

ADELAIDEAN

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NEWS FROM THE UNIVERSITY OF ADELAIDE

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Queen's adviser to develop University horse course

FOR THOSE who enjoy horses as a hobby, they are a relaxing pastime. But for those looking for a career in the horse industry, it requires more than a little nous.

That's according to renowned veterinary clinician and animal science



In its leader of May 27, 1997, the *Australian Financial Review* claimed that "...investment in human capital is the most important way advanced economies can lift productivity".

I agree: the wealth of nations is knowledge, some of it implicit in our social arrangements, but much of it explicit and explicitly taught and learned: knowledge of self, knowledge of others, knowledge of the impersonal world, knowledge of ideas, knowledge of knowledge, of ways to know. The wealth of nations is mostly carried around in the heads of the people (although the University Librarian will not want me to forget his domain).

However, the *AFR* then went on to make claims about the appropriate funding of undergraduate education, which I dispute. Grants to universities for undergraduate education, instead of being commended as an investment that benefits the economy, were deprecated as "middle class welfare". The *AFR*'s reasoning was that, because students themselves gained so much financially from their own education, no public support for undergraduate education was needed. The editorial also implied that the Commonwealth Treasury spends more on tuition grants to universities than it receives in return from graduates.

To examine the validity of these judgments, I made some estimates of the financial consequences of Commonwealth funding of Australian undergraduates. What is the value of the learning? Who pays for it and who benefits from it? The results of the calculations, reported in a paper delivered recently at the Conference of Economists, are summarised here.

Consider a young person who, after completing high school at age 17, ceases education and goes to work in full-time employment. With a job, he or she obtains some financial independence, possibly to leave home for a life freer of parental scrutiny; or to stay at home and support the family and still have some money to spend.

At the end of, say, three or so years, what would they have? Maybe some savings in the form of money or a car; and they would have learned something about the world of work, especially relatively unskilled work.

If, however, in three years this young person had been able to create an asset worth a quarter of a million dollars, then that rightly would be regarded as quite an achievement.

Yet, this is exactly what the average undergraduate does: starting with high school qualification, an undergraduate goes to work at building an asset which is worth over a quarter of a million dollars in about three years.

My figuring relates to the average undergraduate as reported in the Australian census, and not specifically to graduates of the University of Adelaide. Many Adelaide graduates have complete undergraduate degrees of length greater than 3.3 years, which is the average length of an undergraduate course. Many have undertaken post-graduate education. Many will earn more than the average graduate. My calculations relate to a typical or average undergraduate, going to university straight from school.

On average, graduates earn more than do those who finish formal education with high school. Over a lifetime, the average graduate earns almost \$900,000 in today's dollars. That is, it would require a bank deposit of \$900,000, paying 5% real interest, to provide enough capital and interest to draw down to generate the annual income of the average graduate over a working life.

While the graduate earns \$900,000 over a lifetime, the average non-graduate earns a quarter of a million

dollars less. This is the sense in which university education, in three and a bit years, adds a quarter of a million dollars to the person.

Economists call these sorts of calculation the estimation of "human capital". The average graduate's human capital is \$900,000, of which university education is responsible for about a quarter of a million. (The word capital comes from the Latin caput or head, and your human capital is what you carry around in your head.)

In my conference paper, I report that the general picture remains the same on adjustments made on the assumption that, even if they had not attended university, those who do in fact go on to university study would have earned more than the average non-graduate.

Who gets the quarter of a million? Roughly speaking, it is shared 50/50 between the graduate and the Commonwealth Treasury. What I mean is that, after recouping its outlays on undergraduate education, the Commonwealth Treasury collects another \$100,000 in extra income taxes; extra, that is, above the income taxes paid by the non-graduate. (HECS repayments are small in comparison with regular taxes.)

Students, their families and friends, and government, invest in human capital and government collects half of the financial benefit. Now, government is partner in all legitimate, taxpaying, money-making activities, but that fact alone is insufficient reason for the Commonwealth Treasury to invest in all such activities. However, an economic justification for public investment is that, without adequate and appropriate government investment in education, there will not be enough education; and the investment pays off. That is to say, in the absence of government assistance, many persons for whom education spending would yield a great net benefit for society will not receive any education or enough education.

