THE AUSTRALIAN
NATIONAL UNIVERSITY

CONFERRING *of* DEGREES

AUTUMN 2000

Wednesday 19th & Thursday 20th April

University's donation of equipment boon for students

LEETON High School's science faculty recently received a donation of selected scientific equipment from the Australian National University in Canberra.

Although this equipment is obsolete for the ANU's own needs, it is still in excellent condition and will prove to be valuable educational resources for the students at Leeton High School.

The science faculty would like to take this opportunity to thank those people involved at ANU in the donation of this equipment.

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On Tuesday of this week 8 year 12 chemistry students attended a chemistry day at Charles Sturt University in Wagga.

The group comprising T Creek, E Manton, S McVittie, K Pieber, K Schultz, T Schultz, L Smeal and T Stivens travelled by car to complete some experiments and activities in chemistry, talk to scientists involved in this area about research techniques and employment opportunities.

Students completed experiments and activities dealing with acids, polymers and redox. These included measuring the pH of common substances, a titration, making slime, reducing sugar to carbon and combusting condi's crystals.

They also had first-hand experience of an atomic absorption spectroscope to determine the level of zinc in a hair sample.

The opportunity to talk to chemists who are currently undertaking research was a worthwhile experience.

The day was a complete success and very enjoyable. It gave the Leeton group the chance to meet more than 50 other students and gain a little experience of university life.

Mr Werner said the students had a terrific time and were great ambassadors for the school.

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The English faculty is gearing up for this year's debating season and looking forward to entering a team in the junior and senior Commonwealth Bank competitions, as well as the year 7/8 competition.

There is also a possibility of a competition being launched between the high schools in the Leeton area. More news of this will follow.

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Still in the area of public speaking, Michele McKenzie and Rennie Simpson will both be entering the Lions Youth of the Year Public Speaking Award.

This is a rigorous trial of minimal preparation where the students are required to answer questions to a panel based on their experiences within their school, community and in sport. They will also be required to perform a prepared speech on a topic of their choice and an impromptu speech.

All at the school wish much luck to these students and feel confident that they will both do their school very proud.

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Year 11 adviser, Mrs Rook would like to extend her support and congratulations to year 11 and the pleasing way they have settled into senior study.

Classroom teachers have commented on the students' maturity displayed so far and hope this is a sign of what is to follow throughout the year. However those concerned are being asked to please be aware that students are to remain in the dem or library for their study periods. These are not to be free periods or a time to pop home and parents are asked to be vigilant with this to help the students develop strong study habits early.

Mrs Rook was also especially pleased with the level of attendance and participation by these students at the Leeton High School swimming carnival on Wednesday of last week.

Many year 11 students commenced vocational education and training courses this week.

Information technology is being offered at Yanco Agricultural High School and the course commenced on Monday night.

Leeton High School Notes

Metal and engineering courses commenced last week in conjunction with YAHS students at YAHS but Leeton High students have subsequently joined Narrandera High students at Leeton TAFE for this course.

Hospitality commenced at Leeton High this week.

Child studies, at Narrandera TAFE, and electrical studies, at Leeton TAFE, will commence next week.

All are excited about the greater flexibility and the wider curriculum these courses offer students.

***

The Japan 2001 project rolls on and the departure date for the Leeton High group is fast approaching.

Spirits have been boosted by the sensational news that the group's application for funding from the NSW Department of Education Student Language Study in Overseas Countries has been approved. This is a wonderful relief and has supported the fund-raising efforts.

This exchange is one of the many wonderful experiences on offer at Leeton High.

In Term 3, Leeton High will once again play host to a Japanese exchange group for 18 days.

A big "well done" for all at Leeton High School as, because of the success of last year's visit, the school was requested by the Department of Education to host another group.

The Japan 2001 group will be holding a disco on Saturday at Leeton Soldiers' Club, in Rapp's and the auditorium.

The disco for under-12s will be from 6.30-8pm costing $3. The under-18s' disco will be from 8.30pm - 11pm, costing $5.

Adults will supervise the disco at all times and Leeton Soldiers' Club will provide security and age checks.

There will be no admittance to anyone over 18 or anyone who is suspected of consuming alcohol or drugs.

No drinks are to be brought into the club and soft drinks and snacks will be available at the club.

***

The Leeton High School 55th Annual Swimming Carnival was another excellent carnival organised by the sport staff, Mr Morrison, Mrs Cryer and new staff-member Mr Cameron.

The carnival ran very smoothly and the level of participation from the students was pleasing.

Two records were broken by Jasmine Frazer, of year 9.

The sport staff would like to thank parents for the great support received from those whose attended. Their assistance at these carnivals is always welcome and greatly appreciated.

The final results were:

Final points score (girls, boys and total):

1st Smith 312, 530, 842. 2nd Mawson 328, 264, 592. 3rd Hunter 220, 324, 544.

4th David 198, 293, 491.

Age champions: 12 years — Angela Marshall, Simon Hillier. 13 years — Nicole Rutland, Uweroa Barclay. 14 years — Shannon Tuckett and Sheree Morris, Kurt Heckenburg.15 years — Jasmine Frazer, Daniel Holt. 16 years — Amy Tubb, Joseph Borgese. 17- plus years — Belinda McInnes, Rennie Simpson.

New records were set by Jasmine Frazer in the 15 years 50m butterfly and 50m backstroke and by Belinda McInnes in the 17 years 50m breaststroke.

Leeton High School will be hosting the South West zone swimming carnival on Monday, February 26 at the Leeton pool. The team list was posted earlier this week and permission notes have been sent home. All notes are to be returned by Monday, February 19.

Any parents who wish to offer their assistance in an official capacity can contact Tricia Cryer at the school. Parents are all very welcome as spectators to help cheer on students.

***

Riverina CHS boys' cricket trials were held last Friday.

