs of its Director, Professor David Beanland, in just one issue.

A quick flick through our files revealed that this publication falls way behind in the follow-the-leader self-promotion stakes. The best old Monty could manage was a meagre two shots of our Vice-Chancellor in its July edition.

Perhaps RMIT's snap happiness in the vicinity of its leader could be excused if there was a lack of other subjects, but the same edition headlined the fact that the Institute was "Australia's biggest university". Sound familiar?

■ Singing your own praises

Applicants for the much sought-after Bachelor of Business(Marketing) have gone to extraordinary lengths this year to make an impression.

No less than six candidates submitted video tapes with applications. But one applicant took the cake. He commissioned a singing telegram boy to deliver his tape and application form direct to the head of the School of Marketing.

■ Peculiar proverb

"If at first you do succeed, don't try again." - Spike

■ Absorbing reading

Picture the Monash staffer engrossed in his book while seated on a bench alongside the Library pond. Finally, he closes the book, stands up, and walks to his left - straight into the pond.

Attempts to uncover the title of this absorbing book have so far proved unsuccessful.

■ Postulating prematurely

Stumbled over in a first draft of a Monash research article ... "many factors may contribute to premature failure including improper lubrication, improper mounting, or too tight a fit". How could the subject be anything else but mechanical engineering?

■ Minutes (seconds and hours)

Hear the one about the hour-long committee meeting at which matters arising from the minutes of the last meeting was the only business considered?

I can just see the next meeting agenda:

1. Matters arising from the minutes of the last meeting which considered the minutes of the previous meeting which considered ...

■ Gobbledegook department

Each month Spike will seek out the 'best' in jargon, double-speak, obfuscation or hyperbole (contributions gratefully accepted).

Item 1. In an otherwise glowing report card on Monash in the *Campus Review Weekly*, the university's "built environment" was described as tending to the "institutional-brutal oeuvre".

Does that mean our buildings are ugly?

Item 2. Who knows what "benchmarking" means? Is it:

- (a) something to be removed with cream cleanser;
- (b) the practice of carving one's initials in desks;
- (c) a management concept;
- (d) spending idle hours feeding the birds in parks?

Answer next issue.

■ Institutional osmosis

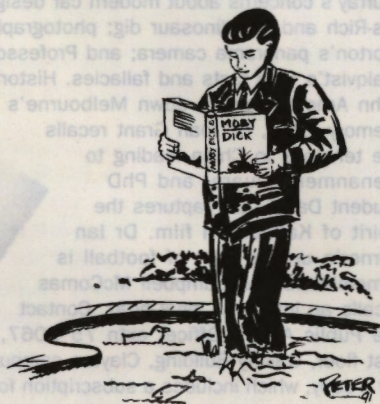
If the new Victoria University of Technology appoints any more former Monash staff and alumni to senior positions, we may as well amalgamate with them and be done with it.

When the university, Victoria's fifth (and counting?), made its first professorial appointments earlier this year, all but one were Monash luminaries. Deputy Vice-Chancellor (Resources), Professor Eric Lund, is a former student; Pro-Vice-Chancellor (Research and Graduate Studies), Professor Paul Clark, is a former lecturer and researcher; and Pro-Vice-Chancellor (Academic Affairs), Professor June Gleeson, also studied at Monash.

■ Burnished ideas

A daily columnist has been inundated with readers' colloquialisms for those who are "A few cents short of the dollar" and such like. Witty and inventive contributions are herewith solicited for future spiking.

For starters, "He hasn't got two ideas to rub together" and "A few shopping trolleys loose in the carpark" come to mind.



Letter to the editor

from Mr John Arnold, National Centre for Australian Studies.

Promoting good ideas for Australia

In February next year, the Ideas for Australia Program will mark its first year in action with a week of activities focusing on aspects of Australian cultural identity.

The Ideas for Australia Week, co-hosted by Monash's National Centre for Australian Studies (NCAS) and ABC Radio National, will bring together participants and speakers from throughout Australia, including some of the country's leading intellectuals.

Much more than a conventional conference, the week will open at the CUB Malthouse in South Melbourne on 16 February with a public forum.

Session topics will include the economy, how artists and intellectuals create Australia, how Australians understand their own country through the media, and what we should know about Australia.

One of the highlights will be the second Donald Horne Lecture. This will be delivered by Professor Emeritus Geoffrey Harcourt in the Great Hall of the National Gallery of Victoria on 17 February. Melbourne born and educated, Professor Harcourt is master of Jesus College at Cambridge. His lecture will be on 'Madness, markets and a middle way'.

The week will conclude with the formal opening at the Powerhouse Museum in Sydney of 'The lie of the land', an exhibition of modern Australian cultural imagery. This will run for six months in Sydney and then travel to Canberra and Melbourne.

Ideas for Australia is a Federal Government initiative, coordinated by Monash through NCAS with assistance from the Australia Council. It was set up following the successful Ideas

Summit, held at Old Parliament House in Canberra in February.

Throughout the year, the Ideas for Australia Committee, chaired by Professor Donald Horne, has run a series of workshops around the theme of 'Understanding our own country'.

Topics have included making better use of our intellectual resources in the universities; breaking down barriers between academics and journalists; community history; Australian perceptions of Asia; and the normalisation of science as part of Australian society.

The program has also supported publication of major reference books, including the recently released *Who's who of Australian writers*, a comprehensive biographical guide to contemporary authors in this country.

Reports on each of the Ideas forums - or discussion starters, to use Donald Horne's phrase - are available from NCAS. Besides stimulating discussion they have provided themes for Ideas for Australia Week.

Most of the week's functions will be open to the public free of charge. A brochure and registration forms will be available shortly from NCAS.

I urge the Monash community to take advantage of this unique opportunity to contribute to the culture of our country, and to promote a greater understanding of its identity.

John Arnold

Coordinator, Ideas for Australia

Letters to the editor

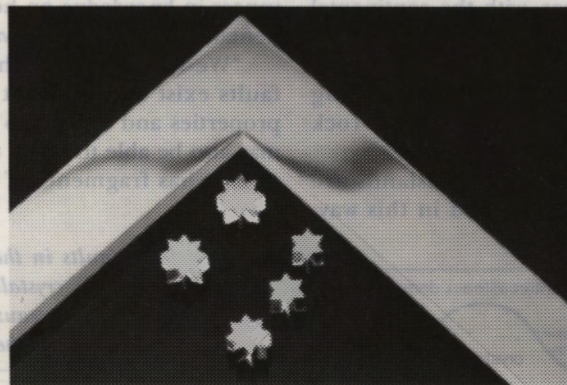
Letters should be about 300 to 400 words in length, typed and signed, and with the author's name clearly written.

Please include a contact phone number for verification. Contributions may be edited for reasons of space.

Write to the Editor, Montage, Public Affairs Office, Gallery Building, Clayton campus.

The Communications Department offers: Monash Christmas cards and presentation folders

Featuring the university's corporate image



Twenty full colour horizontal cards with envelopes cost \$8, or 40 cents each. The message is: *Season's Greetings from Monash*. To order, contact Ms Susan Byrne on extn 75 5059.

Full colour loose-leaf presentation folders cost 80 cents each. A special rate applies for orders of more than 1000. The A4 folders are ideal for brochures, papers, pamphlets, course notes etc. They also take thick documents such as *Monash: An introduction*. To order, contact Public Affairs, on extn 75 2067.

Music study to bridge cultures

A new course in Asian music aims to provide insight into the tastes, cultural beliefs and character of the region.

The three-year course in Asian music has been designed for people who intend to work or do business in Asia, as well as teachers of music or performing arts. Head of the Department of Music, Professor Margaret Kartomi, said because of growing cultural and business links, there was a need for Australians to be better informed about the music and arts of Asia.

"In fact, they will have a definite advantage over their competitors if they know something about the performing arts of the region," she said. "Knowing the culture means knowing more about the people with whom they are dealing."

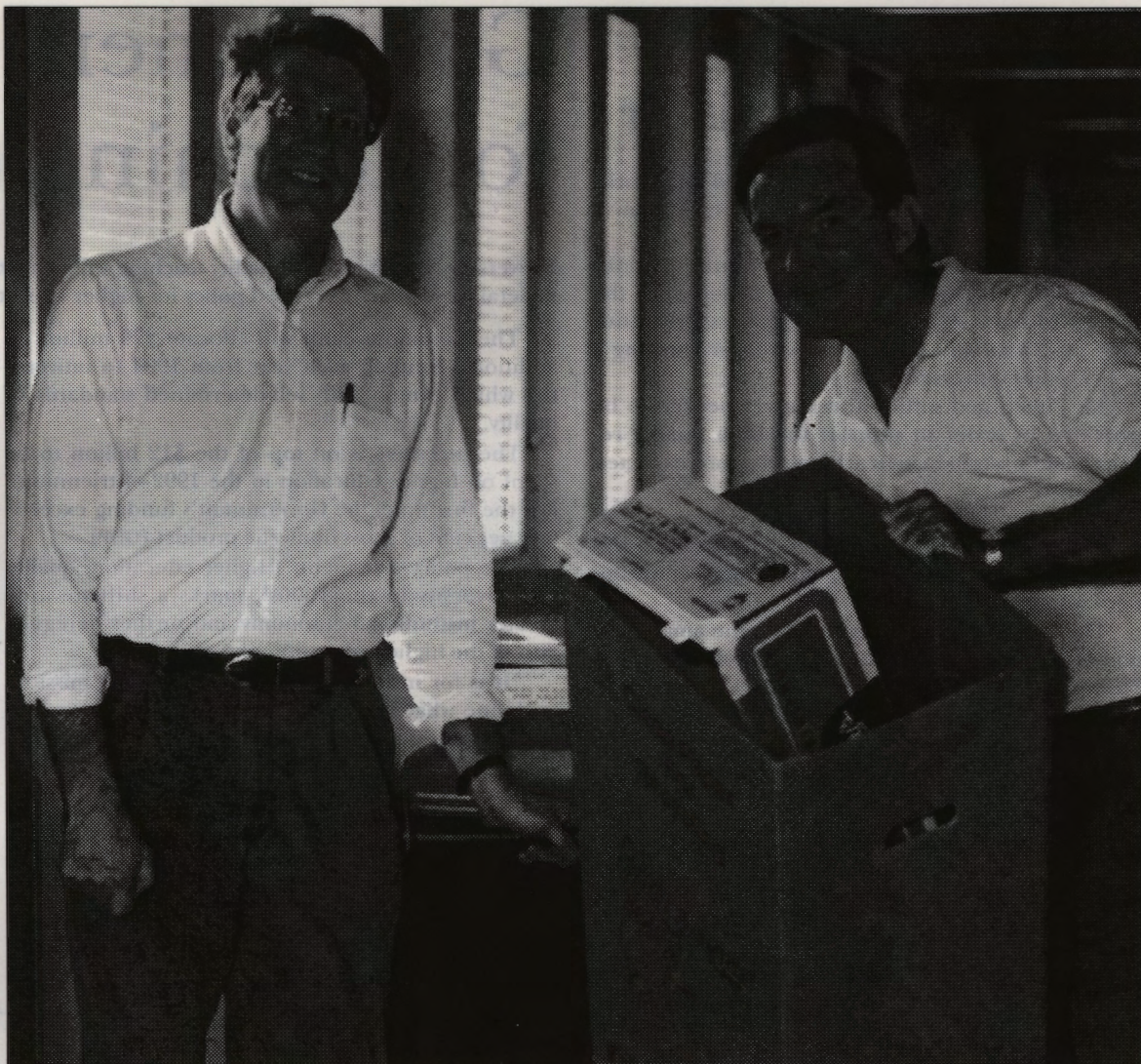
The major sequence of study includes a new course in Indonesian Gamelan Performing Arts, which includes puppetry and dance as well as gamelan (brass percussion ensemble) playing. Other subjects will cover the music of Sumatra, Java, Bali, Thailand, India, Japan, China and Korea.

The department will use its extensive collection of Asian orchestras and other instruments, puppets, costumes and field recordings, which are housed in its music archives.

"Courses in Asian music and performing arts provide an opportunity to learn about local concepts of artistic elegance, beauty and form," Professor Kartomi said. "Students also get the chance to play some of the music they are studying."



Visiting Asian music lecturer Doktorandus Hajizar.



Head of the Department of Geography and Environmental Science, Professor Gordon Clark (left) and Professor Martin Williams, do their duty in the department's recycling scheme.

Geographers take out the trash

A recycling scheme in the Geography and Environmental Science department has achieved a dramatic cut in the volume of its disposable rubbish.

The scheme, in which each person is responsible for sorting recyclables, was introduced last month and has reduced waste by more than 90 per cent.

Each room is required to sort waste into recyclable groups – white paper, other paper products, compostables, and glass and aluminium. The sorted waste is placed in corridor bins each week.

The department has introduced a roster system in which each staff member takes a turn as weekly recycling monitor, collecting and dispatching the bins. In a department with 40 staff members, each is rostered on only once a year. The duties take about half an hour to complete.

Chair of the department's recycling committee, Dr John Grindrod, said he had been surprised at how simple the scheme was to get going. He believes it could be a model for recycling on campus.

The scheme had been well received by staff. "People are separating their stuff, and they are serious about it," he said. "There's no reason why it shouldn't be operating throughout the Menzies Building. Organisation is quite simple when people are responsible for the rubbish in their own rooms."

Dr Grindrod said many secondary schools had very good recycling programs, in contrast to the university. "I think we have a responsibility to set an example to undergraduates," he said.

White paper is taken by Australian Paper Manufacturers, and paper products by a local Oakleigh charity group. Compostable material is used by the grounds staff, and glass and aluminium are recycled through the Union's existing scheme.

Items which cannot be recycled are removed in the usual manner. A plastics recycler is being sought.

Geology student wins international award

Research in Papua New Guinea into the formation of the continental crust has earned a Monash PhD student an international geology medal.

Ms June Hill, of the Department of Earth Sciences, won the G. B. O'Malley Medal at the 1990 International Congress on mining development in the Pacific Rim. Her paper, 'The nature of shear zones formed during extension in eastern Papua New Guinea', grew out of nine months field work in PNG's D'Entrecasteaux Islands from 1987 to 1989.

"Normally mountains form when two plates collide, but in this situation, mountains have formed as a result of a plate being extended," said Ms Hill.

"The islands have very deep rocks on the surface; some rise from as deep as seventy kilometres. My research is attempting to answer why they are coming up from such great depths, and what mechanism is bringing them up."

The main part of her work was detailed geological mapping. This meant trekking through swamps, skirting the giant domes in the interior, penetrating deep gorges in the mountains, and spending many days in

the jungle with her party of hired native bearers. Her main assistant was a local man, David Peniasi, who became an invaluable ally.

"A lot of people inland hadn't seen many white people, especially a female," she said. "When I approached, some of them ran and hid in the bushes. Occasionally I would turn up in a village and it would be deserted. Eventually I'd start hearing a whispering in the bushes. Some were too scared to come out."

Her study found that all of the rocks were very deep, not just some as other researchers originally thought, and that the magmatism (i.e. intrusion of granites) was an important part of the rapid movement process. The rocks are being uplifted centimetres each year.

To determine how deep the rocks were, Ms Hill looked at their orientation and the amount of deformation. "When a rock is deformed, the minerals will tend to align," she said.

"As the rocks are uplifted, the conditions are changing: the pressure is decreasing and water is coming in." Using information about different rock



Ms June Hill with her supervisor, Professor Gordon Lister.

compositions, she determined the pressures and temperatures at each stage of rock formation.

Ms Hill, who completes her PhD at the end of this month, has almost finished her research in the D'Entrecasteaux Islands. Next, she hopes to study intrusion of granites beneath the Antarctic.

New unis an option in Victoria: minister

Two new universities could be established in Victoria, according to the Minister of Education, Mr Barry Pullen.

In a speech to Parliament last month on post-compulsory education and training, he left open the option to have seven Victorian universities. Until now, the Victorian Government has been pursuing a policy of five universities.

Mr Pullen said sufficient resources needed to be provided in order to support the high quality research and postgraduate teaching programs expected of universities.

Expansion in demand for higher education and increased levels of support for research meant it was possible to consider increasing the number of institutions with university status.

The two new universities could be the amalgamation of Royal Melbourne Institute of Technology and Phillip Institute of Technology, and the proposed university in the outer eastern suburbs, to be modelled on Swinburne Institute of Technology.

Mr Pullen said the amalgamation process in Victoria had not gone smoothly but the restructuring was nearly completed. "The merits of the changes are yet to be measured," he added.

He also announced a ministerial task force, comprising representatives from education and industry, to investigate accelerating links between higher education, TAFE and industry.

Government incentives for teaching excellence

Universities which provide quality teaching will be rewarded financially under a new scheme announced in the Federal Government's revised policy for higher education in the 1990s.

The Commonwealth will allocate \$70 million in additional funding each year from 1994 to universities which comply with self-determined standards of quality.

The incentive is on top of the \$12 billion to be spent on higher education in the 1992-4 triennium. For the first time, the Government's funding exceeds one per cent of gross domestic product (GDP).

The policy statement, 'Higher education: quality and diversity in the 1990s', marks a shift towards greater institutional autonomy and further deregulation of the higher education system.

"It is for institutions to determine their mission, to define what they mean by quality of performance against their own objectives, and to identify and provide the evidence necessary for them to gauge their success," the statement said.

From 1994, capital and operating funding will be merged, reducing the role of the Commonwealth in resource allocation and allowing for greater use of alternative teaching modes.

The statement provides \$41 million for an extra 2845 student places in 1994. In 1992-4, the Govern-

ment will spend \$10.5 billion on operating grants for institutions, with \$750 million for direct research grants and a further \$750 million for capital works.

Capital funding had been increased by \$270 million in 1994, he said. However, the AVCC was disappointed that a stronger commitment to expanding the TAFE system was not made in the statement.

The Minister for Higher Education, Mr Baldwin, said participation in the \$70 million quality assurance and enhancement program would be voluntary and the allocation of normal grants would not be affected.

He said an independent national body to be formed next year would assess quality management arrangements adopted by institutions, before allocating the funds.

An independent National Centre for Teaching Excellence in higher education also will be established next year to examine and disseminate information about good teaching practices.

The statement strongly opposed the introduction of fees for undergraduates, but not the Government's fee structure for postgraduate courses.