Importantly, equity grounds and economic calculation point in the same direction: the sorts of arguments that are commonly made in favour of public support for higher education on the basis of equity, lead to very similar policy conclusions as are supported by argument solely based on grounds of economic efficiency.

Investment in human capital is an unusual investment. A student cannot sell 'shares' in him- or herself to the stock market, nor readily borrow on the security of the yet-to-be-formed asset. For this and associate reasons, there is greater economic scope for government to be active in facilitating and encouraging investment in human capital than there is economic scope for government to assist most other legitimate, taxpaying, money-making activities, in all of which government is a partner. Educational investment is different.

As well as enhanced earning power, higher education brings personal benefits in other forms. Not only does higher education develop the mind and spirit, but it also opens up opportunities for the kinds of employment that allow for further development of the mind and spirit. For many people, the most significant effect is that they become more accomplished persons, more interesting to themselves and to their friends and lovers. For others, the liberation and development of the mind primarily manifests in activities beyond family and friends, to the building and protecting what is properly called civil society of voluntary associations and actions.

This then is the ultimate argument why government should support higher education: to produce a better society and better world by ensuring everyone has an equal opportunity to contribute to that better society and better world.





'GARDENS' WINS ANOTHER AWARD

Gardens in South Australia 1840-1940 (*Adelaidean*, 26 October, p.6) has won another award for its research scholarship. The report, prepared by Dr David Jones and Dr Pauline Payne, with sponsorship from Heritage SA and the City of Adelaide, has won a Commendation Award in Planning Scholarship from the Royal Australian Planning Institute (South Australian Group) at their annual awards.

HELPMANN ACADEMY SUMMER SCHOOL

The 1999 Helpmann Academy Summer School with places for 60 participants will be held from 8-10 February at St Mark's College.

The intensive three-day program of workshops, seminars and discussions gives ambitious graduates the chance to meet arts industry professionals in an informal environment.

Speakers include national and international experts from theatre, music, visual arts, media, business and career management.

The school is open to graduates from all Helpmann Academy partners. For further information, contact Sheila Bryce, tel 8303 3692, fax 8303 4406.

SOCIAL SCIENCES FELLOW

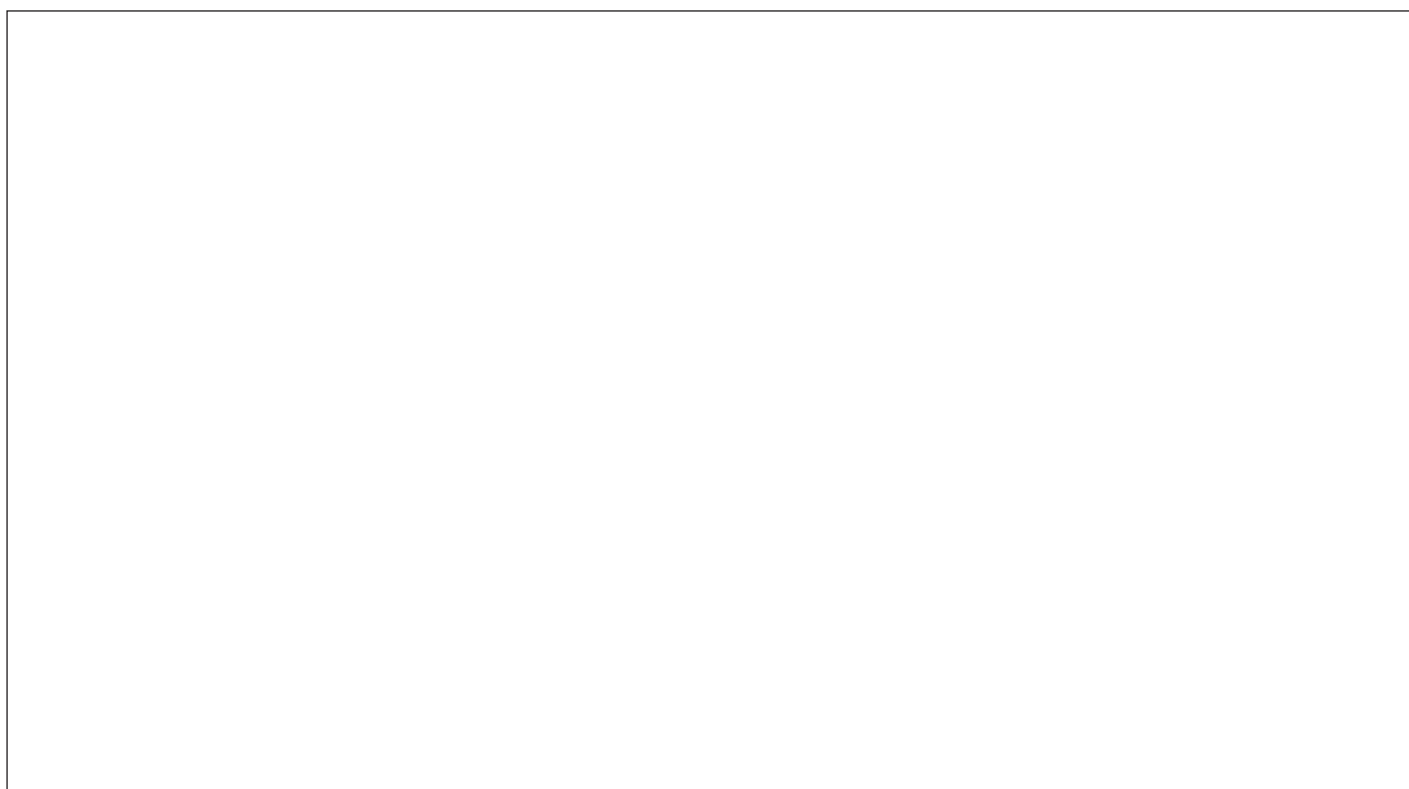
Professor Richard Pomfret, head of the Department of Economics, has been elected a Fellow of the Academy of the Social Sciences in Australia.