Leeton High sent Brenton Hillier (year 11) and Mitchell Bowden (year 10) to the trials. Mitchell was successful in gaining selection in the team and will be travelling to Figtree on the South Coast week 5 of this term. The school wishes him well.

***

A number of selection trials were held on Wednesday during sport.

They were for boys' and girls' open cricket, with Mr Doyle and Mr Welsh and boys' soccer, with Mr Colli.

The competitions for these sports will commence within the next month.

Groups invited to seeks funds

RIVERINA community groups still have time to apply for funding for local environmental activities, Member for Riverina, kay Hull said.

Grops involved in, or thinking about, environmental projects could apply for money from the Federal Government's Natural Heritage Trust, Mrs Hull said.

"Applications for the next rund of funding close on February 23, so people need to get their applications in by then to be eligible," she said.

"Already thousands of community groups around the country have received money from the trust to help conserve their environment and better manage Australia's natural resources."

The $1.5 billon Natural Heritage Trust is the single largest investment by an Australian Government in the environmental future of this country, with proceeds coming from the partial sale of Telstra.

For a free Guide to New Applications, contact Kay Hull's office on (02) 6921 4600 or freecall 1800 065 823. Applications may also be made online at the Natural Heritage Trust web site (www.nht.gov.au).

ANU team seeking new drug patent

By DANIELLE CRONIN, Health Reporter

The Australian National University and a biotechnology company have applied for a patent to develop new drugs which could potentially treat cancer, multiple sclerosis, dengue fever and malaria.

Progen Industries Ltd and the Australian National University announced yesterday that the Australian Patent Office had accepted the joint provisional patent application on new ways to build compounds which mimic the shape of carbohydrates.

Progen research and development vice-president Dr Robert Don said the company, in conjunction with ANU, planned to use the method to develop drugs to potentially treat cancer and inflammatory, cardiovascular and infectious diseases.

"The new technology will be used to develop compounds that act like master keys that bind to a large family of target molecules," Dr Don said yesterday.

"These master keys can be chemically modified to block the action of unique target molecules in order to prevent specific diseases.

"We plan to use this technology platform to discover new compounds for use in our clinical trial program and to form partnerships with other pharmaceutical and biotechnology companies at the drug discovery phase."

The company recently received approval to trial its anti-cancer drug, PI-88, in America.

Dr Don said the Australian discovery was made during Progen's collaboration with Professor Martin Banwell and the Research School of Chemistry team and Professor Chris Parish and the John Curtin School of Medical Research at the ANU.

NEWS

Blood-cell study linked to asthma cause

Researchers at the ANU have determined the structure of a key receptor controlling blood-cell development.

The receptor (the beta common receptor) controls the growth and activity of white blood cells involved in asthma, allergies, bacterial infections and some leukemias.

The three hormone-like cytokines (IL-3, IL-5, GM-CSF) which signal through the receptor are powerful regulators of the immune system and inflammatory responses.

Understanding how the receptor is activated may ultimately lead to new treatments for asthma and leukemia.

The collaboration involved Professor Ian Young's group in the John Curtin School of Medical Research and Drs Paul Carr and David Ollis in the Research School of Chemistry.

"This project is one of the most challenging we have attempted in recent years and required extensive use of modern protein engineering methods to overcome problems in solving the structure," Dr Ollis said.

Previous theories about receptors in this family and the way in which they operate had been heavily influenced by the first structure determined — the growth hormone receptor.

However, in growth hormone signalling there is only a single receptor involved.

"The beta common receptor system is far more complex. The portion of the receptor that is outside the cell and interacts with the cytokines, is twice the size of the growth hormone receptor and there is another receptor involved in signalling which is specific to each cytokine.

"Despite attempts to model the beta common receptor, its structure has remained an enigma until now," Prof Young said.

Determining the structure involved a laborious process of producing the receptor in insect cells, growing crystals of normal and engineered proteins and examining them using a synchrotron radiation source in France.

When the structure was finally revealed it was a great surprise.

"The configuration of the beta common receptor is novel and entirely unexpected. It gives us new insights into how this receptor might operate and is an important first step along the path to drug development," Prof Young said.

How growth factors signal across the cell membrane and direct blood cells to grow and perform their functions is still poorly understood.

"Determining the structures of the receptors involved and of the receptor-cytokine complexes is important in understanding how signalling is achieved and in developing drugs which specifically turn the receptors on or off.

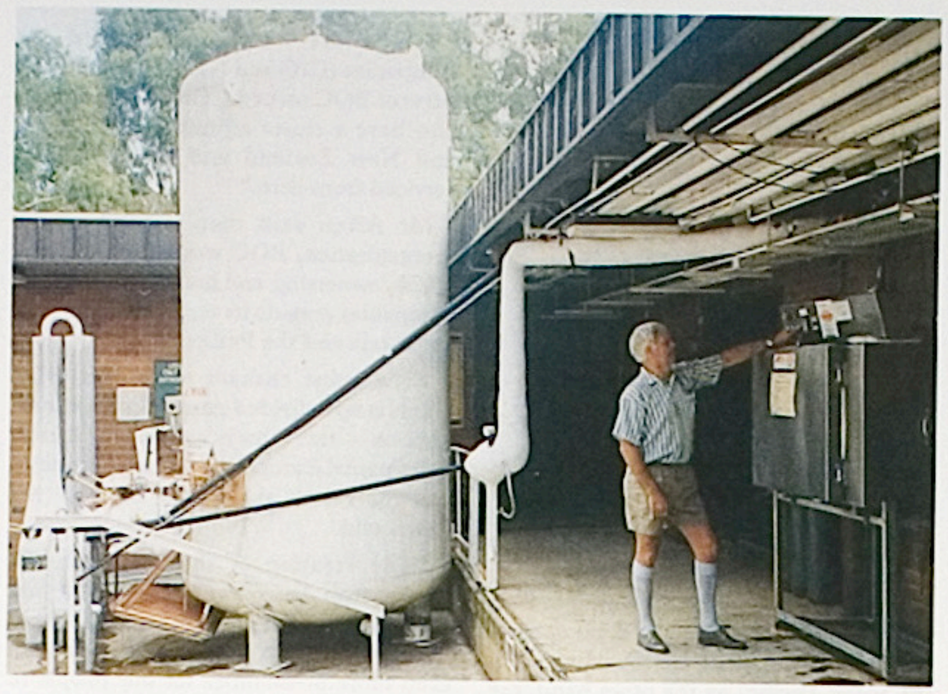
"Drugs modulating the receptor could be useful in treating asthma and allergy, promoting blood cell recovery after chemotherapy and in treating some leukemias," Prof Young said.