FINN REPORT FALLOUT

Radical plan for joint university-TAFE courses

Higher education and TAFE would offer joint foundation studies courses under a radical plan proposed by the Australian Vice-Chancellors' Committee (AVCC).

As part of its response to the Finn review of post-secondary education, the AVCC proposed joint foundation courses in TAFE and higher education.

The AVCC President, Professor Ken McKinnon, said foundation studies would provide generalist vocational training, clearer paths between the sectors and a higher profile for TAFE.

A two-year module has been proposed, to be designed by both sectors and offered either through higher education or TAFE institutions.

The first year would consist of a common module offering studies in language and literacy competence, numerical and mathematical skills and competence, as well as other humanities, natural and social science studies.

After completing one or two years, students could opt to take either a higher education oriented year, which would provide credit transfer to a higher education award course, or a paraprofessional course leading to a TAFE award.

The AVCC also raised doubts about the implementation of key recommendations of the Finn review, prepared by IBM Australia's chief executive, Mr Brian Finn. While broadly endorsing the report, the AVCC is still concerned about a lack of initial consultation with higher education and the sector's representation on working parties set up to enact the findings of the report.

AVCC President Professor Ken McKinnon also warned against resources being diverted from higher education to fund TAFE expansion. He said it had become clear that the TAFE sector saw the report as a reason to do so.

"The AVCC strongly supports the thrust of the report, which envisages the production of a well-educated workforce with skill profiles at all levels that reflect the shift to advanced manufacturing technologies and economically efficient, value-added service industries," Professor McKinnon said.

"While encouraging the expansion of TAFE into the provision of more post-secondary education, Australia cannot allow Finn to become the excuse to curb growth in the higher education sector by cutting funds there to pay for TAFE," he said.

He warned that the revival of interest in technical and further education must not mean diverting funds, or imposing artificial constraints on post-compulsory education.

Professor McKinnon said he was disturbed that higher education had not been represented on the Finn committee, leading to erroneous assumptions and biases in the report. Membership of working parties formed since its release also was skewed towards TAFE and schools, with minimal higher education representation.

"The Finn committee's recommendation that there is a need to define the principal role of TAFE is absolutely correct," he said.

"But there seems to be a rush to enact certain expansionary sections of the Finn Report, rather than take up this crucial recommendation.

"Another disturbing trend from post-Finn discussions is the question of key competencies and the assumption that higher education will fit in with

sets of standards appropriate for, and designed for, industry purposes.

"There have been a number of moves by the faceless bureaucracies to impose rigid standards relating not to course content or teaching processes, but to inflexible competencies defined by employment requirements within an explicit national standards framework.

"Higher education has not been consulted on these actions, although the implications would have a significant impact on their work. Such a system would destroy the very diversity and flexibility which currently ensures

the high quality and acceptance of higher education.

"Even within TAFE and schools, the imposition of such standards will act as a conservative force, restraining institutions from being able to respond quickly and effectively to changing conditions.

"It will only add to central bureaucracies, while diminishing institutional control."

He said the foundation studies module approach would attain Finn Report objectives and ensure that bureaucratic control was minimised.

States examine TAFE cost

The Federal Government plans to take over full financial responsibility for the TAFE sector and other post-secondary training.

The Minister for Employment, Education and Training, Mr John Dawkins, presented the proposal to the Australian Education Council, which comprises education and training ministers, last month. The ministers set up a working party to explore cost implications of some of the options. The council's next meeting is early in November.

Under the plan, the Federal Government would control policy, and finance the expansion of the vocational education and training system. States would retain control of administration and TAFE courses up to Year 12.

Currently the states provide 90 per cent of TAFE finance. Their contributions would go to the Commonwealth, which would increase its share to 70 per cent. It would be the biggest reorganisation of vocational training since the Commonwealth took control of higher education in 1974.

The Finn review of education said that \$1 billion per year needed to be spent by 2001 to provide training opportunities for 272,000 people - a 20 per cent expansion.

The move signifies a shift away from the emphasis on growth in universities to that of the TAFE sector. Commonwealth control was canvassed in the Finn committee's final report, and is considered the only option that would provide the policy framework to implement the review's recommendations.

The proposal could see colleges of technical and further education renamed as Institutes of TAFE to improve their status, as well as community attitudes towards vocational and skills education.

Transforming unreal images of women

Much has been made of Naomi Wolf's extraordinary good looks, especially in light of what she does.

Her recent book, *The Beauty Myth*, is an account of how the diet, pornography, fashion and advertising industries have created unrealistic images of women. Women have become slaves to being thin and good looking, she says.

But in Australia to promote her book, media attention has focused on her appearance. "The scrutinising of feminists' looks is just another way of trivialising what they are saying," she said in one interview.

At Monash, she was asked how successful she would have been without being so attractive. The answer: *she* wrote the book, not her looks.

The public lecture, organised by the Monash Fabian Society and the Women's Campaign Committee, attracted a standing-room only crowd.

Ms Wolf said *The Beauty Myth* is not about wearing or not wearing lipstick. Rather, it is about the current backlash against feminism. She says that in "the third wave of feminism", women must fight against the beauty myth.

So potent is her message about the effects on women of the multibillion dollar world diet industry, that one of her Australian television interviews was cancelled because of fears that advertisers would withdraw their commercials.

"The average fashion model weighs 23 per cent less than the average



An estimated audience of 300 people overflowed a Monash lecture theatre last month to hear feminist academic Ms Naomi Wolf.

woman," Ms Wolf said, "compared with post-WWII fashion models who weighed in at about eight per cent less than average. The 17 year old, anorexic, surgically augmented model has become the new ideal woman."

She says the obsession with weight reduction has led to a culture where

women are so obsessed with their image that they have become apathetic about significant issues, such as equal opportunity in the workplace.

This is in addition to the physical effects of obsessive dieting which include loss of brain function or libido, irregular menstruation and infertility.

Young women in jobs today fear speaking out because there are "so many and more decorative women waiting in the wings ... economics can shut people up," Ms Wolf said.

"Feminism is the logical extension of democracy. No one talks about this as a post-democratic age."

Picture: RICHARD CROMPTON



One of Australia's well-known Aboriginal authors, Oodgeroo Noonuccal (Kath Walker), was given an honorary degree of Doctor of Letters at a graduation ceremony last month.

Oodgeroo is a poet, writer, painter, script writer, teacher, political activist and conservationist who first became involved in political campaigns for Aboriginal rights in the 1960s. She was the first Aborigine to break into mainstream Australian publishing without surrendering her Aboriginal identity. Her first book, *We Are Going*, was published in 1964 and sold out within three days.

In the 1980s, Oodgeroo explored new modes of cultural expression and communication. In 1981 her first exhibition of paintings was held, and she became involved in films, most notably as an actor and script adviser for Bruce Beresford's *The Fringe Dwellers*.

She has been a state secretary of the Federal Council for the Advancement of Aborigines and Torres Strait Islanders, a delegate to the World Council of Churches Consultation on Racism, a Fulbright Scholar, and a delegate to the International Forum for a Nuclear Free World for the Survival of Humanity, held in Moscow.

More services and less politics: new MAS chair

Students deserve more value from their amenities fee, and less internal politics, according to the newly elected Chairperson of the Monash Association of Students (MAS), Ms Kerry Barker.

Ms Barker was elected chairperson of the association in last month's elections, which saw conservative students gain control of the association for the first time since Peter Costello occupied the chair in the late 1970s.

Ms Barker was a member of the Spectrum ticket which represented students from all Clayton faculties, most clubs and societies, overseas students and religious groups on campus.

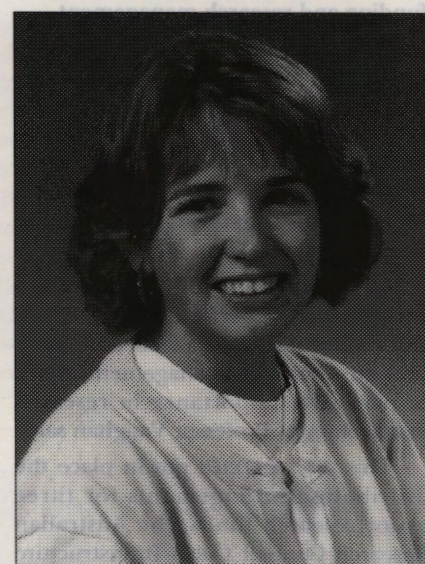
While in office, she hopes to raise the profile of MAS and give students a greater awareness of its services. "During the campaign, we asked students what they thought of MAS activities and how often they used the services provided," she said.

Few students even knew what services were available. To overcome this, she hopes to reduce the internal political activity in MAS so that it can better represent the interests of all students.

"During campaigning, we found that people just aren't interested in student politics," she said. "They don't really care or they think it's a waste of time. Now that we've been elected we hope to give student politics new life."

"We're going to start with the basics. We stood on a platform of trying to keep politics out of the whole Union structure and keeping politics away from the services aspect of the Union."

"We're just trying to get more services that more students will use,



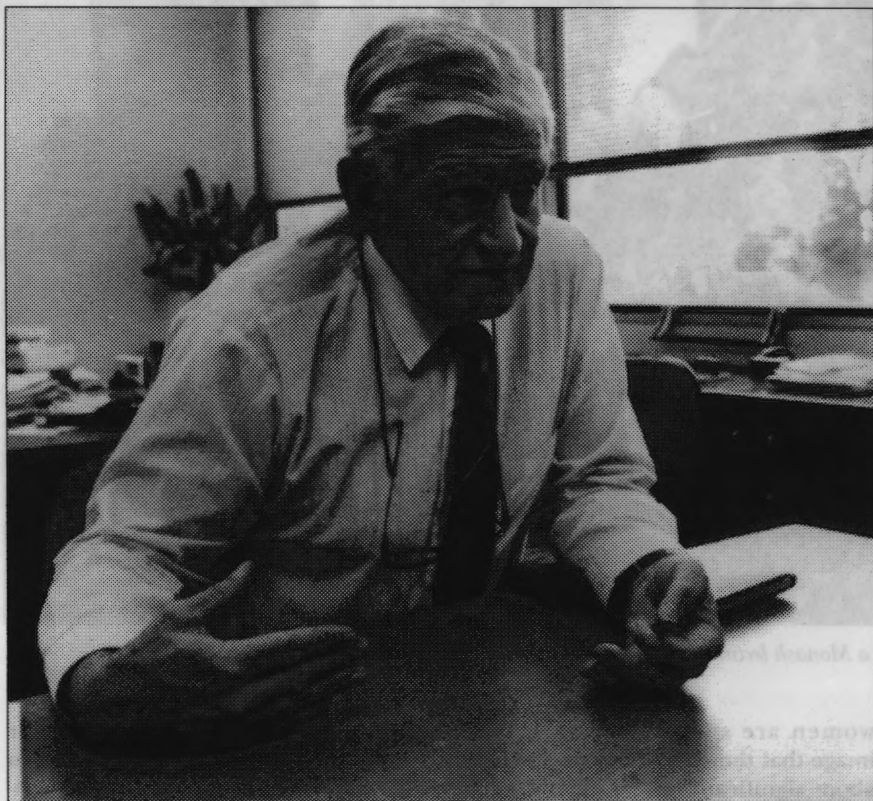
Ms Kerry Barker.

making sure that students get value for money out of their amenities fee."

Among the activities that Ms Barker wants to introduce next year is a Health and Fitness Week in conjunction with the Sports & Recreation Association and outside organisations such as Vic Health and the Anti-Cancer Council of Victoria. The week would promote the benefits of regular exercise and make students more aware of the damaging effects of drugs, alcohol and smoking.

Ms Baker said the role of MAS chairperson provided an opportunity to make a difference on campus. She wants to achieve greater student involvement in the political process at Monash, with MAS acting as an effective lobby group.

Research changes recognise diversity



Professor Geoff Vaughan: "There will always be critics and some compliments ... we have to move with the times, and realise we are operating in a new environment."

A major role in research management is being played by the Committee of Associate Deans – Research (CADRES) after only six months of activity, according to its chairman, Professor Geoff Vaughan.

With representation from each of the 10 faculties, Monash University College Gippsland (MUGG), and the Victorian College of Pharmacy, CADRES has created a direct line of communication from the Vice-Chancellor through to the faculties and colleges on research funding and research management.

The Vice-Chancellor's Advisory Committee on Research is the peak research management committee on campus. The VC's committee reports to Academic Board and receives recommendations directly from CADRES which, in turn, liaises closely with the faculties and colleges.

"This is good in the devolved university structure because it is important that the faculties take a leadership position on their own management; that's of particular importance in research management," Professor Vaughan said.

This year, CADRES put in place the distribution arrangements for three major research funds, the Australian Research Council (ARC) Infrastructure Scheme, the Research Initiatives Scheme and the Small Grants Scheme of the ARC.

Diversity

The new distribution mechanisms have caused some concern because they represented a big change from the university's traditional method of funding research but, according to Professor Vaughan, the new mechanisms are fair because they recognise the diversity of the university on one hand, and merit on the other.

"Typical of this is in the Small Grant Scheme where we gave, from a total of \$1.3 million, \$30,000 to each of the 10 faculties and MUGG, leaving \$1 million to be distributed according to how the faculties and MUGG had performed in a series of competitive re-

search schemes," Professor Vaughan said.

"In the Research Initiatives Scheme we gave a flat allocation of \$30,000 per faculty and to MUGG, with the balance of almost \$1 million being distributed against the full-time research student load."

Although CADRES attracted a degree of criticism when it was established, Professor Vaughan feels that the successful work of the committee can now be appreciated at the faculty level.

Positive

"CADRES has reviewed its activities. We did that six months after we were established and generally the feedback I've had has been positive," he said. "We need some time to prove ourselves."

"Like any change in research management, there will always be critics and some compliments; that's a signal associated with change. People are affected in different ways but we have to move with the times, and realise we are operating in a new environment."

"Because there were some criticisms of research management as a whole in the university, there is a review through the Waller Committee which has been put in place by Academic Board." (See story at right.)

Among the successes of CADRES, Professor Vaughan lists the greater awareness that the faculties have gained about how research money is being distributed throughout the university and the awareness of the activities of the Office for Research.

In addition to its funding recommendations, CADRES has also taken a role in the drafting of a new research management plan which Professor Vaughan hopes will increase DEET funding to the university and allow for greater accountability.

Monash's ARC large grants 1992

FACULTY	NO OF GRANTS	TOTAL (\$)
Arts		
English	3	42,900
Geography and Environmental Science	3	121,400
History	1	30,000
Linguistics	2	45,900
Music	1	20,000
Visual Arts	1	25,000
Asian Languages and Studies	2	95,000
Philosophy	2	52,500
Anthropology and Sociology	2	71,000
Centre for Human Bioethics	1	25,000
	18	528,700
Economics Commerce and Management		
Centre for Policy Studies	1	52,000
Economics	2	34,500
Econometrics	1	20,948
	4	107,448
Engineering		
Chemical Engineering	2	168,000
Electrical & Computer Systems Engineering	2	98,000
Materials Engineering	2	105,000
Mechanical Engineering	3	100,700
	9	471,700
Education		
School of Graduate Studies	2	68,500
	2	58,000
Law		
	2	58,000
Medicine		
Biochemistry	3	136,000
Pathology and Immunology	1	49,000
Anatomy	2	92,000
Centre for Bioprocess Technology	1	25,000
	7	302,000
Science		
Ecology and Evolutionary Biology	1	25,000
Chemistry	9	398,000
Earth Sciences	2	83,000
Genetics and Developmental Biology	3	187,200
Mathematics	3	100,000
Physics	3	113,500
Psychology	2	62,000
Water Studies Centre	1	30,000
Centre for Computational Mathematics	1	58,500
	25	1,057,200
Computing and Informational Technology		
Computer Science	2	82,000
	2	82,000
School of Social Sciences, MUGG		
Sociology	1	35,000
	1	35,000
UNIVERSITY TOTAL	70	2,710,584

RRC invites staff comment

University teaching staff have been invited to make submissions to the Research Review Committee (RRC), chaired by Professor Louis Waller.

The RRC, which was set up in July in response to academic staff concerns on research structure and funding, made a preliminary report to Academic Board last month.

Professor Waller said the committee had already collected information about the organisation and management of research in other Australian universities, and would make further inquiries. The RRC has issued a general statement on the value and place of teaching and research in the university.

The statement, 'The Prime Functions of the University', reads:

Research and teaching – the discovery of knowledge and the imparting of knowledge – are the prime functions of the university. These functions are, or should be, mutually supportive. The best research environment is one in which researchers are constantly challenged to communicate their ideas to students; the best teaching environment is one in which students are invited to share the excitement and problems of discovery.

The standard academic contract, which requires each member of staff to engage in both teaching and research, reflects the benefits of these arrangements. Some academics doubtless teach better than they research, or research better than they teach; and some, it must be admitted, perhaps do neither as well as they might. There will be occasions, too, when academics will be appointed only to research; but the norm, we believe, should remain for all the university's teachers to be engaged actively in research.

All fields of knowledge represented within the university are entitled to parity of esteem. No field of knowledge, by virtue of its pure or applied, experimental or speculative character, should be endowed with more importance than any other. By its policies and funding decisions, the university should seek to create conditions in which those in each discipline can pursue their goals of research and teaching in accordance with the best international standards in those fields.

It does not follow, of course, that all researchers or research projects are entitled to equal esteem, much less that they need equal resources. But we all believe that any fair and efficient research policy must begin by recognising the essential plurality of disciplines and studies and their diverse needs for time, for library resources, for scientific equipment, for computing facilities, and for research and technical assistance.

In addition to the individual responsibility of each member of academic staff to engage in both teaching and research, a corporate responsibility exists, in the university as a whole, to create a collegial environment which encourages the coexistence and interdependence of teaching and research. A special obligation must be assumed by those in positions of authority in the university, and particularly by heads of departments and deans, to encourage and stimulate the activities of staff in both teaching and research, and to engender in these staff a respect for the efforts and achievements of other academics.

Groups or individuals may send written submissions to Ms Vivienne Kelly, assistant registrar, University Secretariat, by 29 November.

Changing values: a means to an end?

IN MY FIVE YEARS as Vice-Chancellor I have argued that the university faces particular challenges, given the rapidity of change in the economic and social frameworks in which Monash is embedded.