Fellows of the Academy are elected on the basis of having made a substantial contribution to one or more of the Social Sciences, recognised internationally.

Professor Pomfret is recognised as one of the world's leading experts on Central Asia and has acted as an adviser to the United Nations, the World Bank and the Australian Government.

Recently he gave keynote addresses at two international conferences on (and in) Central Asia: a UN conference (in Almaty, Kazakstan) on reducing poverty in the region, and a World Wildlife Fund conference (in Urumqi, western China) on sustainable development in Central Asia.

Professor Pomfret's research interests currently centre on economic development and international economics. He is the author of 13 books, one of which,



Pushing the boundaries of molecular research

STARTING with what are thought to be the chemical precursors to life, two of the University of Adelaide's leading chemists are synthesising molecules in two separate areas of cutting-edge research.

While Professor John Bowie uses the chemicals to make and understand interstellar molecules which only last for a second or so, Professor Michael Bruce modifies and stabilises them with metals to try and make new materials for future use.

The two share an Australian Research Council Large Grant of \$186,000 over three years to push the boundaries in their respective but related areas of research.

Professor Bowie is interested in organic molecules found in interstellar space and circumstellar gas and dust envelopes which surround red giant stars. Some 118 interstellar and circumstellar molecules have been

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HARDWARE AND SOFTWARE

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CAMPUS COMPUTERS

Cancer links to mobile phones examined

FEW RESEARCH projects have the potential political and economic ramifications of the University of Adelaide/Institute of Medical and Veterinary Science (IMVS) study into the health effects of radiation emitted from mobile phones.

The \$1million study—beginning in February 1999—is being watched closely by governments across the world, groups such as the World Health Organisation, as well as the massive global telecommunications industry.

The study, funded by the National Health and Medical Research Council, will be the most sophisticated and comprehensive examination of the biological effects of low level radiofrequency electromagnetic fields yet undertaken.

The work is being carefully monitored by an international panel and experiments will be conducted in a "closed" IMVS animal laboratory. Workers enter the lab through an airlock (after changing all of their clothes), everything going in and out is sterilised, and the air is filtered.

Inside the lab, a vast colony of transgenic and "ordinary" mice will be subject to one hour of electromagnetic radiation—in comparable amounts to human mobile phone users—five days a week for two years.