The research has recently been published in the prestigious US-based journal *Cell* and is attracting international interest.

ANU REPORTER
http://www.anu.edu.au/reporter
16 FEB 2001

CIG

Quick response saves priceless lab samples



CIG to the rescue... the mini-batch freezer installed at ANU

Quick action by CIG was instrumental recently in saving valuable laboratory samples at the Australian National University in Canberra.

At the University's Research School of Chemistry, an ultra low freezer used for storing protein samples at temperatures of around minus 60 degrees centigrade broke down, jeopardising years of research.

As replacement parts had to come from overseas, the school's Technical Department had to find an alternative method of refrigeration. Liquid nitrogen was considered, but suitable storage vessels (Dewars) were not available.

The samples were then packed in solid carbon dioxide but this was time-consuming as the coolant had to be topped up regularly, even at weekends.

It was then that John Hush, the school's Head Technical Officer, found a report of a similar problem - and solution - in a five year old copy of CIG's magazine Gases at Work.

"After a lot of ringing around, CIG managed to find a a mini batch freezer and we installed this on loan adjacent to our VIE 7000 litre liquid nitrogen storage tank," John Hush said.

"As these units are usually used for snap freezing in 20-minute cycles, we had to modify the control for continuous storage at minus 60 degrees centigrade and now it works extremely well.

"It certainly averted a potential disaster because the loss of our samples would have destroyed 10 years of research.

"We are now considering building our own standby unit as there are many areas on the campus where a similar problem might occur."

So pleased was the school's Principal with CIG's response that he wrote a letter of appreciation to David Hind, General Manager, CIG Gases New South Wales.

The Australian National University is a major user of CIG gases, principally liquid helium and liquid nitrogen, but also pressure gases such as argon, nitrogen and oxygen.

The university buys approximately 100 litres of liquid helium each week for use in seven different nuclear magnetic resonance units and in various experimental cryostats.

The helium boil-off gas from the VIE is also reticulated direct to laboratory benches to minimise cylinder demand and handling.

2000

TAKEN BY ANU PHOTOGRAPHER.

Canberra Times 16/10/01

Spirit of sculpture in the park raises art to new levels

By FRANK CASSIDY

The sculptures in a new sculpture park at the Australian National University have already set new levels.

Opened yesterday by ACT Liberal Senator Margaret Reid, the 15ha park's first commissioned work is a collection of giant spirit levels by Australian artist Christine O'Loughlin.

Following the land contours between Old Canberra House and Lake Burley Griffin, the spirit levels are O'Loughlin's site-specific response to the landscape.

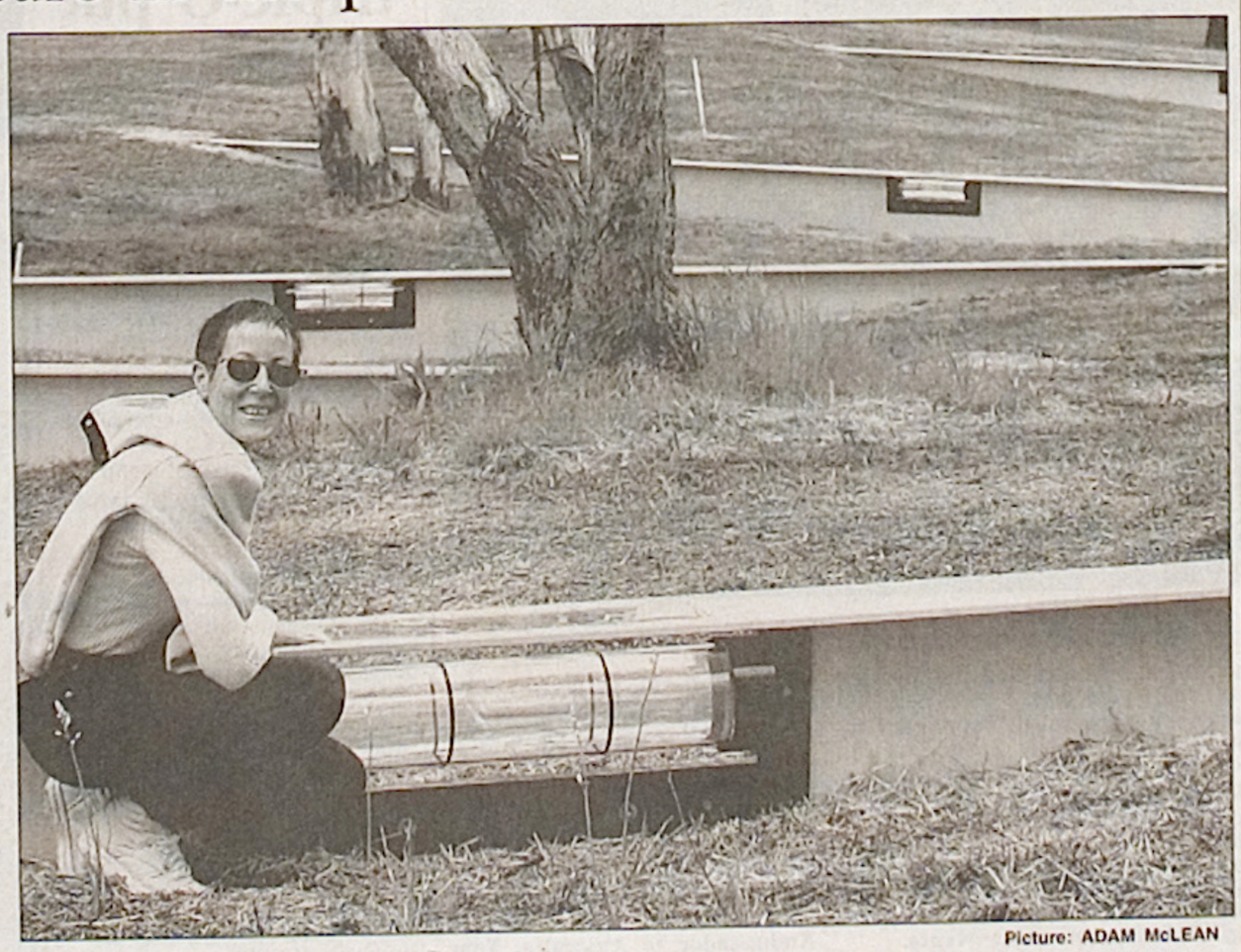
The park's second installation is an acknowledgement of the original inhabitants of the site by Fiona Foley, entitled *Winged Harvest*, referring to significant dates, Bogong moths and native grasses.