To protect and enhance its intellectual life, the university simply cannot go back to what it was five years ago. The maintenance and enhancement of the quality of our teaching and research demands that the institution manages change in a positive and constructive way.

Whether we choose to be involved or not, changes in global systems will continue to affect Australian universities. These changes are quite dramatic: the end of the Cold War, the globalisation of business, the dynamism of the Asia-Pacific region, the strong support for APEC, Europe 1992, and the increased emphasis on trade in services (which includes education) in the current GATT round.

As well, there are a growing number of bilateral arrangements and an emerging perception in Asia – especially in Japan – of Australia making a more creative contribution to the region. In all of these developments there are threats and opportunities.

Change manifests itself in a university in various ways, but usually originates in outside pressures. The deregulation and liberalisation of the Australian economy has exposed all institutions, both public and private, to international processes to varying degrees.

Government regulation and protection, while still considerable, are not as great as they were in the days of the Universities Council and the CTEC. All indications suggest that far more autonomy and deregulation will characterise the higher education industry in the future.

As deregulation moves ahead, supply and demand will adjust much more through the pricing mechanism than through Government control. This will lead inevitably to greater competition between institutions, and to advantages for the more diverse, more distinctive and more flexible ones.

There will be less cooperation, more competition and stronger pressures to recruit outstanding academic staff, especially if the academic salary cap is removed. Cooperation between institutions will be replaced by strategic alliances.

A number of processes are contributing to the changes in the system. A university such as Monash, with its strong links to Asian economies, becomes aware immediately of the increased affluence in Asian countries (almost without exception) and of a continuing strong demand for overseas education.

Australia is able to capitalise on the growth of the Asian market, despite fierce competition, through its somewhat lower total education costs and effective marketing. If this is the main demand side consideration, developments on the supply side have been even more significant.

The decrease in government funding per EFTSU, which has occurred relentlessly over at least the past decade, has prompted some universities (or parts thereof) to seek larger amounts of non-Government money for both teaching and research. Governments have encouraged this trend, which

Universities face a rapidly changing world, with economic and political developments affecting the quality of teaching and research.

The Vice-Chancellor, Professor Mal Logan, envisages a university that is willing to adapt, and become more enterprising and international.

This article is an excerpt from a paper presented to Council this month.



Professor Mal Logan: greater confidence about the future and less concern with the past.

“Through the clawback mechanism we are still ‘supporting’ research at other institutions.

Teaching, as important as it is in any university, can no longer be seen as a trade-off for research activity.”

manifests itself in many different ways – from the introduction of fee-paying courses to the licensing of technology developments.

I have consistently argued that for Monash to protect and enhance its teaching and research, it needs to position itself to take advantage of a rapidly changing environment. This “positioning” is predicated on a culture embracing a number of shared values that should extend across the institution. Briefly, these values (which are a means to an end and not ends in themselves) are:

- A willingness and a capacity to *adapt to new circumstances*, especially in the external environment, to seize opportunities rather than feel threatened by change. This will lead inevitably to a more heterogeneous and diverse institution with a wide variety of programs and, therefore, a far more competitive one capable of performing well in a more deregulated environment. Internally, changes in the fortunes of various parts of the university will depend on the capacity of their academic leaders to adapt.

- An *enterprising (or entrepreneurial) approach to problem solving*. This will lead to a greater diversification of funding sources, more efficiency, and new ways of delivering programs. Examples include the full-fee program (from which Monash will generate some \$20 million this year), new forms of cooperative education (which link business with university-based education) and the introduction of new ways of teaching.

- The *internationalisation of the university*. Traditionally, and quite properly, a university's reputation throughout the world is based on the quality of its research output and of its graduates. But given our particular place in the world and the great range of languages in Asia, our standing there will be based on things in addition to research output. Asia has some of the world's greatest universities, but there is a need for careful bridge-building to underpin our overseas full-fee program and to participate more fully in knowledge transfer. We have a particular place in the world which we can exploit to our advantage.

If these three sets of values were shared by the main decision makers in

the university, the outcome of decisions would demonstrate clearly a more proactive university, more outwardly oriented; a more mature institution with greater confidence about its future and less concerned with the past. The future and shape of the university and the protection and enhancement of its scholarship will flow out of the implementation of these values.

A good deal of the administrative work at Monash over the past few years has been designed to create opportunities for deans to plan the futures of their faculties in a way not experienced before. We have for 1992 established greater certainty about the principles on which the annual budget is based.

Research funding and equipment funding have been devolved to deans. A university-wide development fund is designed to promote new developments consistent with merit and the principles outlined above. We have a firm capital program which will greatly improve teaching and research across the entire university.

The faculties are the basic planning units of the university and each should seriously work out its directions in the university as a whole. The first set of opportunities or challenges to be addressed in any planning exercise lie in the mergers which have been completed over the past two years.

Recently, there have been a number of surveys of Australian universities designed to rank them in ways not always fully understood. At least two books have been published and there have been a number of rankings published in *The Bulletin* and *The Independent*.

While all kinds of doubts can be thrown on the accuracy of the surveys, Monash has consistently come out very well, and the older universities, fairly poorly. Likewise, throughout Asia many of the newer, smaller institutions are better known than the older, and larger ones.

In the changing game in which Australian universities find themselves, the clients have suddenly become more important and are expressing different views to those of the past.

There is a particular responsibility to make the merger work. We must lift the level of outside support for research, and develop an understanding of its central role in the university.

Through the clawback mechanism we are still ‘supporting’ research at other institutions. Teaching, as important as it is in any university, can no longer be seen as a trade-off for research activity.

On the other hand, there are great benefits to any institution in diversity in its teaching programs. Here, Monash has quite remarkable strengths, which must be maintained. We are unique, and certainly no longer a clone of any other institution.

Our clients – the students – appear to be recognising this in their selection patterns. When all developments are up and running, this university will be much better placed to handle changing student and general community demands on higher education institutions.

Outside the university, I see nothing but increased community confidence in the way Monash sees its pre-eminent place in higher education in Victoria.”

NOTES & DIARY



Diary

NOVEMBER

12 Graduate Information Evening
Graduate courses in law. Monash University City Premises, 3rd Floor, 41 Exhibition Street, Melbourne. 6-7.30 pm. Staff will be available to answer inquiries about masters' and diploma courses in Law.

14 Southeast Asian Studies Seminar
World markets, the State and petty-commodity producers: The case of

Malay rubber smallholders, Muyung-sok Oh. Room 515, Menzies Building. 11.15 am.

23 Southeast Asian Studies Seminar
Feminism and modernity viewed from Malaysia, by Dr Maila Stevens, Melbourne University. Room 515, Menzies Building. 11.15 am.

28 Southeast Asian Studies Seminar
Work, workers and trade unions in Indonesia in the 1920s and 1930s, by Dr John Ingleson, University

of NSW. Room 515, Menzies Building. 11.15 am.

30 Evening Concert St Gregorius Dutch Male Choir
Christmas Concert, featuring the Footscray and Yarraville City Band and the string quartet Pitz. Robert Blackwood Hall. 7.30 pm.

DECEMBER

3 Australian Studies Seminar
Archaeology, heritage and the media, by Ms Hilary du Cros. NCAS meeting room.

Notes



Get the safety book

Staff who joined the university after 1 September 1990 or transferred from Caulfield or Frankston to Clayton after 1 July 1990 may not have received the booklet *Occupational health and safety policy statement*. Those who have not received a copy should contact their safety officer.

Bicentenary celebration

A seminar entitled *Boswell's life of Johnson: A bicentenary celebration 1791-1991* will be held on Saturday 16 November.

Speakers include Dr Rusi Khan, a senior lecturer in the Department of Philosophy, and Professor Clive Probyn, Chairman of the English Department. The seminar, to be held at the Council of Adult Education, 256 Flinders Street, Melbourne, commemorates

rates and celebrates the occasion and explores some interesting aspects of both author James Boswell, and subject Samuel Johnson.

For further information, contact Professor Clive Probyn, extn 75 2130.

Equal opportunity guidelines

Guidelines for ensuring equal opportunity in selection of staff have been revised recently. The new guidelines have been sent to selection committees. Copies may be obtained from the Equal Opportunity Unit, Room 212, second floor, Mathematics building, Clayton campus, extn 75 4084.

John Medley Library hours

The John Medley Library, first floor, Union Building, will remain open until 13 December. Staff and students may borrow books until 15 November. All books must be returned by 29 November. From 1 November, the library will close at 5 pm. For further information, contact extn 75 3127.

Summer arts and crafts ...

Bookings are now open for the *Monash Arts, Crafts and Tuition summer school (1992)*. Courses include photography, design, wine appreciation, watercolour painting, and practical electronics. They are open to students, staff and the public. Enrol at the Arts and Crafts Building or contact extn 75 3180.

... and language courses

The Faculty of Arts is offering intensive four- and eight-week summer courses in introductory Chinese, German, intermediate German, Korean, Japanese and Thai. The courses will be conducted over four hours each weekday from 25 November to 20 December and 6 to 31 January. They are open to the public or may be taken for credit.

For further information, contact extn 75 2231 (Chinese, Korean, and Thai - Room S515), extn 75 2236 (German - Room 312) and extn 75 2281 (Japanese - Room 408).

AINSE Conference

The 7th Australian Conference on Nuclear Techniques of Analysis, presented by the Australian Institute of Nuclear Science and Engineering, will be held at the University of Melbourne from 20 to 22 November.

The conference brings together Australian and overseas experts to discuss recent and future developments in the field. University staff and research students whose nominations have been accepted by AINSE may apply for support for travel and accommodation for the conference period.

For further information, contact Ms Joan Watson, (02) 543 9268.

Computer shop hours

The Computer Centre Shop on the ground floor of the Mathematics building, Clayton campus, is open from 9 am to 5 pm on all university business days. Purchases by departments are sales tax exempt. Staff and students pay sales tax on computer hardware, not software.

Press cuttings

The following is a selection of the past month's print media coverage:

1 October *Sandringham-Brighton Advertiser* - **Dr Stephen Trumble**, Community Medicine: Doctor helps peers to turn a new page.

1 October *The Australian* - **Dr Leone Spiccia**, Chemistry: 'Charged' windows react to temperature changes.

1 October *The Adelaide Advertiser* - **Dr Leone Spiccia**, Chemistry: Energy savings as windows adjust to the light.

3 October *The Herald-Sun* - **Mr Barry Ellem**, Anthropology and Sociology: Private jails 'not needed'.

5 October *The Burnie Advocate* - **Professor Alan Trounson**, Early Human Development: Breakthrough for male infertility.

5 October *The Albury Wodonga Border Mail* - **Professor Bruce Tonge**, Psychology: Warning on 'hidden illness'.

6 October *The Sunday Herald-Sun* - **Dr Robin Bell**, Paediatrics: How much is fit for baby?

6 October *The Sunday Age* - **Dr Robert Birrell**, Anthropology and Sociology: Hewson cites economics to cut migrants.

6 October *The Sunday Age* - **Dr Helga Kuhse**, Human Bioethics: Suicide guide to be sold in Australia.

7 October *The Age* - **Ms Judith Rich**, Economics: Female workers still chasing fairer deal.

7 October *The Age* - **Dr Chris Maher**, Geography and Environmental Science: Cheaper housing hit by high jobless level.

9 October *Waverley Gazette* - **Dr Eve Fesl**, Koorie Research Centre: Straight from the Koories.

9 October *Oakleigh Springvale Times* - **Professor Paul Rossiter**, Materials Engineering: Downturn brings a degree of despair.

9 October *Nunawading Post* - **Mr Allan Drummond** and **Mr Francis Jee**, Accident Research Centre: Cyclists on footpaths trial.

10 October *The Age* - **Professor Frank McDermott**, Surgery: New call for curfew to cut deaths on the road.

10 October *Sydney Morning Herald* - **Professor Frank McDermott**, Surgery: Curfews for young drivers inevitable, says Vic Professor.

12 October *The Geelong Advertiser* - **Professor Geoff Thorburn**, Physiology: Pregnant women warned about high doses of aspirin.

12 October *The Warrnambool Standard* - **Professor Geoff Thorburn**, Physiology: Pregnant women warned on aspirin.

12 October *The Launceston Examiner* - **Professor Geoff Thorburn**, Physiology: Warning on aspirin use.

12 October *The Canberra Times* - **Professor Geoff Thorburn**, Physiology: High doses of aspirin can harm foetal development.

12 October *The West Australian* - **Professor Geoff Thorburn**, Physiology: Aspirin warning to pregnant women.

12 October *The Brisbane Courier-Mail* - **Professor Geoff Thorburn**, Physiology: Aspirin in pregnancy warning.

12 October *The Adelaide Advertiser* - **Professor Geoff Thorburn**, Physiology: Aspirin may put stress on unborns.

12 October *The Herald-Sun* - **Professor Geoff Thorburn**, Physiology: Warning on aspirin.

14 October *The Age* - **Mr Paul Ridgway**, Physics: Last of the old style, so look to past examination papers.

14 October *The Age* - **Professor Tony O'Grady**, Politics: How good an analyst are you?

15 October *The Age* - **Professor Ian Rae**, Science: Problem - how to assess the problem-solvers?

15 October *The Age* - **Mr Frank Fisher**, Graduate School of Environmental Science: What to do with dead batteries.

15 October *The Waverley Post* - **Mr Brian Ruck**, Medicine: Monash Medical Centre completes move.

15 October *The Waverley Post* - **Dr Alan Bishop**, Education and **Professor Alan Powell**, Econometrics: Two new appointments.

15 October *The Waverley Post* - **Ms Anne Ohlmus**, Occupational Health and Safety: Monash Uni stubs out smoking.

15 October *The Mirboo North Times* - **Dr Sue McNamara** and **Associate Professor Daryl Nation**, MUCC: Electronic class lecture.

15 October *The Independent Monthly* - **Professor Peter Singer**, Human Bioethics: Thinking about suicide.

16 October *The Age* - **Mr Peter Delaney**, Pharmacology: A microscopic journey through the body.

16 October *The East Gippsland News* - **Dr Brank Cesnik**, Medicine: GPs isolated.

16 October *The Waverley Gazette* - **Ms Anne Ohlmus**, Occupational Health and Safety: Monash bans smoking.

17 October *The Brisbane Courier-Mail* - **Dr Graeme Oliver**, Social and Preventive Medicine: Study into whooping cough fears.

17 October *The West Australian* - **Dr Graeme Oliver**, Social and Preventive Medicine: Study looks at vaccinations effect on brain.

17 October *The Launceston Examiner* - **Dr Graeme Oliver**, Social and Preventive Medicine: Bid to allay vaccine fears.

18 October *Financial Review* - **Dr Alan Bishop**, Education and **Professor Alan Powell**, Econometrics: Appointments.

18 October *The Herald-Sun* - **Mr George Rechnitzer**, Accident Research Centre: Truck barrier 'to halve toll'.

18 October *The Age* - **Mr Geoff Alford**, Centre for Competitive Advantage: Telecom's market share loss will cost thousands of jobs.

18 October *The Age* - **Professor Peter Singer**, Human Bioethics: Duty only to the dollar?

20 October *Sunday Herald-Sun* - **Professor Ian Rae**, Science: How Greenpeace missed the boat.

22 October *The Sydney Morning Herald* - **Ms Bronwyn Naylor**, Law: Vipers or victims?

22 October *The Sydney Morning Herald* - **Professor Peter Spearitt**, National Centre for Australian Studies: Intellectual gains lost in the press.

22 October *The Sydney Morning Herald* - **Professor John Freebairn**, Economics: Libs' GST proposal need not be all doom and gloom.

22 October *The Australian* - **Dr Branko Cesnik**, Medicine: Rural doctors conquer isolation.

22 October *The Age* - **Ms Kay Simpson**, Mathematics Education: Time series: First find your pattern.

22 October *The Age* - **Dr Robert Birrell**, Anthropology and Sociology: Chinese distort figures, say academic.

22 October *The Age* - **Mr John Pearson** and **Ms Meredith Fletcher**, MUCC: How we made our garden.

23 October *Oakleigh-Springvale Times* - **Professor Paul Rossiter**, Centre for Advanced Materials Technology: Success story defies the recession.

23 October *The Foster Mirror* - **Mr Murray Homes**, MUCC: Student housing at Monash.

24 October *The Herald-Sun* - **Professor Mark Wahlquist**, Medicine: Obese man 'danger to passengers'.

24 October *The Australian* - **Dr Ian Ward**, Economics: Nobel cost of accessibility.

24 October *The Age* - **Dr Steven Sommer**, Community Medicine: In praise of the family GP.

Press cuttings may be perused at the Public Affairs Office, first floor, Gallery Building, Clayton campus.



Examining one of the collection's mineral samples are (from left) Mr Ray Price of Friends of Monash; Dean of the Faculty of Science, Professor Ian Rae; Mr Ernest Cripps, the donor of the collection; and Head of the Department of Earth Sciences, Professor Ray Cas.

Rock and mineral treasures uncovered

An extensive private collection of rock and mineral samples has been presented to the Department of Earth Sciences by an amateur collector.

The 2137 samples, from around Australia and most continents, were collected and documented by Mr Ernest Cripps as a retirement hobby.

Mr Cripps and more than 150 students, staff and guests last month attended the official presentation and unveiling of new cabinets to display the collection in the department's first year laboratory, ground floor, Mathematics building.

The cabinets, funded by a gift of \$5000 from the Friends of Monash, were built in the Chemistry department workshop. The collection was unpacked, catalogued and displayed with the help of technical staff in the Earth Sciences department, as well as many volunteers.

Earth Sciences curator, Ms Patricia Komarower, said the department had been approached about the collection in June, but work had begun only in August.

"It's such a large collection, that without the many hundreds of hours of volunteer labour, it would not have been ready for viewing in such a short time," she said.

The collection was remarkable for its quality and range. "It will be a valuable teaching and research resource, adding to the department's existing collection of samples," she said.

About 40 per cent of the Cripps collection will be on show at a time, but the display will be changed regularly to highlight different parts of the collection. Individuals can view the collection when classes are not being held, but groups should contact Ms Komarower on extn 75 4896.

Cultivating garden lessons

Working in a school garden can teach primary schoolchildren lessons in history, mathematics and the environment.

The Centre for Gippsland Studies at Monash University College Gippsland has produced a unit of work, titled 'School Gardens', which has been enthusiastically received by primary school teachers throughout the State.