The transgenic mice, which arrive from New York in February, all have a tiny piece of human DNA which makes them susceptible to lymphoma. This susceptibility will highlight any effects of the radiation on the cells of the animals.

The study will be "double-blinded". The technicians and scientists working on the study will not have any way of knowing which mice have been receiving radiation, and which are part of the control group. None of the research team have worked on previous studies into this issue undertaken at the IMVS, to ensure objectivity.

The work is due to be completed in April 2001.

Professor Barrie Vernon-Roberts, Professor of Pathology at the University of Adelaide and Director of the IMVS, said the great care taken in the design of the study was a reflection of the enormous implications of the work.

"If this study does find that exposure causes or contributes to tumours in the entire animal, then the work will be scrutinised very closely," he said. "It's extremely sensitive."

Dr Tim Kuchel, the Head of the IMVS Veterinary Services Division, agrees.

"There must be no cause for criticism in the way this study has been conducted and designed," he said.

The system for exposing the animals to the radiation is meticulously designed. Looking similar to a ferris wheel, the animals are kept at a uniform distance from the exposure source.

Electromagnetic radiation is emitted from a wide range of common appliances including televisions, computer screens, microwave ovens, radios and power lines. Mobile phones emit mid-range levels of such radiation compared with other appliances (power lines are at the low end of the scale and x-rays are at the top). However, the fact that mobile phones are constantly pressed against the head and carried close to the body has raised particular concerns about their use.

Studies so far indicate that electromagnetic radiation may have a biological effect at the cellular level, with concerns being raised that although the radiation may not cause DNA damage, it may inhibit the capacity of the immune system to identify mutated cells, thus increasing the risk of tumours.

However, there has never been a large-scale, controlled study of the kind now being undertaken.

Dr Kuchel said a pilot study conducted in Adelaide, and published this year,



Mobile phones—new research being watched closely by governments, health groups and the telecommunications industry. Photo: David Ellis

found a two-fold increase in lymphoma among mice subjected to electromagnetic radiation. The equipment for the new study takes advantage of recent insights into how RF is absorbed, and the experimental design indicates five power settings to determine threshold levels of effect. The new study is the logical next step which will either confirm or refute the findings of the pilot study.

"There is no fully corroborated in-vitro evidence that RF produces DNA damage," he said.

"There's a suggestion, however, that RF can interfere with DNA repair mechanisms. If those mechanisms are damaged, then mutations may get out of control."

Professor Vernon-Roberts said his group had been chosen for the study

because of its unique blend of expertise and excellent facilities.

"On this campus we have a combination of the elements needed to do the work," he said.

"We have three veterinary pathologists, one of whom is also a radiation biologist. We have outstanding pathology facilities and we have major expertise in cancer research, through the Hanson Centre for Cancer Research.

"The IMVS is unusual in having medical and veterinary science together. Even in the United States, you would come across this sort of combination very rarely."

The study has been approved by the animal ethics committees of the IMVS and the University of Adelaide.

—David Washington

Getting to the bottom of global cooling

IN WHAT is widely regarded as a major coup for Australian science, Adelaide geologist Dr Brian McGowran along with two colleagues elsewhere last year secured the services of the JOIDES Resolution deep ocean drilling vessel to obtain seabed core samples from Australia's southern continental margin.

The significance of these core samples for research being undertaken at the University of Adelaide's Department of Geology & Geophysics by Dr McGowran and Dr Qianyu Li is that they will provide the key to a better understanding of the cooling of the earth's oceans, which began somewhat abruptly about 42 million years ago.

The Great Australian Bight project was scheduled to start last month, having come to the top of the list of the 100-plus projects submitted to the international Ocean Drilling Program (ODP) by researchers in recent years.

The JOIDES Resolution, centrepiece of the ODP research program, carries out six projects each year in waters up to 8 kilometres deep, adding to the global body of knowledge about the earth's oceanic geology.

"In terms of significance, ODP as a scientific enterprise rates alongside

the moon landing and the human genome project," Dr McGowran said.

"What makes our drilling project special is the fact that Australia has such a long southern coastline. This puts us in the box seat to carry out research into sea level change at the northern edge of the Southern Ocean, the engine room of global cooling."