In officially opening the ANU International Sculpture Park, Senator Reid said the area adjacent to the National Museum of Australia was an ideal venue for small- and large-scale outdoor sculptures.

"The site offers a variety of settings on grassy inclines, gullies and embankments, shaded areas, open grasslands, pathways and water frontages," Senator Reid said.

Director of the ANU's School of Art Professor David Williams said the emphasis would be on environmentally sensitive pieces by major Australian and international artists.

"The ANU International Sculpture Park complements other sculpture initiatives in Canberra and the National Gallery," Professor Williams said.

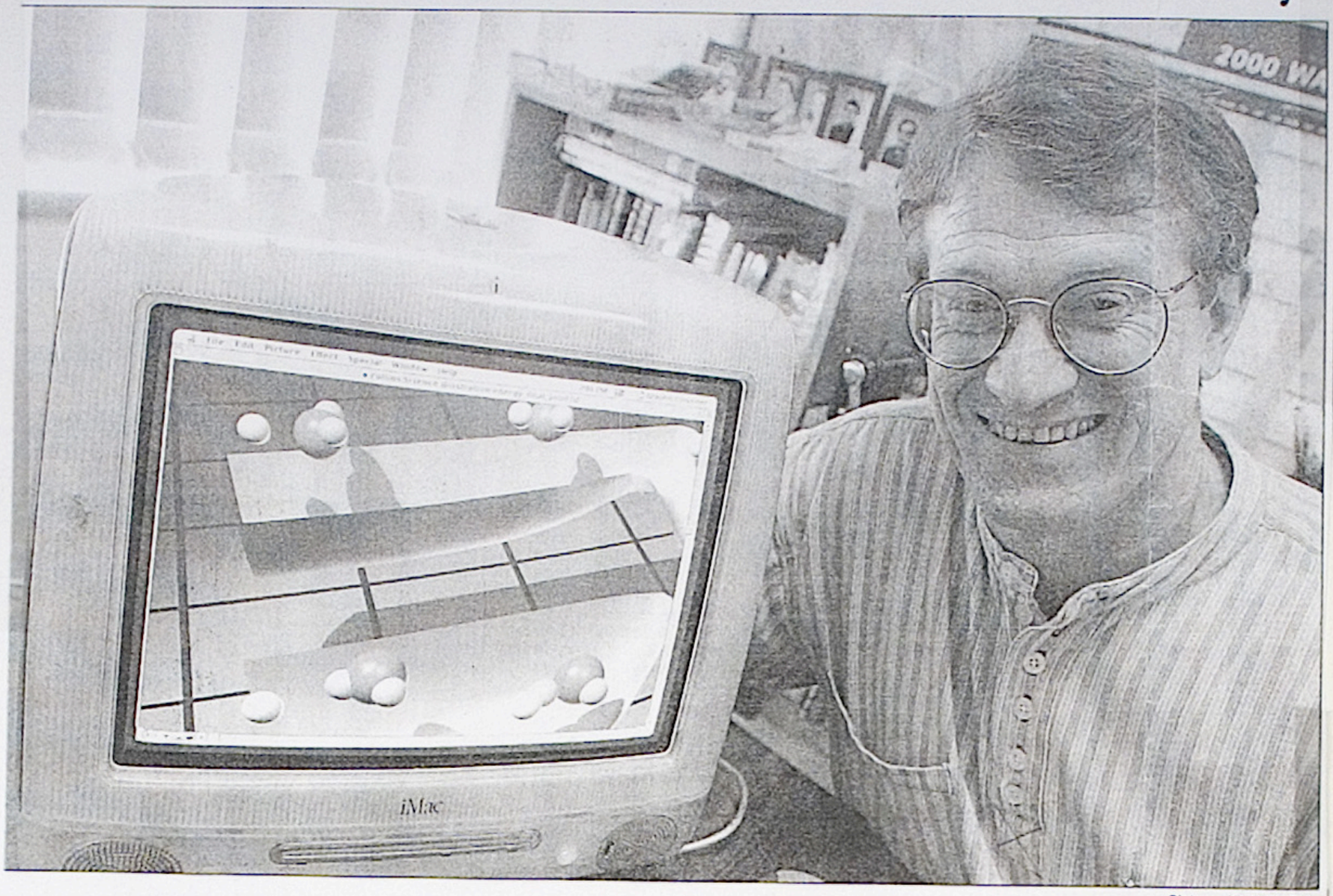


Picture: ADAM McLEAN

Artist Christine O'Loughlin with her sculpture, *Spirit Levels*, at the ANU's new International Sculpture Park yesterday.