It has been prepared by executive director of the centre, Ms Meredith Fletcher; a lecturer in the School of Education at Gippsland, Mr John Pearson; and Ms Sue Allen, a teacher at Bundalaguah Primary School, near Sale.

The teaching kit contains photographs of children in the school gardens of Gippsland in 1911, children's writing about their gardens, and a teachers' booklet covering classroom discussions, establishing a garden, research projects and excursions.

"Generations of children have enjoyed working in the school garden," Mr Pearson said. The educational benefits of school gardens could be seen in

the children's own accounts of their experiences, written in the 1920s.

School gardens and plantations gave children the opportunity to test ideas, such as the conditions under which plants grow, and to observe, discuss and record the results.

"Where there has been a relationship between what has been studied in the classroom, and what has been done outside in the garden or grounds, real learning and understanding have developed," he said.

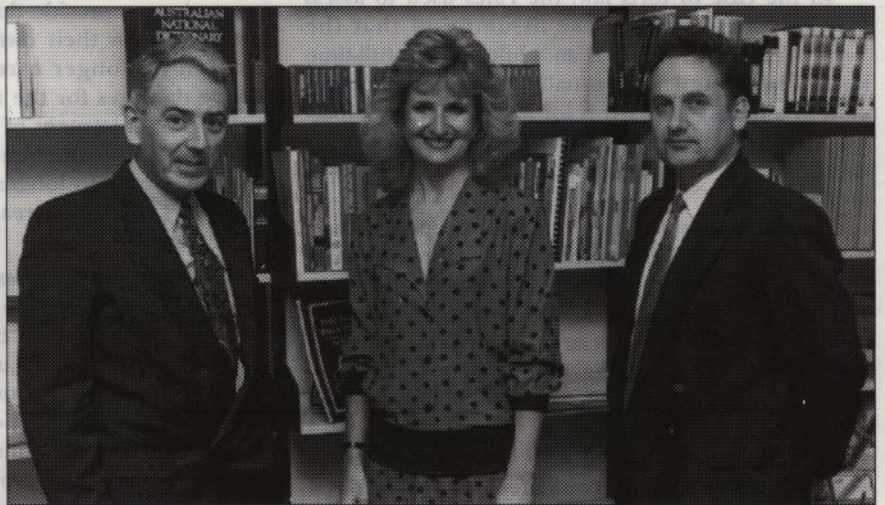
"In a very concrete way, school gardens have provided children with direct, first-hand experience of some of the concepts and skills which form part of the primary school curriculum.

"Projects based on the school garden have provided opportunities for children to learn the roles and responsibilities involved in working in a group, and the importance of cooperation in attempting to reach common goals."

The Centre for Gippsland Studies promotes the study of the region, focusing on local and regional history, the environment, literature, Aborigines and the social sciences.

The research centre's archive holds more than 2000 books, as well as photographs, maps, newspapers, articles and genealogical records.

Recently it has compiled a kit for secondary schools, 'Five Gippsland Women', on the place of women in local history. 'School Gardens' costs \$14, plus \$2 post and packing. Phone extn 72 0339 for more information.



At the launch of the centre are (from left), the Registrar, Mr Tony Pritchard, Head of Language and Learning Services, Mrs Rosemary Clerehan and Educational Services director, Mr John Julian.

Study skills centre opens

The Language and Learning Services Centre was officially opened at Caulfield campus last month.

The self-access centre, which opened at the start of the year, intends to help students improve their academic reading, writing and study methods. Language and Learning Services was established at Chisholm Institute in 1984 to improve academic literacy.

"We decided the ideal way to operate was from a centre where students would have access to staff, work individually or in small groups, use our materials and attend courses," said the head of the Language and Learning Services, Mrs Rosemary Clerehan.

During first semester this year, 300 Caulfield and 152 Frankston students have had individual consultations at the centre. Almost half of the consulta-

tion hours at Caulfield were used by overseas students.

"The centre has enabled the development of a wide range of well-attended courses, often tied to particular subjects such as commercial law or engineering management," Mrs Clerehan said.

It aims to provide specific courses in English as a second language, to diagnose the academic literacy needs of students and to coordinate any literacy testing programs. It can also provide staff development programs to assist staff to foster language development skills in specific disciplines.

Students from Caulfield – and Clayton and Frankston, where possible – may borrow materials. The centre is expected to be fully operational in the first semester of next year.



Jeetho School, 1911.

Graduate careers seminar

The Monash Postgraduate Association (MPA) last month held a one-day graduate seminar-workshop, 'Goodbye academia – alternative career prospects for higher degree holders'.

Business identities spoke on career paths. Subjects including personal skills identification, job applications and interviews were discussed.

This month, the MPA is running three workshops for postgraduates. The

first two covered interview skills and resume review. The hidden job market is the subject of the final workshop on 12 November. For bookings and further information contact the MPA office on extns 75 3197 or 75 3198.

Monash study tours

Next year, the David Syme Management Education Centre, Canberra, is organising four overseas study tours,

following its highly successful tour of China for Australian Local Government personnel.

Through university links, the centre organised visits to universities, hospitals, factories, kindergartens, and social welfare agencies, which most visitors to China would not see.

The 1992 tours include a trip to the USA for human resources professionals; a second study tour to China for health professionals; a North American study

tour for museum professionals; and a tour of Europe for vocational education and training personnel.

Flights, visas, conference registrations, meals, accommodation, organised tours of institutions, and local sightseeing tours are organised by the centre.

For further information, contact the centre, Hewlett Packard Building, Fern Hill Technology Park, Bruce ACT, 2617, or phone (06) 253 2211.

OVER THE PAST three decades women have become increasingly involved in law teaching and practice. But surprisingly, there has been little discussion among lawyers about the impact which women are likely to have on the theory and practice of law in the future.

Most legal practitioners and academics seem to have reassured themselves that the feminisation of the legal profession will make little difference. Such an attitude can be attributed to the simple desire that things should stay as they are. But it also tells us something about law's epistemology – the way in which law is seen as a set of principles, as a system of knowledge and as a way of perceiving the world. According to liberal theory, the legal system is rational and impartial. Thus lawyers tend to assume that issues of gender are irrelevant to the nature of legal education, the form of legal institutions or the content of legal rules.

In recent years feminist legal theorists have increasingly challenged law's account of itself as impartial, objective and gender neutral. Broadly, they have argued that the nature of law, the process of legal reasoning and the assumptions which underpin legal rules reflect the ways in which men see and experience the world.

The gendered nature of law is illustrated by its response to one of the central features of women's lives – our responsibility for child bearing, child rearing and domestic labour. Both torts and family law exemplify the ways in which apparently neutral rules may conceal gendered assumptions.

In the case of torts law, the rules used to assess damages are based on the assumption that the 'normal' accident victim is an adult male in full-time work. The central (and usually the largest) component in a damages award is for loss of earning capacity. Emphasis on loss of earning capacity disadvantages all those who are not full-time workers when they are injured.

But earnings-related compensation operates as a form of systemic discrimination against women because of their responsibility for household labour and because they usually earn less than men. Women are also disadvantaged because loss or impairment of the ability to work in the home has not yet been clearly recognised as an economic loss suffered by the injured person herself.

Historically, a husband who was deprived of his wife's domestic services could recover the replacement cost of those services in an action for loss of consortium. But wives had no corresponding right to sue for loss of their husbands' services. The action for loss of consortium has been extended to wives in some jurisdictions, and completely abolished in others. Law reforms which enable women to sue for loss of their husbands' services do not achieve equality of outcome, since men are rarely responsible for domestic labour.



by Marcia Neave

In the states where the husbands right to sue has been abolished, it is not clear whether women who can no longer provide domestic services are entitled to damages for their own economic loss. A woman who can no longer care for her own family may receive damages for the mental suffering caused by her "loss of enjoyment of life". In other words, she is compensated on the same basis as an amateur footballer who can no longer play sport. The law treats housework and child rearing as leisure or pleasure rather than as work.

Like the rules of assessment of damages, the principles determining title to property owned by de facto spouses and unmarried couples reflect assumptions which historically disadvantaged women. Nineteenth century property reforms gave women the right to retain their earnings and own property separately from their husbands. This right was of little value to women out of the paid workforce since the legal rules determining title to property only took account of financial contributions to its acquisition. Women's work in the home was not treated as a contribution to the resources of the breadwinner but as a gift.

The Family Law Act now requires the Family Court to take account of the "homemaker and parent contribution" in resolving property disputes on divorce. But except in New South Wales and Victoria, where legislation now permits the court to reallocate

property between de facto partners, it is doubtful whether a de facto wife can claim an interest in her partner's property by virtue of her contributions as homemaker and child rearer.

Similarly, in a dispute between a wife and a third party claiming an interest in her husband's property, falling outside the provisions of the Commonwealth Family Law Act, the wife's contributions of labour do not necessarily give rise to any interest in that property. In a recent decision, the High Court of Australia has opened the way for recognition of the value of domestic contributions in disputes between de facto partners. But in that case the woman was in full-time paid work and her domestic labour was recognised because she also made a substantial financial contribution. So far there has been no decision in which a domestic contribution, standing alone, has been sufficient to give a rise to an interest in property.

After marriage breakdown, the Family Law Act now requires the "homemaker and parent contribution" to be taken into account in resolving property disputes between married couples. It is doubtful whether this provision has resulted in a full recognition of the economic value of housework and child-care. Given that the Family Law Act requires financial and domestic contributions to be compared, it seems likely that courts are still influenced by traditional attitudes to the value of women's work. A survey of 825 divorced couples conducted by the Australian Institute of Family Studies demonstrates that women are disproportionately disadvantaged by divorce because of the effects of marriage and child bearing on their earning capacity.

The current law fails to take account of social and structural factors which affect the way in which responsibility for work in the home is divided between men and women. Formal equality disregards the effect of the sexual division of labour in the same way that more traditional rules disregarded the value of women's work in the home.

What is needed are creative social policies which make it easier for men and women to share domestic work and child rearing and enable those involved in the essential work of raising children to do so without sacrificing their opportunity to participate in paid work as well. Such a model will require fundamental changes to the ways in which the legal system sees and responds to the lives and experiences of women.

Professor Marcia Neave holds a personal chair in the Faculty of Law.

Apology

The caricature which appeared with last month's Savant column was not that of the article's author, Professor Graeme Davison. *Montage* regrets any embarrassment caused.

DIOGENES



MEMORIES of childhood are like a movie passing through worn sprockets: the images leapfrog over one another in no particular sequence. One day it is high summer, and you have just hooked,

lined and sinkered your best friend with your first cast. The next it's mid-winter, and you've managed to shrug your parents' grasp and begun climbing the south col of Mount Donna Buang.

The mind's censor usually cuts out the unpleasantness, leaving a reel of childhood images that are a Hollywood away from the B-grade reality of what passes for maturity. The result provides a fascinating contrast between such memories and the actions of those a little closer to the ozone layer.

First, there's the business of animals. Most children possess rat cunning when it comes to the acquisition of pets; the more exotic the better. But as adults we erect almost every possible barrier to the purchase of even something as self-contained as a tortoise ("No, darling. Tortoises require 24 hour surveillance, a vegetable garden and a 50 metre swimming pool") or as amiable as a pooch ("Sorry, sport. Dogs need a yard full of chicken wire to pre-

vent tunnelling, a barbed wire fence, a team of sanitary engineers and a paddock of beef on the hoof. How about a musical instrument?").

At various times throughout the year, children will expect gifts. Who cares what the occasion: Bart Simpson's birthday? Fine, I'll have a T-shirt thanks. A certain quartet of turtles renounce violence and become social workers? Great, gimme a headband.

Adults remember vividly the excruciating pain of the wait at Christmas, but tend to do everything to ensure their children suffer the same agony. So by the time the ceremonial unwrapping of the presents has arrived, youthful eyes almost have glazed over. Anticipation has taken a hike. The gifts beneath the tree have become permanent icons. "My expectations have nosedived," their eyes seem to say. "Will you please help me unwrap this?"

Children love food, particularly the quicker kind. Give them free range of McDonald's and they'll graze until the

golden arches begin to tarnish. Parents were young once – even they know the gourmet delights of a hamburger with the lot.

But with adulthood comes circumspection, and they will suggest just about every known healthy alternative before they surrender. But to little advantage. Inevitably, the kids take the restaurant (and moral) high ground, establish a buffer zone, and proceed to lay waste to the laminex.

School is another blind spot. While it receives an almost universal thumbs down from survivors, children are told right from the start that education is a fine and noble thing. It takes about four years before they pluck up enough courage to confront their parents and tell them the jig's up.

By then it's too late – life has become serious. Looming just beyond the schoolyard is the metamorphosis from awkward youth to an even more awkward and earnest adulthood.

RESEARCH

MONASH

Illuminating visions of life

The invention of the laser confocal microscope allowed the first images from beneath the surface of living tissue. But until now, its potential has been limited by its bulkiness. A miniaturised version being developed at Monash opens new vistas in medical research, industry quality control and virtual reality.

The past decade has seen several quantum leaps in the field of microscopy, including the scanning tunnelling microscope, which can resolve the surface topography of a material, atom by atom.

It also saw an equally important advance in light microscopy: the laser confocal microscope.

This instrument uses laser light to 'see' beneath the surface of living tissues and certain translucent organic materials. But as often happens in the evolution of scientific instruments, not long after the original idea has been introduced, somebody conceives an equally brilliant refinement that renders it obsolete.

Biologists who hailed the laser confocal microscope when it was introduced to the Australian market three years ago are now eagerly awaiting a miniaturised, vastly more flexible successor, conceived in Melbourne and developed jointly by the small Dandenong company, HBH Technological Industries, and Monash researchers.

If the confocal laser microscope was a quantum leap in light microscopy, the HBH scanning confocal laser microscope is a similar advance over its predecessor. The US technology magazine *R & D* nominated the HBH Fibrescan 1000 microscope as one of the 100 most significant inventions of 1991, presenting it with one of its coveted annual *R & D 100* awards.

The microscope has been developed from an original idea conceived by managing director of HBH, Mr Martin Harris. Mr Peter Delaney, a PhD student in the Department of Pharmacology, has taken the idea from drawing board to prototype, and has been exploring its potential on a range of biological specimens, as well as organic and inorganic materials.

Mr Harris came to instrument design by an unusual route. While a research student in the Zoology department at Melbourne University in 1980, he was investigating respiratory movements in tadpoles. The work was tedious, so he designed and built a microscope to electronically quantify these movements.

The microscope used optic fibres as light-collecting pinholes, linked to electrical photodetectors. Later, he investigated confocal techniques of isolating the focal plane to improve the accuracy of the measurements.

With any conventional light microscope the problem is that the whole object is illuminated, yet only part of it can be brought into focus at high magnification. Out-of-focus structures contribute blur and flare, obscuring details from the focal plane.

The confocal laser microscope is the ultimate solution to these problems. It illuminates the specimen with brilliant light of a single wavelength. The laser is focused to penetrate into the specimen to a specific depth, and is reflected by features in the tissues, or causes the tissues to fluoresce.

The size of the laser 'spot' can be adjusted to provide higher or lower magnification. The important result is that outside the focal point, the laser light is unfocused; light returning from these levels is rejected, so that only detail from the focal plane is observed.

The original laser confocal microscope uses a mirror to steer a beam from a laser, which scans the selected plane point by point, line by line. As it scans, a detector picks up the returning light from individual points in each scan line (called pixels), measures their intensity, assigns a corresponding shade of grey, and builds up a two-dimensional image in computer memory.

The digitised data can be manipulated with computer software to produce a magnified monochrome image on a video monitor. Although Mr Harris and Mr Delaney have not yet attempted to generate false-colour images – highlighting features of interest – they say it will be easy to do so with existing computer software.

The image effectively represents a two-dimensional optical slice through



Shown with the microscope are (from left) HBH managing director, Mr Martin Harris, and developers Mr David Mitchell and Mr Peter Delaney.

the specimen. It can resolve detail as small as 1/4000th of a millimetre, which means it can look inside living cells and see details of their organelles and internal structure.

The enormous potential of the laser confocal microscope lies in the fact that by stepping the focal plane down through the specimen, a series of optical slices can be obtained and integrated by computer to generate a three-dimensional image of the interior of the specimen. The image can be rotated in any direction, or made 'transparent' to allow the researcher to isolate aspects of interest.

However, the original laser confocal microscope's potential has been limited by its bulkiness. The laser and optical components that direct the beam into the specimen, and which gather the returning light, must be kept precisely aligned. Flexibility is limited because specimens must be mounted on a fixed stage, as with a conventional microscope.

Moving the microscope and setting it up elsewhere might involve hours of realigning the optics, so laser confocal microscopes have tended to remain where they were first installed. The HBH microscope, whose development was sponsored under the Generic Grant Program of the Department of Industry, Technology and Commerce, solves this problem with optical fibres.

The beauty of these fibres is that they make the critical straight-line optical alignments unnecessary, by providing a flexible conduit between the various optical elements, around curves or even over long distances. In the HBH fibre-optic confocal laser microscope, the laser and other bulky optical com-

ponents can be kept well away from the business end of the system, which, at the end of its flexible umbilical optical fibre, can now be miniaturised and made portable.

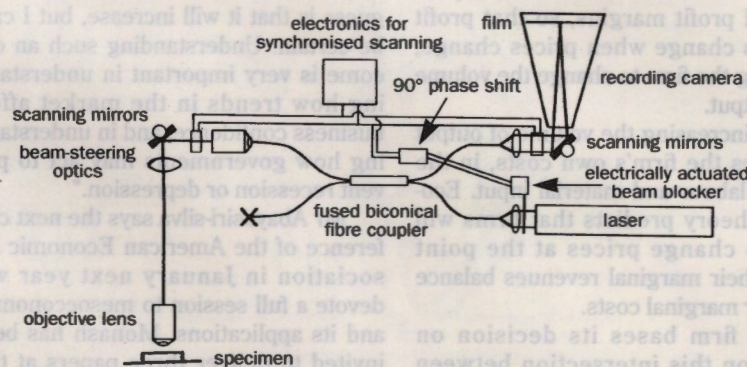
Without the elaborate devices needed to align and adjust the optics of the original laser confocal microscope, it is also cheaper. Mr Harris believes it can be marketed at just below the \$50,000 cut-off level for large equipment grants, so that specialist laboratories will be able to buy their own dedicated microscopes without having to justify the expenditure by establishing cross-disciplinary projects with other laboratories.