The Southern Ocean achieved this prominence as a result of continental drift which tore apart the ancient southern continent of Gondwanaland. About 42 million years ago, as Australia drifted northwards, a circumpolar current began to flow around Antarctica. Meanwhile, the Pacific Indian throughway above New Guinea constricted, setting up a new regime of global ocean currents. From then on, heat flowed more efficiently from tropics to poles, and the earth began to cool.

Antarctica, once covered in forests of giant fern trees and southern beeches, accumulated a covering of ice and snow, and the rainforests which grew over much of Australia shrank to their present distributions as the land dried out. Sea levels fluctuated widely over this time, dropping by 150 to 200 metres in the long term.

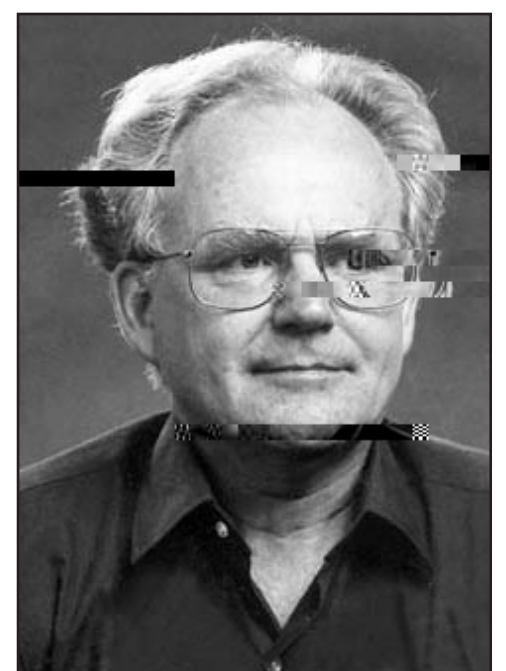
Similarly, Australia's shorelines

fluctuated, advancing over time by as much as 600 kilometres along the central southern part of the landmass to expose the vast limestone plains of the Nullarbor. These same limestones also stretch southwards under the waters of the Great Australian Bight where the ODP survey is being conducted.

The material being sought after is the fossilised remains of *foraminifera*—tiny protozoans mostly less than half a millimetre in size which still inhabit all marine environments today. Over millions of years, they have accumulated in their thousands per cubic centimetre of sediment, holding within their fossilised shells a very precise record of changes to carbon, oxygen and nutrient levels carried by ancient ocean waters.

Many samples of these fossils have been collected from sites exposed on dry land in southern Australia as well as from coastal sites and the shallow waters of the Great Australian Bight—but very few samples have yet been obtained further offshore to fill out the stratigraphic record.

Dr Li went aboard the JOIDES Resolution last month as it carried out exploratory drilling work in the region in waters up to four kilometres deep.



Dr Brian McGowran

He and Dr McGowran expect that the information obtained will provide a better understanding of the causes, extent and effects of oceanographic changes over the last 42 million years.

—Tony Cox

Ship for World Youth

HONOURS STUDENT Ms Kirsty Munro
is one of a do

A L U M N I
NEWS

A PORTRAIT OF JOHN BRAY - LAW,
LETTERS, LIFE

Published jointly by the John Bray Law Chapter of the Alumni Association, the University of Adelaide Foundation and the Libraries Board of South Australia, this book commemorates the life and work of John Bray in the form of essays by people who knew and respected him—Dame Roma Mitchell, Justice Michael Kirby, Andrew Ligertwood, Jean P Whyte, Peter Ward, Arthur Rogerson, Brian Medlin, Andrew Taylor and Michael Abbott QC.

The volume is eminently readable and is a striking tribute to Bray's life and works.

Available from the Alumni Office in Kintore Avenue or phone (08) 8303 5800, fax (08) 8303 5808, or email: <gsauer@registry.adelaide.edu.au>

Priced at \$32.00 (soft cover) and \$55.00 (hard cover, very limited quantities)—includes postage and packing within Australia.