WORKSHOP STAFF @ RSC MADE THE SPIRIT LEVELS. 93 hrs

Cyber lab model set to 'revolutionise' study



Picture: KYM SMITH

Australian National University researcher Dr Michael Collins says the computer modelling will complement traditional lab methods.

By DANIELLE CRONIN

An Australian National University researcher has helped evelop a computer model hich simulates a chemical reaction and could revolutionise cientific study world-wide.

The ANU Research School of hemistry's Dr Michael Collins nd Singapore National University's Dr Donghui Zhang teamed p to create the computer technology which would help scientists understand and control chemical reactions in a cyber lab.

Dr Collins said the computer modelling would not render test tubes and chemistry labs obsolete but would complement traditional methods.

Scientific issues-management consultant Professor Ben Selinger said computers, in the past 20 years, had produced better models and cut the cost of scientific research.

But technology had also reduced the "sensual" nature of scientific discovery and removed human intuition from the equation.

Science was one part knowledge, one part artistry, professor Selinger said.

Dr Collins said his computer modelling could influence research in atmospheric chemistry, industrial chemistry, and in drug design, by measuring the "speed" of chemical reactions.

"It's a benchmark calculation," he said.

"We used a relatively simple chemical reaction that needed to be done precisely to get the correct answer.

"The building of the energy surface took months, even with the most advanced computer technology.

"It was important to show it can be done.

"Now we can use the process to study other chemical reactions."

The computer software would be donated to university researchers throughout the world.

CANBERRA TIMES NOV 4 2000

ABC News Online

AUSTRALIAN BROADCASTING CORPORATION

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Other Areas of Interest:

LOCAL NEWS

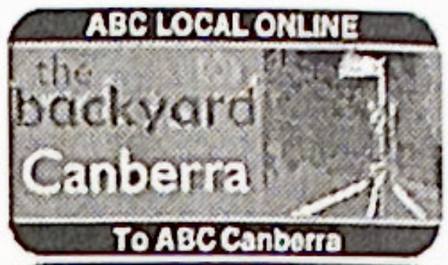
Academic ditches test-tubes for computers

An Australian-based academic is set to release a computer program enabling scientists across the world to conduct chemical experiments on computers rather than in test tubes.

Michael Collins, from the Australian National University, in colaboration with an academic from the University of Singapore, has refined a computer program that solves complicated equations for chemical reactions.

"What we can do on a computer these days is to solve the fairly complicated equations for how atoms and molecules move when they're colliding and undergoing a chemical reaction," Mr Collins said.

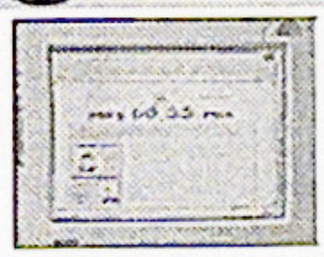
BACK



IN DEPTH

There are renewed calls for cannabis to be trialled as a treatment for the terminally ill. Join the debate.

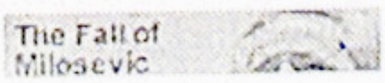
VIDEO



Cyberbludging - surfing the internet at work - is estimated to be costing Australian businesses billions of dollars a year.

AUDIO

- British scientists claim they are well on the way to finding out how to prevent the dreaded beer-gut.
- Victoria's former chief magistrate has denied he was guilty of any wrongdoing and says there were no grounds to remove him from office.
- Cane toads are set to arrive in Kakadu by the year's end.

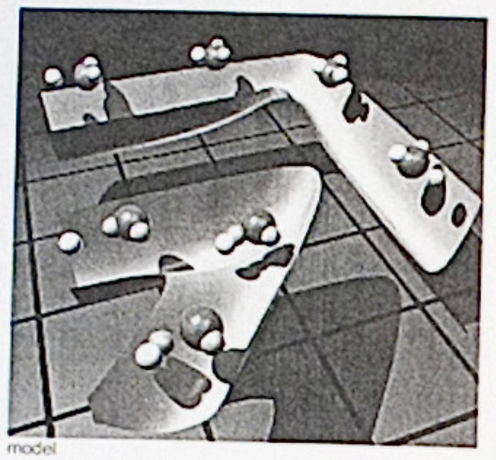


News in Science
abc.net.au/science/news

Atomic behaviour uncovered

Monday, 6 November 2000

An Australasian research group has achieved a new understanding on how atoms behave in a chemical reaction - a development which they say could change the face of chemistry.


model

Dr Michael A. Collins of the Australian National University and Dr Donghui Zhang of the National University of Singapore have used quantum dynamics to develop a detailed model of a chemical reaction and its speed. The research is published in the current issue of *Science* .

"It's a benchmark calculation," Dr Collins said. "We used a relatively simple chemical reaction that needed to be done precisely to get the correct answer...Now we can use the process to study other chemical reactions".

The graphic shows the model in action. It demonstrates hydrogen atoms (grey) reacting with heavy water molecules (red and blue) in two different scenarios.

In the first scenario (the top half of the graphic), the hydrogen atom hits the heavy water molecule and, like a pendulum ball, causes the deuterium (blue) to be knocked off the heavy water molecule.

In the second scenario (the bottom half), the hydrogen atom hits the heavy water at a particular angle and bounces off, taking the deuterium with it.

"We chose this particular reaction because previous research has shown that shining laser light of different colours on this reaction, alters the balance of each scenario," said Dr Collins.