A single laser could be used to operate a number of fibre-optic confocal microscopes in adjacent laboratories, with images being relayed by a central computer back to scientists' offices elsewhere in the building. Mr Harris and Mr Delaney believe that scientists will rapidly develop new applications for the microscope, just as people found myriad applications for the laser when it was invented in the 1960s.

The size and portability of the HBH Fibrescan 1000 microscope open up applications forbidden to its bulky predecessor. The most exciting of these, already in the prototype stage, is a fibre optic confocal laser endoscope – a miniature microscope that can be introduced into the body to study living tissues directly.

The endoscope represents a special challenge in design, because there is no way to integrate an oscillating mirror to produce the scanning action of the laser confocal microscope.

Continued on Research Monash 8



A schematic diagram of the fibre-optic laser scanning confocal microscope.

Modelling the real world

Economic modelling uses mathematics to predict how an economy will react to market forces. The trouble is, most of these models apply to a perfect, closed world while real-world economies are far from this ideal. The challenge for economists is to build better models, simulating world pressures and imperfect competition.

In the perfect world of the economic model, there are no depressions or recessions. In a closed mathematical environment, insulated from the harsh realities of real-world economics, rational companies respond predictably to market forces, and perfect competition smooths out troughs.

But as Australia has found to its cost in the past decade, real companies do not always respond predictably when governments adjust the levers and gears of economic policy. The models have obvious shortcomings because they fail to predict the general behaviour of the national economy.

One deficiency has been that traditional economic models assume perfect competition, when real-world competition is imperfect. Most of these models also operate as closed systems, dealing purely with domestic markets. There are no imports or exports, no capital inflows or outflows. In short, the idealised company operating within this environment never has to grapple with forces imposed by the international marketplace.

"We have difficulties explaining real world problems," said Mr Kaludura Abayasiri-silva, a former senior economist from the Central Bank of Sri Lanka and now a PhD student in the Department of Economics. "How can we introduce imperfect competition to macroeconomic models?"

This question was addressed by Professor Yew-Kwang Ng in the early 1980s by developing a new method of economic analysis called mesoeconomics. He is internationally recognised as the pioneer of modern imperfectly competitive macroeconomic models.

Mr Abayasiri-silva's PhD study is supervised by Professor Ng.

Mesoeconomics is concerned with the microeconomics of an idealised, imperfectly competitive firm, and the way the firm responds to macroeconomic forces such as aggregate demand, aggregate output and the average price level of the economy.

In perfectly competitive models that assume large numbers of firms and a large number of consumers, consumers cannot influence prices set by the firms because they do not buy as a coordinated group. These models cannot simulate price-setting by individual firms,

which is dictated by market forces. For simplicity's sake, both companies and consumers are treated as price-takers – entities that passively accept the price set by market forces.

So who or what sets prices? "In reality, it's very difficult to handle all the variables," Mr Abayasiri-silva said. "In our extreme simplifications, we don't distinguish between companies with different degrees of price-setting abilities, so all companies are taken as having some degree of market power."

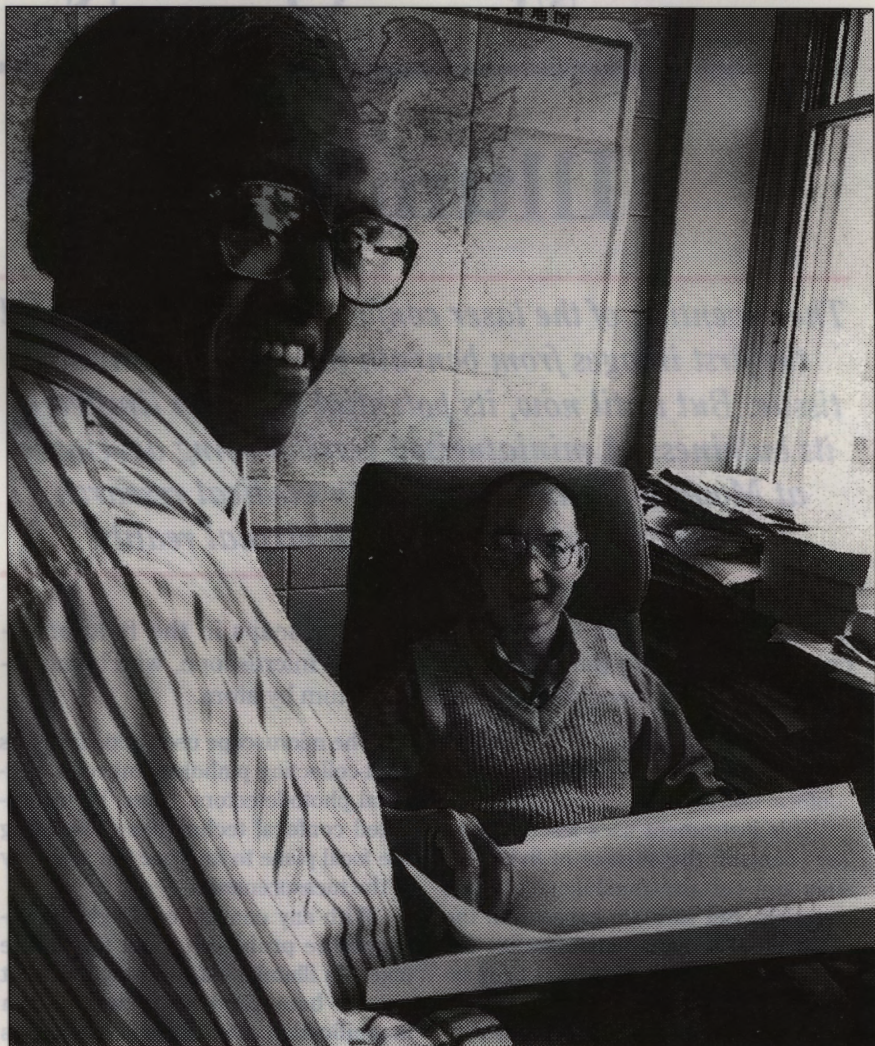
In imperfect competition, firms have some ability to influence prices in an economy. A firm faces a demand curve that is influenced by average price levels in the economy and nominal aggregate demand.

Models that use an approach called partial equilibrium analysis ignore interactions between sectors. They allow firms to maximise profit and set prices and production levels, but do not specify how a firm actually acquires information from consumers in making its pricing and production decisions.

On the other hand, a general equilibrium model takes into account both producers and consumers. Firms produce goods, and consumers demand those commodities. Firms derive income from consumers but also spend money purchasing input from consumers (households), for example, by hiring labour.

Consumers maximise their satisfaction within the constraints of their budgets, while firms make profits subject to cost considerations. The problem of this approach is its assumption of perfect competition, adopted to facilitate general equilibrium analysis.

In his 1982 paper in *Economica*, Professor Ng first outlined his new theory of mesoeconomics. It represents an advance on both partial and general equilibrium economic models by building in a new layer that integrates both microeconomics and macroeconomics. Professor Ng wrote a book describing his



Mr Kaludura Abayasiri-silva (left) with Professor Yew-Kwang Ng.

theories in 1986, but his concepts were still based on a closed-economy model.

"In my research project, I have extended Professor Ng's model to an open economy, which is the real world," Mr Abayasiri-silva said. "My model is attempting to lay microeconomic foundations for open-economy macroeconomics, based on imperfect competition. The problem is to determine how a representative firm decides what level of output to produce, and what price it will set."

"In my model, the representative firm operates not only in the local but the overseas market as well. It must take into account foreign prices and how those prices will affect its output decisions. The question is: in the real world, where domestic firms must compete with foreign products, what happens when there is an increase in nominal aggregate demand?"

Mr Abayasiri-silva says that traditional models predict that when aggregate demand increases, prices soon increase. For example, when governments increase expenditure on goods and services there is an increase in nominal aggregate demand, and firms charge more.

In non-perfect competition, the demand curve for a firm's product is downward-sloping: when prices fall, firms can sell higher volumes of their product and make the same money on reduced profit margins, so that profit margins change when prices change, requiring the firm to change the volume of its output.

But increasing the volume of output increases the firm's own costs, in the form of labour and material input. Economic theory predicts that firms will seek to change prices at the point where their marginal revenues balance out their marginal costs.

The firm bases its decision on output on this intersection between costs and revenues. Total revenue then depends on quantities of product sold.

Any increase in nominal aggregate demand shifts the demand curve upwards and to the right again producing a change in marginal revenue. At given marginal cost, the firm must increase its prices, and must also increase its output. Increasing output requires purchasing more labour, increasing costs.

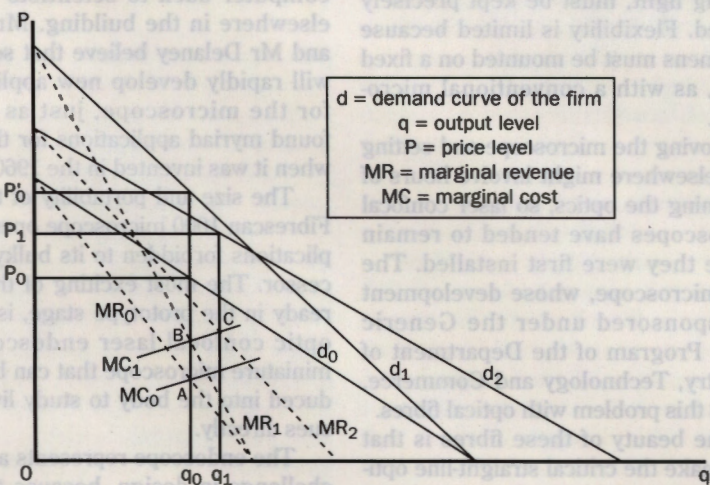
Mr Abayasiri-silva says that, in such a case, traditional models predict no change in output, only an increase in prices. "In my model, the representative firm is competing with foreign prices," he said. "If the local price increases, but there is no change in foreign prices, then local consumers perceive a fall in the relative price of foreign goods."

"That changes the demand curve, introducing a new situation. Depending on this change, there may be either a fall in output or an increase. I am doing more research to see which case may apply, but it depends ultimately on how consumers respond to the changing relative price of foreign goods."

The outcome is also influenced by consumer preferences: do they prefer local products or foreign products, and what premium will they pay for products if they prefer to buy Australian? This is taking economic modelling into the realm of microeconomics.

"We need empirical observations to determine in which direction change may occur – whether output will increase or decrease," he continued. "My guess is that it will increase, but I can't be certain. Understanding such an outcome is very important in understanding how trends in the market affect business confidence, and in understanding how governments may act to prevent recession or depression."

Mr Abayasiri-silva says the next conference of the American Economic Association in January next year will devote a full session to mesoeconomics and its applications. Monash has been invited to deliver three papers at this session, a measure of its growing intellectual influence in the field.



A comparison of the traditional and the imperfect competition models. The former effects an increase in price level from P_0 to P_1 , without changing output. The latter moves output from q_0 to q_1 (B to C), as well as the price level from P_0 to P_1 .

Deciphering ancient symbols

Myriad explanations of prehistoric monuments have been proposed; none answer all the questions. Now, a Monash researcher has produced a remarkable – perhaps definitive – reinterpretation of the design and purpose of Stonehenge, as well as other great prehistoric monuments in Britain and Ireland.

Although the Neolithic Britons and Irish were eventually overrun or absorbed by later waves of invaders from Europe, important elements of their culture survive – even down to the present day.

Their extraordinary feats of design and engineering reveal a knowledge of mathematical concepts usually credited to civilisations several thousand years younger.

Some 4500 years ago, they had discovered the special properties of right-angled triangles, supposedly defined by students of the Greek philosopher Pythagoras around 550 BC. They also knew about the relationship between a circle's circumference and its diameter (π), approximating it to the fraction $22/7$.

They developed a reliable system of measuring distances and angles, and some of these units are still in use, unsuspected, today.

With accurate tools of measurement based on these units, they became skilful surveyors, designing their monuments, aligning their roads and placing settlements according to precise mathematical rules centred around special numbers – notably 3, 9, 11, 22 and 33.

The pre-Celtic Britons and Irish developed a system of symbolic writing that predated the cuneiform script of Sumeria and the hieroglyphs of ancient Egypt by 1500 years. And they established a solar calendar that divided their year into a cycle of 16 months – each of four five-day weeks – supplemented by 45 intercalary days to make up a 365 day year.

Research at Monash by Dr Neil Thomas, a chartered engineer turned classical scholar, has confirmed that Stonehenge and other prehistoric stone circles – and their long-decayed wooden counterparts – are sophisticated solar calendars. Some feature subsidiary lunar calendars that could have been used at the time of construction to predict lunar eclipses.

Dr Thomas, who received his PhD in October, developed an interest in the pre-Celtic culture of Britain and Ireland after he decided to investigate his Celtic ancestry – he has Welsh, Scots and Irish ancestors. After 12 years of intensive scholarship, he presented his PhD thesis 'The Proto-Civilisation of Albion and Erin', on the Neolithic culture of Albion (the ancient name for Britain) and Erin (Ireland).

A background in engineering and mathematics gave Dr Thomas new insights into the design and function of the megalithic monuments of Britain and western Europe. He believes the Neolithic culture of Britain and Ireland worshipped the Sun and the Moon, and three gods corresponding to Odin, Thor and Freyr in the later Norse pantheon.

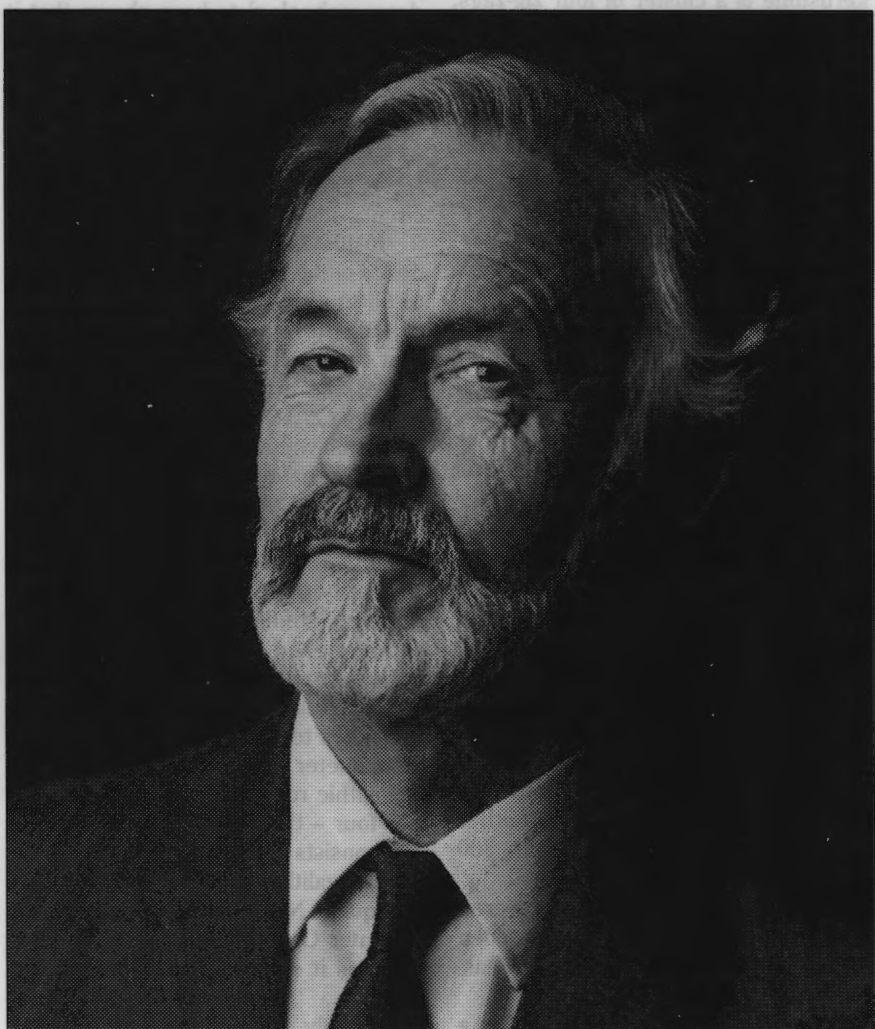
Some stone and wood circles they built were temples of worship, as well as serving both as calendars and primitive astronomical computers which helped them order their lives around the annual solar and lunar cycles, and the annual cycle of the seasons.

Dr Thomas' interest was sparked by a book, *Ancient Megalithic Sites in Britain*, published in 1967 by the late Professor Alexander Thom, Professor of Engineering at Oxford University and a renowned amateur archaeologist. Professor Thom and his son, Dr Archibald Thom, surveyed many ancient sites in Britain, Ireland and France between the 1930s and 1960s.

Professor Thom advanced a controversial theory that certain stone circles and other sites in Scotland and the adjacent Western Isles indicated that people living in these areas had been using a 16 month calendar as early as 1600 BC. Dr Thomas has not only confirmed this theory, but has shown that the 16 month calendar was widely used in Ireland and Britain as early as 3500 BC.

One of his most important discoveries has been to define when the Neolithic and Celtic years commenced. Most scholars have nominated spring or autumn, but Dr Thomas's interpretation of an 1800 year old Celtic bronze plaque inscribed with a 12 month lunar calendar found at Carnac, in France in 1897, leaves little doubt that the Celtic year pivoted around midsummer – as did the solar and lunar calendars of the pre-Celtic Britons and Irish.

The month names on the Coligny calendar assume new meaning when the year is anchored in summer. Modern Scots, Irish and Welsh words describing natural seasonal phenomena may preserve the essence of the ancient Celtic lunar month names.



Dr Neil Thomas: describing a sophisticated pre-Celtic culture.

The Celts apparently maintained the Neolithic solar calendar, with its quarterly festival days, when they invaded Britain and Ireland around 500 BC. The calendar's pagan festivals survived the Roman, Anglo-Saxon, Viking and Norman invasions, eventually being adopted by the Roman church as Christian festivals.

Although the Neolithic names of festivals are lost, phonetic traces may be preserved in their Celtic names: Lughnasad (the Christian Lammas, or Harvest Festival); Samain (All Hallows Eve, or Hallowe'en); Imbolc (Candlemas, the feast of the purification the Virgin Mary); and Beltane (May Day).