Bulletin Board

1.00pm Microbiology & Immunology Seminar: Chronic myeloid leukemia biology - Application of a murine model by Dr Tim Hughes (Division of Haematology, Hanson Centre for Cancer Research/IMVS). Departmental Library, 5th Floor, Medical School South.

(Director Institute of Interactive Media, University of Technology, Sydney).
BH2-09, City West Campus, UniSA.

1.10pm History Staff/Post-graduate Research Proposals: The food culture of 19th century emigrant Prussians and its evolution in the Barossa Valley by Ms Angela Heuzenroeder. Faith, gender and society: religion in 20th century Australia by Ms Julia Pitman. Common Room 420, 4th Floor, Napier Building.

1.10pm Genetics Seminar: Functional studies of laminin-1 and its receptors by Mr Mats Falk (visiting student). Seminar Room, Fisher Bldg.

12noon HCCR/IMVS Seminar: Lipoprotein oxidation: a cause for or consequence of atherosclerosis by Dr Roland Stocker (Head Biochemistry, Heart Research Institute, Sydney). Verco Theatre, IMVS.

4.00pm The Role of Universities in Australia in 2010: Speaker - Associate Professor Shirley Alexander

Applications for the following vacancy will be considered only from members of the staff of the University

ADMINISTRATIVE OFFICER

(Ref: 4485)

Department of Surgery

Royal Adelaide Hospital

Salary HEO2: \$24,890 - \$26,463*

To provide clerical and secretarial services to the Professor of Neurosurgery. Duties include word processing of correspondence, scientific papers, research grant applications, maintaining a filing system and organising travel arrangements as required.

You should have:

- demonstrated ability to use a word processor and familiarity with medical/scientific terminology
- excellent interpersonal and oral and written communication skills

*Junior rates apply to those persons 20 years of age and under.

This continuing position is available immediately on a 51.45 hours per fortnight basis. Further details from Professor NR Jones, telephone: 8222 5628.

***APPLICATIONS** to Professor NR Jones, Department of Neuro Surgery, Level 5, McEwin Building, Royal Adelaide Hospital, North Terrace, Adelaide, 5000 by 27 November 1998.

includes only those persons who hold current written contracts of appointment with the University.

appointments will be made at Lecturer Level B or Senior Lecturer Level C, and the positions will be tenurable. Appointments will be made at levels consistent with the applicant's experience. Successful applicants would be expected to have a PhD (or equivalent) in areas of broad relevance to the research interests of the Department of Plant Science and to have a demonstrated capability to contribute to a diverse range of exciting under-graduate teaching programs.

The Department of Plant Science currently has 11 lecturing staff and a total of approximately 150 staff, including 50 postgraduate students. Staff are involved in a number of large research programs encompassing cytogenetics, virology, molecular genetics, DNA marker and genome mapping technologies, enzymology and protein chemistry, c

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Applications for the following vacancies are not restricted to members of the University.

LECTURERS B (Ref: 3658/3659)

SENIOR LECTURER (Ref: 3664)

(Tenurable)

Department of Plant Science,
Waite Campus

Salary: \$48,435-\$57,518/
\$59,332-\$68,415

Three new members of academic staff are being sought for the University of Adelaide's Department of Plant Science, which is located on the Waite Campus, 7 km from central Adelaide. The

**END OF UNIVERSITY'S FINANCIAL YEAR -
31 DECEMBER 1998**

**GENERAL
NOTICES**

Research Grants & Fellowships

The following is a list of grant, fellowship and other research funding schemes currently available for application. A more detailed electronic version of this listing (Update: Research), together with guidelines and application forms for some of the major schemes, are available at: <<http://www.adelaide.edu.au/RB/>>. For hard copy application forms the Research Branch, ext 35137; email <research@registry.adelaide.edu.au> or ccmil RESEARCH, Branch.

Sponsored Programs Information Network (SPIN): SPIN Australia - A database containing current and comprehensive information on over 2,600 government and private funding opportunities. SPIN web site: <http://australia.infoed.org/spin_start.html>. Select 'Access Spin WWW' and then select 'Spin Australia'.

Department of Industry, Science & Tourism (DIST) - Technology Diffusion Program (TDP): This Program has three integrated components: Technology Alliances; Technology Transfer; and Online Business. Further inf