"To understand which scenario happens and why, we must first understand all the forces between the atoms," he said.

Dr Collins explained that the gold surfaces in the graphic represent the energy which gives rise to these forces. These surfaces took months to build, even with the most advanced computer technology.

"This is basic research which will help us to better control chemical reactions. In the past there was a lot of guess work, but this method will be easier, more accurate and more reliable."

The researchers say they intend to give away the computer software and technical advantage they've developed to accelerate the progress of chemistry worldwide.

Anna Salleh - ABC Science Online

MEDIA MONITORS

NewsAlert

Attention: CLARISSA THORPE
Company: AUSTRALIAN NATIONAL UNIVERSITY
Address: MEDIA.LIAISON@ANU.EDU.AU

Summary:

Afternoon 12.30-4.00 **03/11/2000 - 01:32 PM**
2CC (Canberra) **Summary: C00002532373**
Compere: Damien Morgan **Duration: 1:00**
News: Mr Michael Collins from the Australian National University has made a major discovery looking at atoms on a computer. He says this technology could be used by scientists all over the world

Demographics

Male 16+	1100
Female 16+	900
All People	2100
ABs	400
GBs	2100

Afternoon 12.30-4.00 **03/11/2000 - 01:07 PM**
2CC (Canberra) **Summary: C00002531678**
Compere: Damien Morgan **Duration: 0:06**
Canberra News: Dr Michael Collins has made a major discovery in chemistry by using computer technology. This discovery could change the way chemistry is studied all over the world.
Interviewees: Dr Michael Collins, Australian National University

Male 16+	700
Female 16+	1300
All People	2000
ABs	100
GBs	2000

Afternoon **03/11/2000 - 12:02 PM**
ABC 666 2CN (Canberra) **Summary: C00002520693**
Compere: Newsreader **Duration: 0:30**
A university in Canberra has made a major discovery that could change the study of chemistry around the world. ANU Scientist Dr Michael Collins, has conducted high-resolution experiments on a computer, rather than in test-tubes.
Excerpt: Dr Michael Collins, Chemist

Dame brings Athena's message down under

Dame Professor Julia Higgins, in Australia as the David Craig Visiting Lecturer, talks to **Sean Daly** about UK efforts to improve the number of women academics.

A high-profile British female academic has urged Australian universities to provide top-level backing for programs aimed at boosting the numbers of women in the upper levels of academia and science.

Dame Professor Julia Higgins, the incoming Foreign Secretary of the Royal Society in London and 2001 David Craig Visiting Lecturer, said the UK experience showed efforts aimed at boosting the numbers of women academics and scientists failed unless they had chancellery-level backing.

"What we have seen is that any measures need the highest level support from universities. My advice is: 'Don't start from the bottom up'," she said.

Prof. Higgins is the chair of the steering committee of the Athena Project, a UK-wide government-funded activity to improve recruitment, retention and advancement of women in academic posts in science, technology and medicine.

"The Athena Project was established after the Higher Education Funding Council funded a project over four years for £250,000 aimed at supporting women academics in science engineering and technology (SET) and improving their positions," Prof. Higgins said.

"There are very few countries in the world where there are reasonable numbers of women in the higher levels in academia and in science.

Photo: Stuart Hay, ANU Photography

ANU Vice-Chancellor, Professor Ian Chubb (left), Dame Professor Julia Higgins and Professor John White of the ANU's Research School of Chemistry.

In the UK, if you take the case of most of the sciences, women at the undergraduate level are up to about 50 per cent (e.g. biology or chemistry) of the numbers but they decrease at the higher levels until at the professorial level they make up only about 10 per cent of the total."

Prof. Higgins said the Athena Project's studies revealed it was a complicated issue.

"It is not overt prejudice but there seem to be a lot of hidden assumptions about what is a suitable career for women, what will or won't work. Women aren't applying for some jobs at the level of lectureship upwards, even though there are a lot of them with PhDs."

Prof. Higgins said a recent survey by the Royal Society of Chemistry of women doctoral students in chemistry showed that most thought a career in the field was not compatible with family life and many found the laboratory environments "too macho".

Asked if she thought the Australian Vice-Chancellors' Committee might look at funding for a program similar to the Athena Project, Prof. Higgins said she thought it was worth serious consideration

"These issues are not specific to any one country and all countries need to look at ways to improve the numbers of women academics."

Prof. Higgins will also use the visit to view Australian research in her academic field of neutron scattering. She is Professor of Polymer Science in the Department of Chemical Engineering and Chemical Technology at Imperial College, London. Earlier this month she delivered the first of the 2001/2002 Solomon Lectures at the ANU on "Polymer Blends — Mixing, Demixing and Compatibilisation".

Shortly after her arrival this month Prof. Higgins was the guest of ANU Vice-Chancellor, Prof. Ian Chubb, at a lunch for distinguished academic and professional women in the Canberra area as well as a number of junior female academics. As a first-time visitor to the country, she is also hoping her four-week stay will allow a little time for sightseeing.

The Athena Project's website is at <http://www.athena.ic.ac.uk/>.

Friday 16 November 2001 (Vol.32, No.17) ANU Reporter

Humpty Dumpty Restored: When Disorder Lurches Into Order

By KENNETH CHANG

Not all the universe is falling apart all of the time.

An experiment by scientists in Australia has shown that a small patch of disorder can momentarily lurch into order, akin to Humpty Dumpty's magically putting himself back together again.

That would appear to violate the second law of thermodynamics, which states that entropy, a measure of disorder, rises inexorably unless an outside energy source maintains things in order. A billow of smoke always disperses, never contracts.

The experiment confirms a theory from 1993 that reconciled a long-standing paradox, that the laws of physics do not run fine forward and backward in everyday life, but they do at the atomic level, where subatomic particles collide.