Dr Thomas has been able to decipher and interpret the meaning of mysterious inscriptions on the kerbstones of the prehistoric Newgrange and Knowth Mounds on the River Boyne in County Meath, near the Irish capital, Dublin.

The 16 month solar calendar first appears cut into a kerbstone of the Knowth mound, dated at 3500 BC. Although the calendar's form varies in the later stone and wood circles of Britain and Europe, the basic system of calculation remained essentially unchanged for nearly 40 centuries.

The Knowth mound – the largest of three Neolithic mounds near the Boyne River – is surrounded by 127 stones, called kerbstones, inscribed with intriguing symbols, including spirals, kite-like diamonds, undulating and straight lines, zig-zags and groups of short, parallel lines.

In 1986 Dr Thomas focused on one of the most elaborately inscribed kerbstones, designated K15 (left). It has an obvious rising-sun motif, with 16 rays radiating in a 180 degree arc from a central Sun. Above the rising sun is another arc, containing the moon, and filled with pock marks that Dr Thomas interprets as stars.

Beyond the central rays is a semi-circle of 16 squares; all except one

square have one, two or three grooves inscribed above or below them. Dr Thomas believes these were extra days, added to the adjacent square's basic unit of 20 days. The 16 squares count for 320 days (16 months of 20 days), and the total of 45 lines representing extra days in each month, take the total to 365 days.

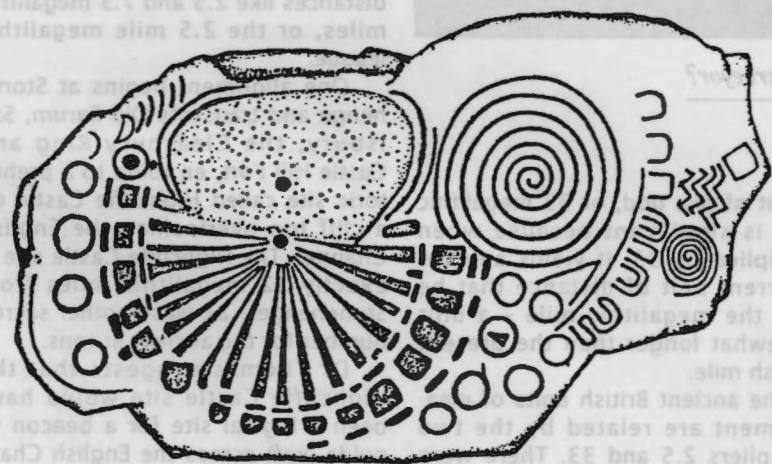
At the top left of this central design are two symbols that obviously refer to a new moon and a half moon. Five adjacent marks represent the five days of the week. Although their original names have probably been lost or changed, they represented Sun Day (Sunday), Moon Day (Monday), Woden's Day (Wednesday), Thor's Day (Thursday) and Freyr's Day (Friday).

The Knowth kerbstone features 10 plain circles, plus an 11th containing a dot, and a 12th marked with a vee lying on its side. The 10 circles may have been counted twice (for the basic 20 day month), with the 11th and 12th circles being counted for months of more than 20 days.

Dr Thomas believes that the zig-zag and wavy-line symbols that appear on many Knowth kerbstones, and elsewhere in Neolithic and Celtic inscriptions and artefacts, were used for counting, with each change of direction being counted as one unit. Thus the V on the 11th circle represents 'one'. The dotted 12th circle probably represents a count of two days. When counted alone or in combination the circles can be used fill out months of 21, 22, 23 or 24 days.

A large clockwise spiral on the right of the stone represents the 'warm' summer Sun, and a nearby smaller counter-clockwise spiral, the 'cold' winter Sun. (A symbol found on other kerbstones, consisting of two equal spirals formed from a single line, but reversed in direction, is thought to represent the equinox; on two days each year, in spring and autumn, day and night are of equal length.)

Continued overleaf



Kerbstone K15 from the Knowth Mound near Dublin.

From previous page

Above the winter Sun on the K15 kerbstone is a cluster of four zig-zags, each with four turns, and a diamond that Dr Thomas interprets as meaning 'a whole'. This grouping may restate the principle of a whole year being composed of four quarters of four months each.

The inscription is completed by a curving cluster of eight hoops, with a long line and a large vee. Dr Thomas interprets this group as representing eight anniversaries in the year, celebrated by the later Celts as the four quarter-day festivals of Lughnasad, Samain, Imbolc and Beltane, plus the two equinoxes, and the two solstices (summer's longest day, and winter's shortest day).

Knowth kerbstone K15 is thus a description of a solar calendar with the important mathematical elements of a full year. The basic principles of this calendar are embodied in many other stone and wood circles in Britain.

Stonehenge's fame has tended to obscure the fact that two other wood rings once stood nearby: an egg-shaped calendar at Woodhenge about 300 metres to the north-east, and another wood circle at Durrington Walls, 300 metres further to the north-east.

In 1970, archaeologists discovered the post holes for another large wooden circle near the Dorset coast at Mt Pleasant.

All four circles were built within a few centuries of each other, about 1000 years after the construction of the Knowth mound with its kerbstone calendar. The Mt Pleasant calendar on the coast is the oldest of the four, with carbon dating suggesting it was built in 2400 BC. Woodhenge is the same age,

while the Durrington Walls ring was built about 300 years later.

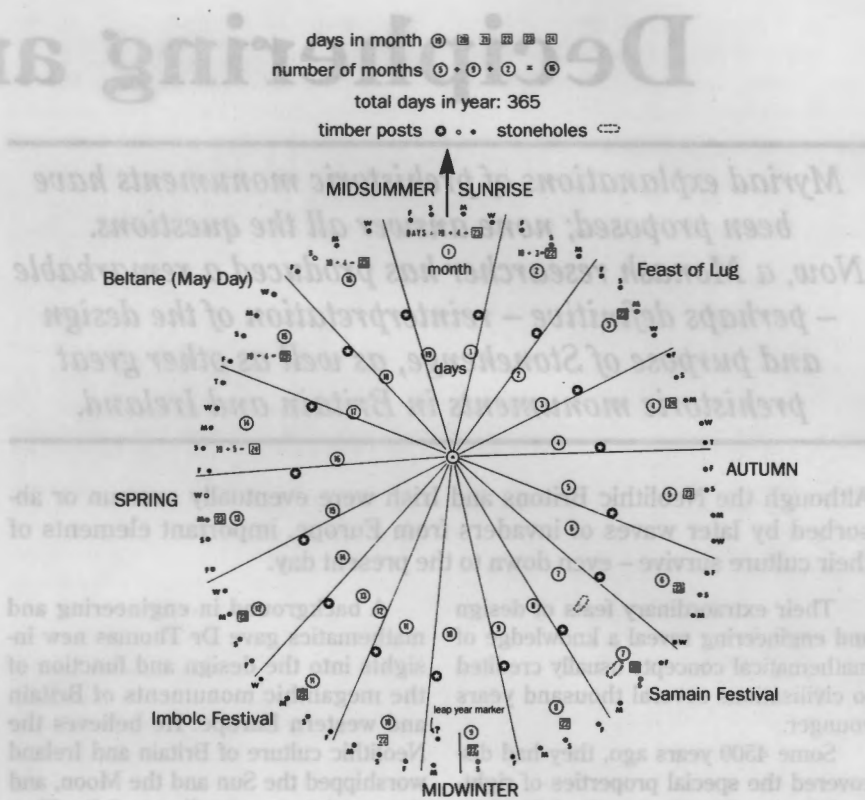
Stonehenge is both the oldest and youngest of the four Neolithic calendars; archaeologists have shown that it was built in up to six discrete stages. The huge double circle of bluestones at its centre was probably not completed until 1000 years after the original henge or ditch was dug around the site, using the excavated chalk to create a large circular mound.

Inside the embankment there is evidence of the former presence of a circle of 56 mounds of white chalk, the so-called Aubrey holes, dug during the first construction phase in about 3100 BC. A ring around the Aubrey holes would be 273.6 metres in circumference – a significant measure when converted into a measurement unit that Dr Thomas calls the megalithic rod.

In the 1960s Professor Alexander Thom deduced from the mathematical regularity of certain measurements in Britain's Neolithic circles that their builders used a unit of measurement equivalent to 2.073 metres.

The Aubrey circle's circumference translates to 132 megalithic rods, and its diameter of 87 metres becomes 42 megalithic rods. If the circle is divided into four – the Neolithic year, remember, consists of four quarters – each arc is 33 megalithic rods. The number 33 is a frequent Neolithic motif, continuing into later Celtic literature. Dr Thomas believes it symbolised royalty or the deities.

Notably, the chosen length of the perimeter is also divisible by six: 132 divided by six yields equal lengths of 22 megalithic rods – another recurrent number in Neolithic measurement. Dr Thomas points out that if the 42 megalithic rod diameter of the Aubrey circle is also divided by six, the whole-



The Woodhenge calendar circa 2400 BC.

number ratio in megalithic rods comes out neatly at 22:7 – their approximation for the basic ratio of a circle's circumference to its diameter, or pi.

While any circle obviously would yield the same ratio, for a culture obsessed with the numbers 22 and 33, the chosen circumference of 132 megalithic rods – embodying both these numbers – must have been deeply satisfying. A smaller circle of 66 megalithic metres (also divisible by 22 and 33) does not yield a whole number of units when quartered, and would have been mathematically less pleasing.

Stonehenge, Dr Thomas believes, was originally a lunar calendar. The Aubrey circle's main axis seems to have been aligned with a causeway that crossed the ditch. Beyond the ditch, archaeologists have found about 40 post holes in six irregular lines. These six lines of posts seem to have been used for observing the rising midwinter full moon.

The moon's orbit is complex; when it rises on midwinter's day, it will not rise at exactly the same position on the horizon on the same day of the year until 19 years later.

DR THOMAS has provided a convincing account of the identity of the so-called Long Man of Wilmington, a massive figure carved into the chalk of a hillside near Eastbourne, Sussex. The Long Man measures 68.4 metres high from head to toe – almost exactly 33 megalithic rods. The number 33 was sacred to the ancient Britons.

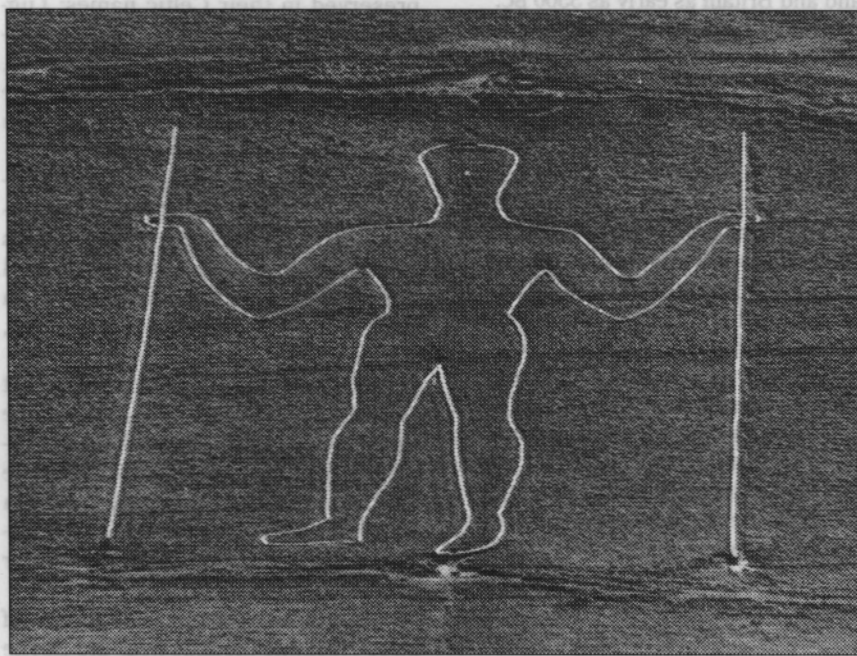
Dr Thomas calls the 33 rod measure a dod. In laying out the original circle of Stonehenge 4500 years ago – the so-called Aubrey circle – its designers made it exactly four dods in circumference. The four quadrants forming the perimeter, each of 33 megalithic rods, divided the year into four quarters of four months each.

Some 25 years ago, Professor Alexander Thom (see main article) concluded from his studies of ceremonial circles in Britain and Europe that their designers had employed specific units of linear measurement, including a measure that Dr Thomas now terms a megalithic yard, and less frequently, a unit 2.5 times longer, the megalithic rod.

Dr Thomas suspects the enigmatic Long Man of Wilmington was a surveyor, and that the staves in his hand were his tools of measurement. They were about the same height as the figure, who in real life was probably about 1.5 metres tall. It is a reasonable assumption that poorer nutrition resulted in average height being considerably less than today.

He believes the Long Man's staves originally widened at the top, and were pierced by a hole that allowed the megalithic surveyor to sight through one staff to see the other some distance away. Without a

Surveying Neolithic measures



The Long Man of Wilmington: an ancient surveyor?

sighting hole, the second stave would be hidden by the first.

The staves were probably pinned together by a peg inserted through the holes, and lashed with a brace that held them at right angles.

In this configuration, two staves 1.47 metres long (roughly eye-level for a 1.5 metre tall man) subtend a distance of 2.073 metres – Professor Thom's megalithic rod.

Dr Thomas says the Long Man's

height of one dod, or 33 megalithic rods is significant because when multiplied by 33, it yields another recurrent unit of distance that he calls the megalithic mile – a unit somewhat longer than the present English mile.

The ancient British units of measurement are related by the two multipliers 2.5 and 33. There were 2.5 megalithic feet in a megalithic yard, 33 megalithic yards in a dod,

and 33 dods in a megalithic mile. And 2.5 megalithic miles, Dr Thomas believes, may have been the linear measure called the league, whose origins are obscure.

The ancient Britons also developed a system for measuring angles, by repeatedly subdividing the basic quartered circle. There were 64 megalithic degrees in a full circle, rather than the 360 degrees of today.

Using modern survey maps, Dr Thomas ran these systems of angular and linear measurement over the distances and alignments between many ancient sites in Britain.

Stonehenge, and the village of Avebury to the north, seem to be focal points for large numbers of megalithic circles, engineering works and a complex network of connecting alignments.

Most of the angles between these alignments are exact multiples of the megalithic degree, and most of the distances are in whole numbers of megalithic miles, except for distances like 2.5 and 7.5 megalithic miles, or the 2.5 mile megalithic league.

One alignment begins at Stonehenge and transects Old Sarum, Salisbury, the Clearbury Ring and Castle Hill Fort, en route to a prehistoric site called Highcliffe Castle on a cliff top overlooking the English Channel. The Highcliffe Castle site is exactly 22 megalithic miles from Stonehenge – 22 was another sacred number for the ancient Britons.

Dr Thomas suggests that the Highcliffe Castle site would have been a logical site for a beacon to guide craft across the English Channel from Europe and into safe harbour at the mouth of the Avon River.

For a priest or shaman standing in the centre of the Aubrey circle, the six lines of posts may have been defined alternative rising positions for the mid-winter full moon during its 19 year cycle.

Alternatively, Dr Thomas says it may have been possible, if difficult, to use the lines of posts to predict lunar eclipses, which occur at intervals of 18.61 years. There is a hint of this possibility in the unexplained choice of 56 stones to make the Aubrey circle. It may be coincidence, but if each stone is counted twice – a common practice with some of the solar calendars – the count of 112 is very close to the figure obtained by multiplying the 18.61 year eclipse cycle by six.

About 1000 years after the Aubrey circle was constructed, the original causeway was shifted to a new alignment 3.5 degrees to the east. Two stones that had marked the entrance of the lunar causeway were shifted to the new alignment. The causeway looked straight towards the midsummer sunrise at 49.9 degrees east. Stonehenge was transformed from a lunar to a solar calendar.

At the same time, a massive construction project that must have occupied almost the entire adult population of the region for many years, saw two concentric circles of bluestone megaliths erected inside the Aubrey circle.

The stones were quarried some 250 kilometres away at Carn Meini, in the Preseli Mountains near the coast of south-west Wales. Dr Thomas believes the bluestones, weighing up to 40 tonnes, were taken down to the coast and rolled into the surf before being floated on rafts around the coast, and then up the River Avon towards Stonehenge.

Finally, they were brought ashore and transported on sleds to be erected at Stonehenge. Britain 4000 years ago was much colder than today; the engineer in Neil Thomas speculates that his Neolithic counterparts may have taken advantage of thick morning frosts that allowed the sleds to glide over grass.

The bluestone columns were arranged in 38 pairs. The significance of the number is elusive, but the nearby Woodhenge circle features a circle of 19 solitary posts that may have represented the basic count of 19 days in the British Neolithic month (one day less than the older Irish kerbstone calendar at Knowth).

That the 38 pairs of columns at Stonehenge may have represented 19 days of the month is implied by the placement of three extra pairs inside the bluestone circle, aligned with the midsummer axis. These columns may have been counted as required to add to the basic 19 days of the month, for a maximum of 22 days in any one month.

These stones were reused, but their arrangement has been inferred from the depressions they left in the chalky soil. All of them lay inside the massive group of Sarsen stones that attract modern visitors to Stonehenge.

Around 2500 BC, four massive bluestones were placed strategically on the perimeter of the Aubrey circle. These so-called Station Stones define a rectangle whose short sides point to the midsummer sunrise and, in the opposite direction, to midwinter sunset. The placement of these stones appears to have presaged a fundamental change in the Neolithic culture of the day: a shift from worshipping the Moon as the primary deity, to worshipping the Sun.

The shift to Sun-worship may be reflected in the construction in 2100 BC of the so-called sarsen circle, comprising 30 massive columns surmounted by a continuous lintel. Within it were five massive stone arches, called trilithons,

comprising two supporting columns capped by a lintel.

Only three are still standing, but formerly the five trilithons were grouped in a horseshoe shape within an ellipse whose perimeter measures precisely 33 megalithic rods, denoting the deep significance of the trilithons. The open end of the horseshoe faces the midsummer sunrise. Dr Thomas proposes that the five trilithons represented the five gods for whom the days of the Neolithic week were probably named: the Sun, the Moon, Woden, Thor and Freyr.

The village of Avebury, almost due north of Stonehenge, actually lies in the centre of the largest stone circle in Britain. Excavations suggest that the Avebury ring, half a kilometre in diameter, originally had 99 stones when it was constructed some 4500 years ago – thrice the hallowed number 33.