That spontaneous order effect, the creation of order from disorder, is small and short-lived. But it may prove to be important in the emerging field of nanotechnology, where it could bungle future molecular-size machines by making them run backward, the researchers said.

"I think nature already does that," said Dr. Denis J. Evans, a professor of chemistry at the Australian National University. Living organisms may take advantage of the effect to kick around proteins and other molecules until they bind together properly, Dr. Evans said. So the effect could be useful.

In the everyday world, the second law prohibits the flow of heat energy from a cooler reservoir to run a motor or do other work. Otherwise, one could imagine a machine running on the thermal energy in a glass of water — the jiggling of individual water molecules — and leaving behind a chunk of ice as the only waste.

But at a much smaller scale, the researchers have demonstrated, it is possible essentially to do just that, at least under certain circumstances.

In the experiment, reported in the current issue of Physical Review Letters, Dr. Evans and other scientists at the Australian National University in Canberra and Griffith University in Brisbane suspended a transparent bead one four-thousandths of an inch wide in a small puddle of water. A laser shining through the water held the bead in place. The bead's curved surface, acting like a lens, bent the laser light, exerting a force that kept it at the center of the beam.

"It just goes zip, and it quickly goes to the focal point, and it sits there," said Dr. Edith M. Sevick, a chemist at the Australian National University on the research team.

The team lowered the laser power

A finding with implications for the tiniest of machines.

so that it barely kept its hold onto the bead. "We can actually seeing it jiggling around right around the focal point," Dr. Sevick said.

The team used the laser to drag the bead through the puddle at a leisurely pace of one-seventh of an inch an hour, as if it were a tugboat pulling a barge.

Usually, the water exerted a slowing force. But occasionally enough water molecules bounced off the bead at the same time, reflecting a more orderly arrangement of the molecules, to push the bead ahead, as if a barge suddenly jumped in front of the tugboat pulling it.

"That's the violation," Dr. Sevick said.

The violation lasted two seconds at most, and it occurred only because the force of the laser light was minuscule, almost as slight as the force of the water molecules bouncing off the bead. Over longer periods of time or if the laser power was turned up, the effect disappeared.

"You cannot get perpetual motion machines," Dr. Sevick said. "You always get back to the second law."

Until recently, scientists could not fully explain how the second law arises. In the basic equations of motion, both those devised by Isaac Newton and the later ones of quantum mechanics, time is said to be reversible. The equations remain true even when time flowed backward.

But the equations of thermodynamics, which describe the collective random motion of many trillions of particles, do contain a definite direction of time. Heat always flows from warm to cold, never the other way around. Entropy rises, never falls.

As early as 1876, a physicist, Josef Loschmidt, pointed out that paradox. If the motion of each individual particle is reversible, why is their collective behavior irreversible?

Dr. Evans finally figured out the answer in 1993. The irreversibility arises from causality, that events in the future cannot affect the present. From that, he showed that ordered systems became exponentially less likely while the probability of disorder rose.

Computer simulations verified that the ideas worked. Still, scientists like Dr. Peter T. Cummings of the Oak Ridge National Laboratory in Tennessee said it was surprising to find a clear example in the real world of the hazy zone between very small systems and very large ones.

"It's unexpected there could be an experimental verification of this theorem," Dr. Cummings said. The Australian experiment, he said, "puts it squarely in the realm where it may have practical significance."

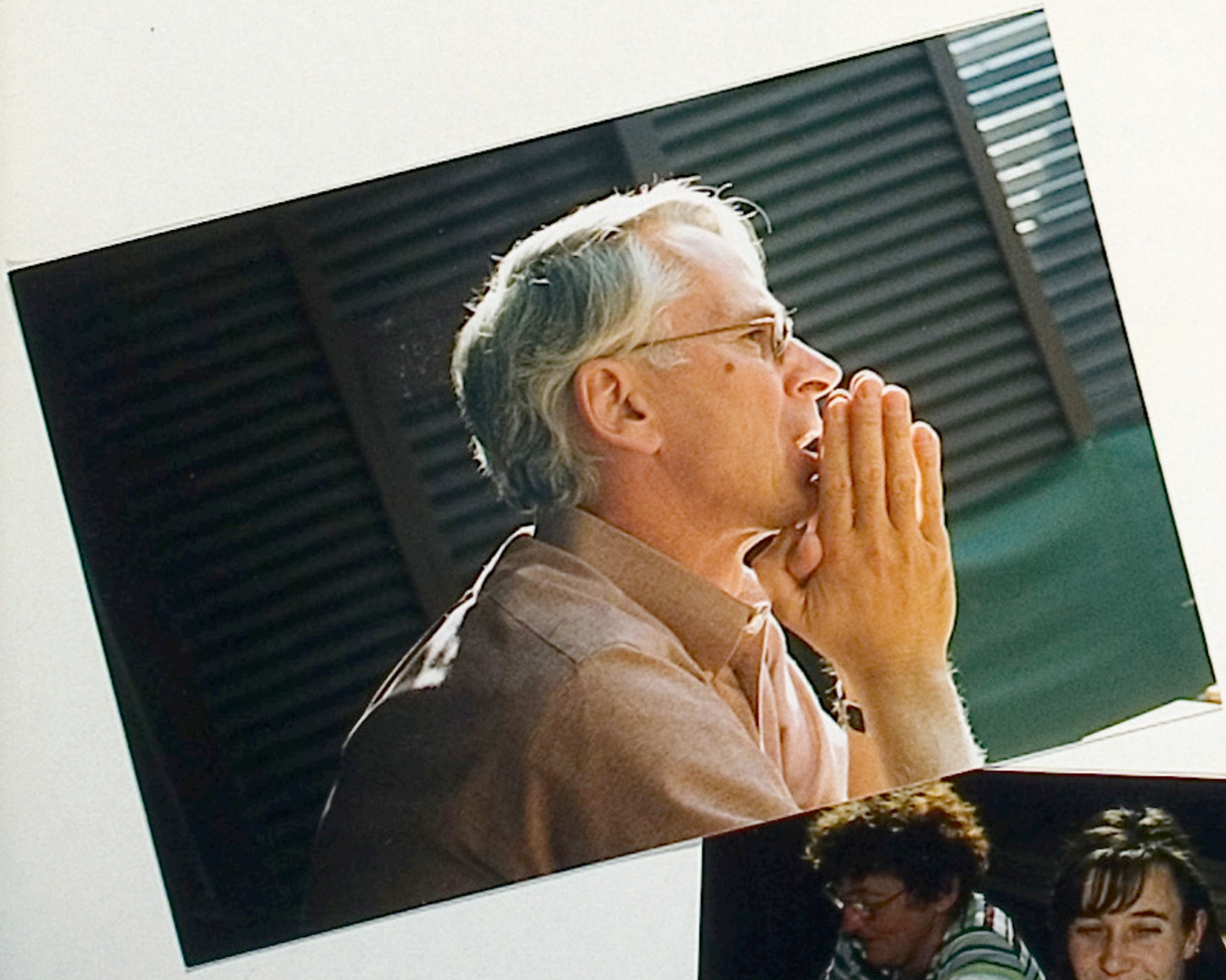
NEW YORK TIMES 30 JULY 2002.