Other features in and around the Avebury circle lead Dr Thomas to speculate that it may have been the ancient spiritual capital of Britain, a veritable Holy of Holies. A ditch surrounds the stone circle, and outside it lies a circular mound constructed from the excavated earth. The mound may have provided elevated seating for crowds watching the ceremonies inside the circle.

Four causeways cross the mound and henge and meet in the middle of Avebury village. Each was once flanked by a pair of huge stones where it entered the circle. Avebury's West Kennet Avenue, passes through the main circle via the south-eastern causeway, and out through an avenue of large stones on its way to an ancient site called The Sanctuary, one megalithic mile distant.

Avebury's main ring had no calendrical function, as far as Dr Thomas can discern. The calendar was at The Sanctuary. Excavations in the 1930s revealed a series of concentric circles, variously constructed from large wooden poles and megaliths.

Like other calendrical rings, The Sanctuary embodies the four-quarter solar calendar, with 16 months of a basic count of 20 days, and four five-day weeks per month. The inner wooden posts, Dr Thomas believes, once sup-

ported a large, circular hut with an entrance facing the avenue from Avebury.

The orientation of the entrance and the avenue corresponds on the calendrical ring of The Sanctuary to the Celtic month of Imbolc, the augury of lambing. The ancient Britons may have marched annually down the avenue to The Sanctuary to celebrate the coming of the warmer months.

Within the massive Avebury ring are the remnants of two smaller rings. The smaller one comprises 27 standing stones surrounding three large sarsen stones – two now remain – arranged in a U shape at its centre, the open end facing east towards sunrise.

Dr Thomas speculates that the 27-stone ring was used in ceremonies entreating a fertility god, corresponding to Freyr, in the much later Norse pantheon, to provide success and plenty. The number 27 features in Welsh and Irish mythology in association with exalted and successful activities.

The larger 29 stone circle surrounded a line of nine standing stones, with two other stones set east of the line. At the centre of the circle was a large stone called The Obelisk. Many

other megalithic rings in Britain feature the same circle and central pillar.

Later Norse legends and Icelandic sagas describe a temple of similar design to the one at Avebury, dedicated to the god Thor. Avebury's Obelisk stone corresponds to Thor's stone, on which the bones of sacrificial victims were broken before they were sent to heaven.

In AD 930, according to an Icelandic saga, Iceland was divided into a commonwealth, comprising four judicial districts. Each summer 36 chieftains, nine from each district, gathered to hear disputes at a ceremonial stone building called the Althing, the pre-eminent court of the land and a forerunner of the world's first parliament – and ultimately the British Parliament.

The defendant, represented by the Obelisk stone at Avebury, would stand before a jury of nine (the line of nine stones) and listen as the case was argued by a prosecutor and a defender (the two extra stones). By Dr Thomas's account, the two inner stone rings at Avebury probably honoured Thor (who stood for justice and the rule of law) and Freyr (fertility and plenty); the great stone circle around the area paid homage to the greatest of the gods, Wotan or Woden (the Norse Odin).

There is a hint of the primary deity's name in the name of a massive ditch or dyke near Avebury, called Wansdyke. Dr Thomas suggests that the original name may have been Woden's Dyke. Similarly Waden Hill, south of Avebury, may once have been Woden's Hill. Woden is cryptically honoured in the name of many other prehistoric ditches around Britain, which share the name Grimsdyke – Grim being an alternative name for a Woden who stalked the countryside disguised in a hood.

Avebury itself may be a linguistic relic of Woden's beorh; beorh means barrow, the name of the huge prehistoric earth mounds built in Britain and Ireland. In the Norse style, Woden was probably pronounced Voden, and may have been shortened via V-beorh to the penultimate V-bery.

The design of the great ring of Avebury, Dr Thomas suggests, may have been the physical embodiment of the Norse creation myth. The two great stones marking the entry points of the four causeways may have represented the feet of the four dwarves who held up the hemisphere of the heavens, sheltering the gods who ruled life in ancient Britain.

The ancient British trinity, Woden, Thor and Freyr, provided justice and the rule of law, good seasons, and health and fertility. An ancient Briton could have asked for no more.



Part of the largest stone circle in Britain, at Avebury, north of Stonehenge.

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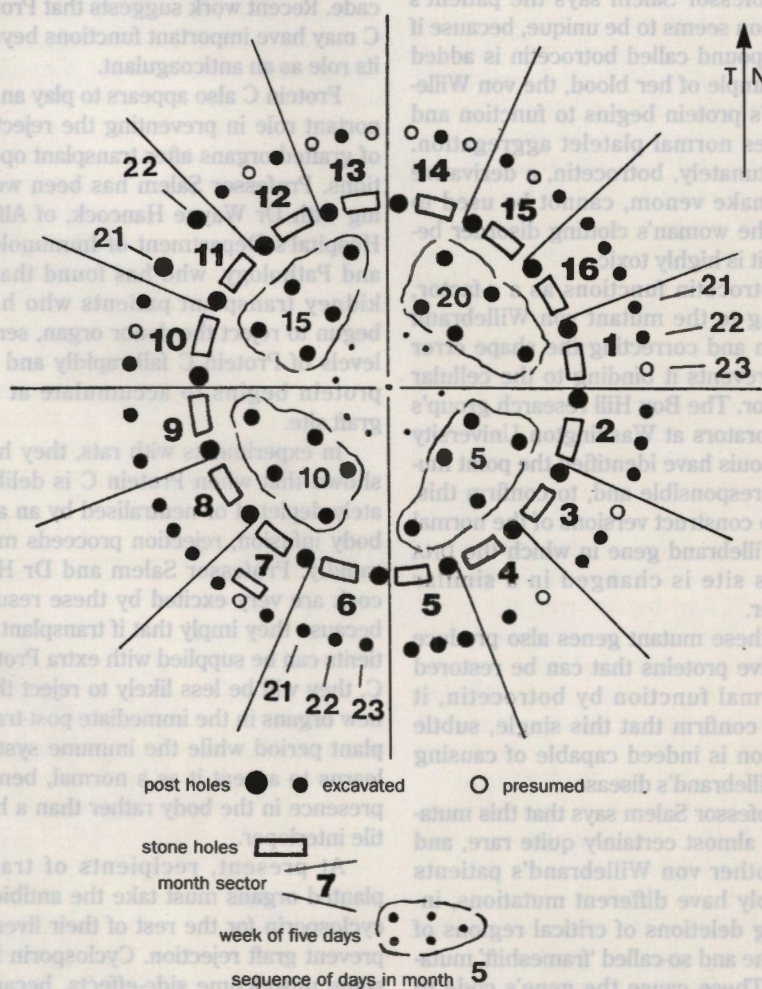
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Clotting: it's in the blood

Blood clotting depends on the complex interaction of many biological transmitters which send messages between individual blood cells. Inherited genetic disorders interrupt these paths in different ways. Researchers are gradually learning how these connections function.

The genetic disease haemophilia, in which the blood fails to clot, almost exclusively affects males. The gene resides on the male's single X-chromosome, inherited via the mother – females are protected against the disorder because their second X-chromosome provides a backup gene that functions normally.

Haemophilia is caused by a defective gene for a blood-clotting factor, Factor VIII. Queen Victoria spread the disorder through the royal families of Europe through several of her daughters.

But there are other genetic disorders involving the blood that affect the sexes equally. The ability of the blood to clot, so vital to the maintenance of life in a hazardous world, depends on the proper functioning of a complex cascade of biochemical events.

The cascade involves many different proteins, enzymes and hormone-like factors that transmit signals between blood cells. Haemostasis – the dynamic maintenance of blood flow in the body – involves dozens of genes. If just one of these genes fails to fulfil its role properly, the blood may fail to clot when the vascular system springs a leak; or equally seriously, may clot at the wrong time.

A team led by Professor Hatem Salem, Professor of Medicine at Box Hill Hospital, is carrying out research into blood clotting disorders; not just haemorrhagic (bleeding) diseases, but a group of disorders called thromboses, in which blood clots at the wrong time, blocking veins or arteries.

The most common haemorrhagic disorder that affects both males and females is von Willebrand's disease. When the wall of a blood vessel is breached, specialised blood cells called platelets rapidly clump together and adhere to the damaged region of the vessel wall, arresting the escape of blood. In individuals who inherit a defective gene for von Willebrand's (vW) factor, the platelets fail to aggregate and uncontrolled bleeding may ensue.

Professor Salem says vW factor triggers platelet aggregation, and also seems to be essential for the platelet 'plug' to adhere to the blood-vessel wall. His team is studying the vW protein's structure to identify which regions are critical to the process of binding to signal-transducing proteins on the surface of the platelets. These cell-surface proteins, which serve as molecular switches, activate enzymes in the platelets that cause them to aggregate and bind to the blood vessel wall.

Von Willebrand's disease, like all genetic diseases, is incurable. However, it can be treated. vW factor is part of a cocktail of proteins that precipitate out when normal serum is chilled, and this mix can be infused into victims of von Willebrand's disease who require surgery, or who have suffered injuries that cause bleeding.

vW factor is a very large protein, encoded by a big gene on human chromosome 6. Molecular biologists at the University of Washington in Seattle recently isolated and cloned the von Willebrand's gene, an essential first step for studying its DNA code and later,

for producing vW factor in large amounts, and in pure form.

In the Box Hill department, Professor Barry Firkin and Dr Kathy Thomas have been studying a Melbourne von Willebrand's patient who appears to have what molecular geneticists call a point mutation in the gene. A single letter of the DNA code in her gene has been changed, so that a different amino acid "building block" is inserted at the corresponding point in the protein encoded by the gene. This patient makes normal amounts of von Willebrand's factor, but for some reason, it fails to function.

It became clear during the 1980s that the three-dimensional structure of most proteins is crucial to their biological activity. Signalling proteins, for instance, work by a lock-and-key interaction with their cellular receptors; should a mutation subtly change the shape of either key or lock, the signal may not be transmitted, and a biochemical cascade may be halted in midstream.

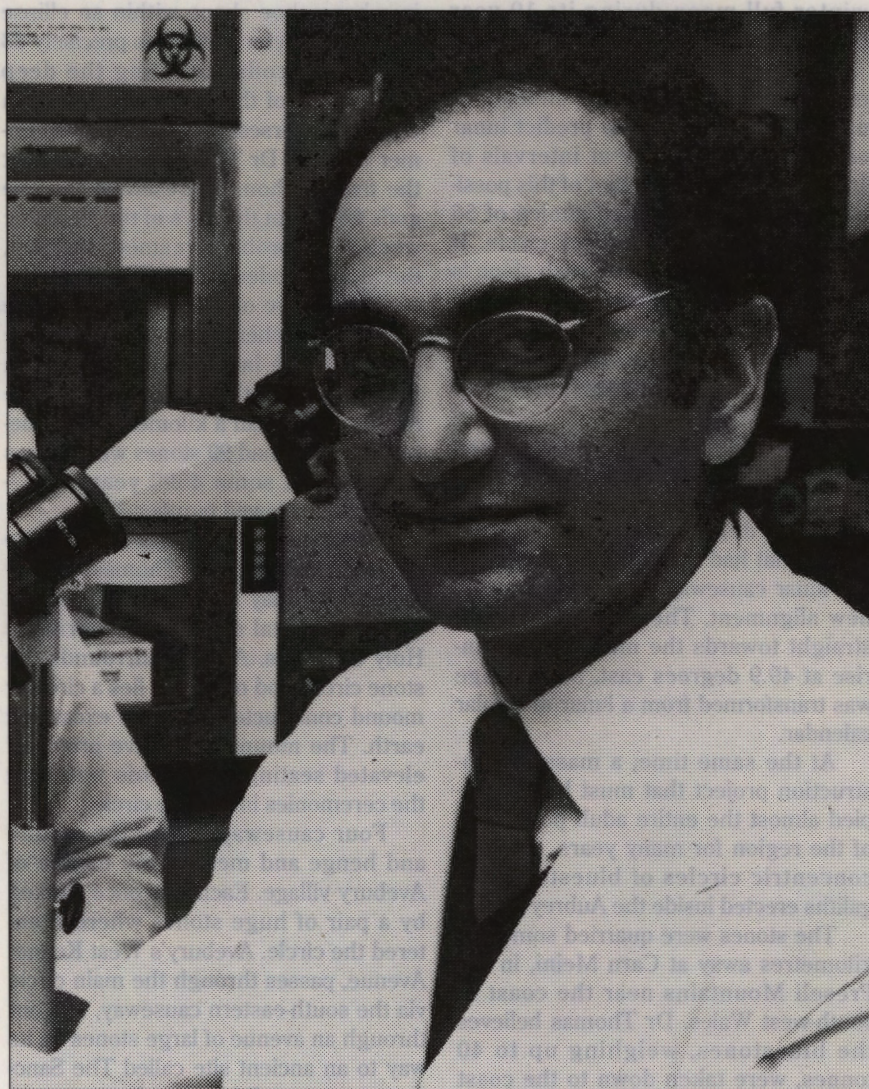
This is what has seems to have happened in the Melbourne patient. A point mutation has been tentatively identified in her gene, which causes the vW protein to fold abnormally and interferes with its ability to bind to the appropriate receptor on the surface of her platelet cells. Her platelets do not aggregate, and her blood thus fails to clot.

Professor Salem says the patient's mutation seems to be unique, because if a compound called botrocetin is added to a sample of her blood, the von Willebrand's protein begins to function and induces normal platelet aggregation. Unfortunately, botrocetin, a derivative of a snake venom, cannot be used to treat the woman's clotting disorder because it is highly toxic.

Botrocetin functions as a c-factor, binding to the mutant von Willebrand protein and correcting the shape error that prevents it binding to the cellular receptor. The Box Hill research group's collaborators at Washington University in St Louis have identified the point mutation responsible and, to confirm this, plan to construct versions of the normal von Willebrand gene in which the DNA at this site is changed in a similar manner.

If these mutant genes also produce defective proteins that can be restored to normal function by botrocetin, it would confirm that this single, subtle mutation is indeed capable of causing von Willebrand's disease.

Professor Salem says that this mutation is almost certainly quite rare, and most other von Willebrand's patients probably have different mutations, including deletions of critical regions of the gene and so-called 'frameshift' mutations. These cause the gene's code to be read from the wrong starting point, resulting in a 'nonsense' protein that has no biological function.



Professor Hatem Salem: Patients may not need immunosuppressive drugs.

Blood clotting is necessarily a rigorously controlled process; in addition to factors that induce clotting, like von Willebrand's factor, there are also factors that act as anticoagulants, to halt or prevent clotting.

Professor Salem's research group has been investigating another factor called Protein C, a key anticoagulant which is normally present in an inactive form in the blood. On activation, it plays a direct role in halting the clotting cascade. Recent work suggests that Protein C may have important functions beyond its role as an anticoagulant.

Protein C also appears to play an important role in preventing the rejection of grafted organs after transplant operations. Professor Salem has been working with Dr Wayne Hancock, of Alfred Hospital's Department of Immunology and Pathology, who has found that in kidney transplant patients who have begun to reject the donor organ, serum levels of Protein C fall rapidly and the protein begins to accumulate at the graft site.

In experiments with rats, they have shown that when Protein C is deliberately depleted or neutralised by an antibody infusion, rejection proceeds more rapidly. Professor Salem and Dr Hancock are very excited by these results, because they imply that if transplant patients can be supplied with extra Protein C, they will be less likely to reject their new organs in the immediate post-transplant period while the immune system learns to accept it as a normal, benign presence in the body rather than a hostile interloper.

At present, recipients of transplanted organs must take the antibiotic cyclosporin for the rest of their lives to prevent graft rejection. Cyclosporin has some unwelcome side-effects, because it causes general depression of the immune response, exposing transplant patients to the risk of infection.

Protein C does not have these adverse effects; its activity does not involve the immune system. Professor Salem says that if protein C can be shown to prevent graft rejection, transplant patients might be able to cease treatment after their new organ has 'taken', and could then go on to lead a normal life without the need to take immunosuppressive drugs such as cyclosporin.

Professor Salem's research group is also studying an anticoagulating factor called thrombomodulin, secreted by endothelial cells that line the inner surface of blood vessels. Professor Salem isolated the human protein during post-doctoral research in the United States, and subsequently confirmed that it is a factor that performs a critical role in activating Protein C.

The St Louis research group has isolated the human thrombomodulin gene, and part of the mouse gene. Dr Phil Bird at Box Hill Hospital has managed to recover the complete mouse gene.

Mice, with their rapid life cycle, allow mutant genes to be studied more conveniently than in humans. Dr Bird now plans work with transgenic mice, which have had mutant versions of the mouse thrombomodulin genes introduced into their genetic blueprint, to gain an understanding of how mutations in the human gene may induce potentially lethal thromboses (abnormal blood clots in humans).

Dr Chris Mitchell, a senior lecturer in the Department of Medicine, has studied the blood of another Melbourne patient, a man in his 50s, who died of a massive thrombosis. Dr Mitchell discovered that the man made normal Protein C, but for some reason his immune system synthesised antibodies that inhibited its function, causing his blood to clot spontaneously.

Continued on Research Monash 8

Clearing a cellular pathway

Patients with liver damage are susceptible to the toxic effects of many common drugs and antibiotics, making treatment problematic. The cause has been a long-standing medical mystery, but two Monash researchers have advanced a simple explanation which promises economic and therapeutic benefits worldwide.

"Life," said a sage, "depends on the liver." That statement is literally true for thousands of Australians with chronic liver disease. Their impaired liver function puts them at risk of toxic effects from drugs and antibiotics when they fall ill or contract an infection.

A healthy liver rapidly clears most drugs and toxins from its owner's system; normal drug therapies take this into account, by setting dosages to maintain an effective concentration of a drug over a period long enough to control the infection.

But patients with chronic liver disease and impaired liver function clear drugs more slowly, so that even reduced dosages may be hazardous. If the drug concentration remains elevated for too long, it can damage healthy tissues, particularly the kidneys. In liver-damaged patients, the dosage of certain drugs may need to be reduced to as little as 10 per cent of normal.

The root cause of reduced drug clearance in damaged livers has been a long-standing medical mystery. But now two Monash medical researchers have advanced a simple explanation that could revolutionise the administration of drugs to liver-damaged patients around the world, and cut the social and economic costs of complications from poor liver function or drug toxicity.

The researchers are Dr Allan McLean, Director of Clinical Pharmacology at the Alfred Hospital and an honorary academic member of the Faculty of Medicine, and Dr Denis Morgan of the Victorian College of Pharmacy, which recently affiliated with Monash.

Dr McLean and Dr Morgan have completed a comprehensive review of experiments into the effect of recently observed changes in the structure of diseased liver cells. These changes, they believe, limit the diffusion of oxygen through liver tissues, inhibiting specialised oxygen-dependent enzymes that clear drugs from the patient's system.

Liver cells form from two tube-like vessels, one inside the other. Figure 1 (below) shows that the wall of the inner vessel, the endothelium, is sieve-like in nature. A tiny branch from the hepatic portal vein delivers blood into the top of the central vessel into the sinus formed

by the endothelium, and blood drains from lower end of this sinus.

The endothelial lining is surrounded by a layer of hepatic cells, punctuated by tiny holes called fenestrae (literally windows). Red cells moving down through the sinus are too large to pass laterally through the fenestrae.

However, oxygen imported by the red blood cells, plus other molecules in the bloodstream, move freely through the fenestrae into a cavity called the space of Disse. Here they mix thoroughly and are consumed by various cellular processes, including the enzyme reactions that clear drugs from the liver.

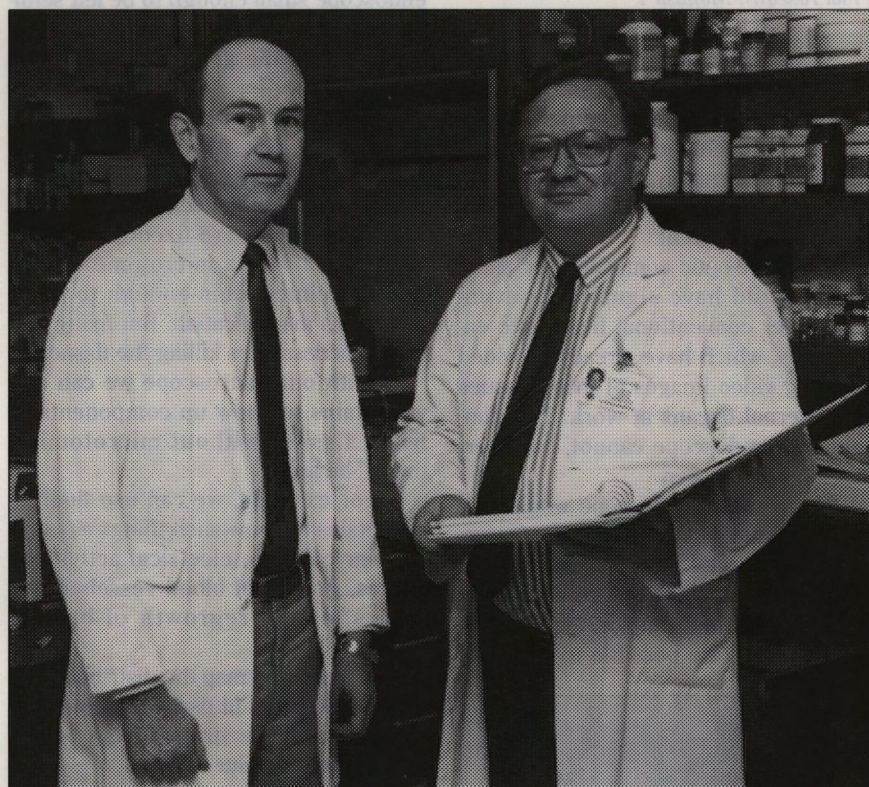
Dr McLean said that the constant mixing of oxygen and other molecules like albumin proteins in the space of Disse maintains a biochemical gradient that causes oxygen to flow into adjacent liver cells. Cell biologists have noted that in livers affected by cirrhosis or other forms of liver disease, tiny blood vessels grow and block the fenestrae – a process called capillarisation.

The specialised microcirculation serving liver tissue now reverts to the circulation pattern typical of capillaries in other tissues. Larger molecules like proteins are barred from passing through the wall of the sinus, and only water and organic salts can diffuse into the space of Disse.

Other pathological changes may also occur. Fibrous tissues may develop, forming a matrix that further limits the diffusion of gases and biochemical molecules into the space of Disse.

Dr McLean says that the blocked fenestrae and other physical barriers can drastically reduce the supply of oxygen needed by drug-clearing enzymes. "In terms of oxygen access, you have gone from a system with unrestricted oxygen flow to one with a relatively long diffusional pathway," he said.

Something similar happens in diseased lung tissue. Lung and liver tissues actually form from similar tissues,



Dr Denis Morgan (left) of the Victorian College of Pharmacy, and Dr Allan McLean, Director of Clinical Pharmacology at the Alfred Hospital.

and by similar processes, during embryogenesis. "When people looked very carefully at gas exchange in the lung, at least 50 per cent of diffusional resistance to gas exchange is attributed to the endothelial lining of lung capillaries," Dr McLean said.

"In chronic lung disease, fibrosis develops in lung tissue just as in cirrhotic liver tissue. Fibrosis of the endothelium of the lung can increase resistance to gas diffusion by a factor of three or four. What our study suggests is that even if there is no marked pathological change in liver tissue except for capillarisation, resistance to oxygen diffusion may be significantly increased because there is virtually no resistance in normal liver tissue."

Dr McLean and Dr Morgan came to their conclusions after analysing patterns of change in drug metabolism in people with liver disease. They found that such people fell into two classes.

One group of drugs, initially insoluble in water, is cleared by a process called conjugation, in which enzymes attach the active form of the drug to a carrier molecule, making it water-soluble. The complex is then cleared by excretion in the urine or in bile. Drugs in this group work equally well in normal and liver-damaged patients: their activity is spared.

But there is a second clearance pathway, in which enzymes oxidise or reduce the drug molecule. It is these drugs that pose problems in patients with liver damage, because their clearance is affected. One commonly used drug in this class is omeprazole, which suppresses excess secretion of acid in the stomach.

"Omeprazole is severely affected because as soon as oxygen delivery to the liver is reduced, the rate at which the drug is cleared or metabolised is reduced correspondingly," Dr McLean said. "Even the smallest reduction in oxygen produces a change."

"This is a fundamental difference that has been observed and published by other researchers. When we looked at all the other drugs that are not cleared by the conjugation route, the only thing they had in common was their sensitivity or resistance to oxygen. No other explanation held up."

"We had a hypothesis: that poor oxygen supply to the liver was responsible for reduced rates of clearance of drugs that are metabolised by oxidation or reduction. We then searched for any published examples where researchers had intervened or made measurements that might confirm or deny our hypothesis. In the examples we came across, one of two things had been done."

"In cells deprived of oxygen, there is an increase in the ratio of lactate to pyruvate, which is consistent with reduced oxidation. Similarly, there is an increase in the ratio betahydroxybutyrate to acetoacetate. It happens because the cells are forced to switch to anaerobic metabolism."

"We also found papers where researchers had measured rates of oxygen consumption in diseased and healthy livers, and these results also supported our hypothesis – the diseased livers were consuming less oxygen."

The examples they found in the medical literature involved experiments on isolated slices of tissue from diseased human livers, and on monkeys and rats with liver fibrosis. Diseased liver tissues supplemented with oxygen displayed increased rates of drug metabolism; so did living animals breathing pure oxygen.

In liver tissue affected by capillarisation, resistance to oxygen diffusion is approximately tripled. The two researchers believe the problem of reduced drug clearance could be substantially overcome if patients breathed pure oxygen. But high concentrations of oxygen can be toxic to healthy tissues if breathed for prolonged periods, and oxygen is not cheap.

Supplementary oxygen may not be a feasible therapy. The alternative is to increase oxygenation of the liver by increasing blood flow. Dr McLean and Dr Morgan say this can be achieved with drugs that dilate blood vessels, decreasing resistance to flow.

They found that when vasodilators were given orally, rather than intravenously, there was a much earlier and more pronounced effect on blood vessels in the liver than in the general circulation.

Continued overleaf

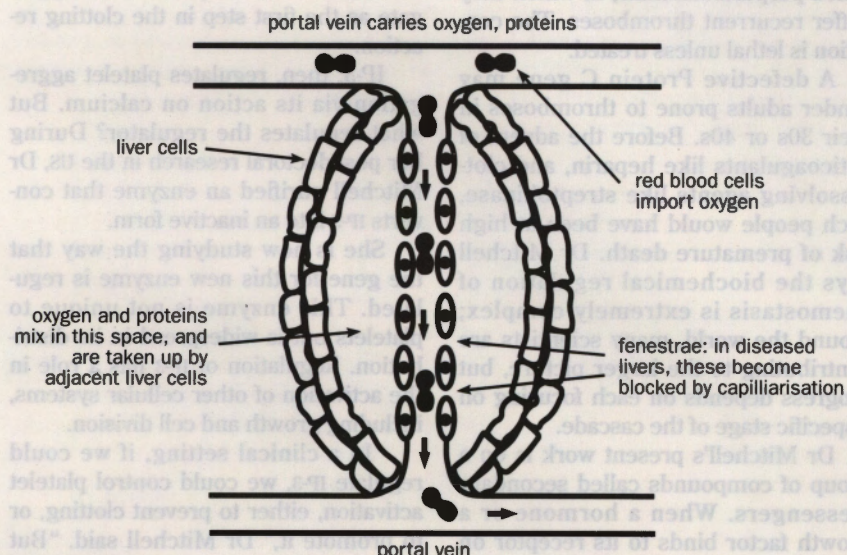


Figure 1.

Tracking through tissue

From Research Monash 1

This problem has been neatly solved in the prototype by vibrating the end of the fibre in a scanning pattern, guiding it mechanically with a special alloy that alternately expands and contracts very rapidly in response to an applied electric current.

The fibre-optic confocal laser endoscope would have significant advantages over conventional fibre-optic endoscopes, which have already provided stunning video images of living tissues and internal organs at work. The conventional endoscope cannot, however, magnify what it sees.

The confocal endoscope would provide high magnification images of structures in the living body that have never before been seen at the cellular level without removing samples. Mr Delaney says it should be possible to make an

endoscope small enough to be left semi-permanently inside the body to study, for example, the growth of cancerous tissue.

"The most exciting applications are its ability to look at living tissues without laborious tissue preparation," Mr Delaney said. In conventional light microscopy, tissues are fixed in wax and then sliced with a microtome to produce specimens thin enough to focus on at high magnification. But fixing and slicing necessitates killing the tissue.

"With our microscope we can use vital stains to show up components of living tissues without microtoming them," he said.

"For example, we can use fluorescent stains to show such things as intracellular calcium, electrical activity of nerves, growth of blood vessels or tumours, or the regrowth of broken bones.

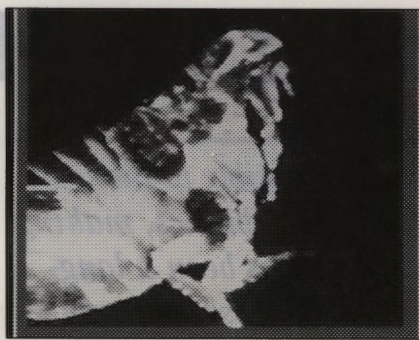
"We can also map the distribution of special receptors in tissues that are the sites of action for drugs or the body's own neurotransmitters."

For fluorescence microscopy, where the tissues are actually emitting light under the stimulus of the laser beam, the HBH Fibrescan microscope offers twice the resolution of a conventional light microscope.

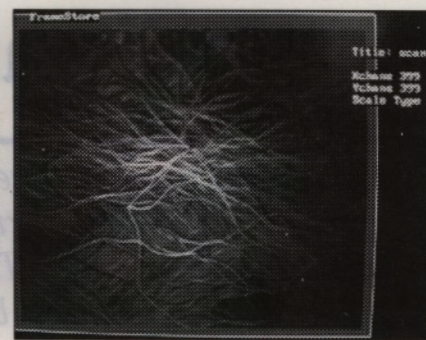
For reflection microscopy, it is a factor of 1.4 better. Mr Delaney points out that superior magnification and definition are actually bonuses, on top of scanning 'slices' of living tissue to obtain three-dimensional images.

"Medical researchers are very interested in using it for studying the wiring of neurons in animal brains," he said.

"It offers the capacity to track down through tissue to see where the synaptic junctions between nerves are located, and in this way, to see how they are organised."



A flea and nylon fibres, as seen by the fibre-optic confocal microscope.



"We have already used it experimentally to observe the microvasculature in a living rat. Even if you could position the whole animal under a normal optical microscope, all you would see is a blur. This allows us to look at changes virtually in real time, so we can observe how certain drugs affect these tissues."

"It has been found that certain cancer drugs work best if they are given when the cells of the cancerous tissue are actively dividing. By implanting an endoscope in the cancer patient, we could actually observe the cancerous cells, and pick the optimum time to deliver the drug."

At Melbourne University, researchers are using an optic fibre confocal microscope to study the chemistry of phototherapy anticancer drugs, and plan to link the microscope to a helium cadmium laser.

Beyond medical research, Mr Delaney believes one of the most exciting applications will be in monitoring industrial processes, and in industrial process control. The microscope could be used in the semiconductor industry, for example, to monitor the deposition of materials as microcircuits on wafers of silicon or gallium arsenide.

Defects often occur in these materials, which make up the circuits. Expert image-analysis systems linked to laser confocal microscopes could detect defects and take remedial action.

"Any product requiring surface analysis to ensure its quality could be monitored on-line by this method: paper, fabric, or metal coated products," Mr Harris said.

With the advent of virtual reality computer-imaging technology, laser confocal endoscope or microscope images could be used to offer students, researchers or surgeons an unprecedented view of living tissues. By 'stacking' sequential optical slices, the microscope could generate a detailed three-dimensional image of a cube of tissue.

Using a virtual reality headset and a powerful computer, a person could make a three-dimensional tour of the tissue. Scientific film-makers as well as educators in the biological sciences are likely to be keenly interested in the marriage of confocal laser microscopy and virtual reality.

The first HBH Fibrescan 800 instruments come off the company's Dandenong production line next month. Given the level of early interest in the international scientific community, the microscope seems destined to establish a significant new export industry.

HBH has already turned down a substantial overseas manufacturing offer because of its commitment to local manufacturing but is seeking collaboration with an overseas partner to ensure access to international markets.



The laser and bulky optical components are joined to the microscope by a fibre-optic cable.

Oxygen aids drug clearance

From previous page

The explanation is simple: the vasodilator is absorbed by the gut and is carried directly to the liver via the portal vein.

Dr McLean recalls that early in his career researchers noted, without being able to explain why, that people with severe lung disease also had reduced liver metabolism of certain drugs. Now the explanation seems clear: impaired lung function reduces oxygenation of the liver, slowing clearance of these drugs.

People with lung disease would also tend to be more severely affected if they developed cirrhosis of the liver, suffering what Dr McLean describes as a 'double whammy'. The liver not only clears synthetic drugs from the system, but a range of toxins produced as normal by-products of metabolism. For example, ammonia from degraded proteins.

These toxins may also concentrate in the circulation in people suffering liver disease. Such patients may develop a condition called hepatic encephalopathy – a decline in mental function resulting from brain damage caused by toxins in the blood – which in turn may be explained by impaired oxygen supply in the liver.

Hepatic encephalopathy causes confusion and disorientation; victims may

be unable to cope socially, and may need to be institutionalised or provided with long-term care, at considerable expense.

"Ultimately, what incapacitates these people is their change of mental state," Dr McLean said. "Our hypothesis suggests that if we could increase their supply of oxygen, their liver function would improve, and they would be able to get on with their lives."

"Our review also established that liver disease changes the effect of certain drugs on their target tissues, particularly the central nervous system. For example, it can alter the sensitivity of receptors in the brain to psychotropic drugs like benzodiazepines. Benzodiazepines are often given as tranquillisers to liver-damaged patients suffering from hepatic encephalopathy, which results in a vicious circle."

Dr McLean and Dr Morgan believe that the simple measure of increasing oxygen supply to liver-damaged patients could have extensive therapeutic and economic benefits, and expect that if their hypothesis is confirmed by further experiments, such a therapy will be rapidly adopted around the world.

Their analyses of the cause and treatment of liver impairment have recently been published in a leading pharmacological review journal, and a leading international clinical journal on liver disease.

Inherited genes may cause lethal blood diseases

From Research Monash 6

The finding shows that blood disorders can occur even in individuals in which the genes directly involved in haemostasis are perfectly normal.

However, Dr Mitchell says inherited Protein C defects are well described in the scientific literature. Newborn babies who inherit a defective Protein C gene may develop a condition called purpurafulminans, in which they suffer recurrent thromboses. The condition is lethal unless treated.

A defective Protein C gene may render adults prone to thromboses in their 30s or 40s. Before the advent of anticoagulants like heparin, and clot-dissolving agents like streptokinase, such people would have been at high risk of premature death. Dr Mitchell says the biochemical regulation of haemostasis is extremely complex; around the world, many scientists are contributing to the larger picture, but progress depends on each focusing on a specific stage of the cascade.

Dr Mitchell's present work is on a group of compounds called secondary messengers. When a hormone or a growth factor binds to its receptor on the surface of a platelet, secondary messengers pick it up and relay the

signal within the cell's internal environment. The secondary messenger may cause the cell to release another hormone or enzyme – for example, a hormone that signals bone-marrow cells to begin making more platelets.

The cell membrane of a platelet contains a lipid substance called phosphatidylinositol. When the cell is stimulated by a hormone, the substance breaks down to form a second messenger called inositol 1,4,5 tris-phosphate (IP-3).

IP-3 triggers the release of calcium into the intracellular environment. Calcium is one of the most important elements in cell function. Among other things, it causes muscle cells to contract, but it causes platelets to aggregate as the first step in the clotting reaction.

IP-3, then, regulates platelet aggregation via its action on calcium. But what regulates the regulator? During her post-doctoral research in the US, Dr Mitchell purified an enzyme that converts IP-3 into an inactive form.

She is now studying the way that the gene for this new enzyme is regulated. This enzyme is not unique to platelets but is widespread in its distribution. Regulation of IP-3 has a role in the activation of other cellular systems, including growth and cell division.

"In a clinical setting, if we could regulate IP-3, we could control platelet activation, either to prevent clotting, or to promote it," Dr Mitchell said. "But it's long-term work. We may not see any results for a decade or more."