Forest **wall hanging**

Artist:	Anne Willsford
Title:	**Forest**
Date of work:	2001
Dimensions:	h. 158 x w. 115 cm
Signature:	top right corner, on back, in machine stitching
Medium/ technique:	Silk dupion and habotai fabrics and wool crepe fabric dyed with Australian native plants and using shibori folding, binding and clamping techniques.

Recommended display method

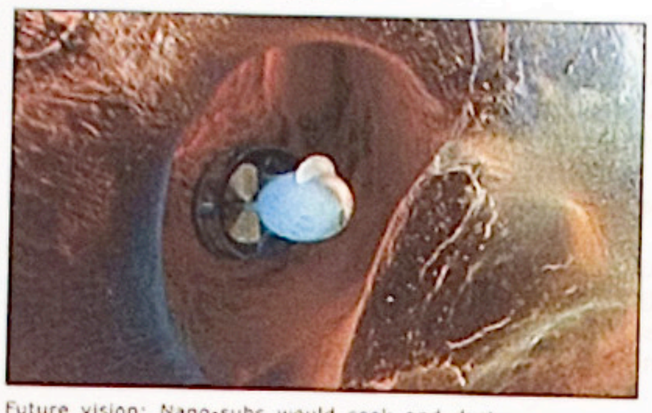
Please hang the wall hanging from the wooden dowel supplied with wire or strong fishing line at each end, with the top of the work at 210 cm from floor.



LIAM WALDRON
★FAREWELL★
MAY 2002.

Thursday, 18 July, 2002, 11:09 GMT 12:09 UK

Beads of doubt



Future vision: Nano-subs would seek and destroy cancer (Image by Science Photo Library)

By Dr David Whitehouse
BBC News Online science editor

One of the most important principles of physics, that disorder, or entropy, always increases, has been shown to be untrue.

Scientists at the Australian National University (ANU) have carried out an experiment involving lasers and microscopic beads that disobeys the so-called Second Law of Thermodynamics, something many scientists had considered impossible.

> **"This result has profound consequences for any chemical or physical process that occurs over short times and in small regions"**
>
> **ANU team**

The finding has implications for nanotechnology - the design and construction of molecular machines. They may not work as expected.

It may also help scientists better understand DNA and proteins, molecules that form the basis of life and whose behaviour in some circumstances is not fully explained.

No discussion

Flanders and Swann wrote a famous song entitled The First And Second Law about what entropy meant and its implications for the physical world. It has become a mantra for generations of scientists.

The law of entropy, or the Second Law of Thermodynamics, is one of the bedrocks on which modern theoretical physics is based. It is one of a handful of laws about which physicists feel most certain.

So much so that there is a common adage that if anyone has a theory that violates the Second Law then, without any discussion, that theory must certainly be wrong.

See also:

30 Jan
02 | Science/Nature
Throwing the DNA switch

12 Sep
01 | Science/Nature
Atomic line-up surprises scientists

09 Aug
01 | Science/Nature
Tuning the tubes

Internet links:

ANU

Entropy: Flanders and Swann

Entropylaw.com

Top Science/Nature stories now:

Mars lander takes shape

Call for tighter rules on DNA patents

Hubble's eye in the sky

Rare space rock 'a gem'

Beckett accepts farm disease errors

'New species' of giant squid found

List maps 'golden age' of science

Lifestyle linked to Alzheimer's

Links to more Science/Nature stories are at the foot of the page.

http://news.bbc.co.uk/1/hi/sci/tech/2135779.stm

CSIRO

Media Release

Bill Stephens 02 6276 6152
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CSIRO Media Releases are available on the Internet: http://www.csiro.au

22 July 2002

Ref 02/XX

NEW DRUG DISCOVERY SPIN-OFF FROM CSIRO

CSIRO Entomology today announced the establishment of a company dedicated to producing a wide range of therapeutic drugs from a virtually untapped source - insects.

"Entocosm Pty Ltd has been established to develop the leading global position on developing drugs from insects," CSIRO's Chief Executive, Dr Geoff Garrett, said.

There are around 250,000 plant species on earth but there are more than four million insect species. Microbial diversity is also huge, although 99% of bacteria cannot be cultured in the laboratory.

"The plant and microbial worlds have long been targets for discovery of therapeutic drugs, but insects have been left virtually untouched," Dr Garrett said.

"With four million species to be looked at, there is great potential for discovery of hugely important therapeutic drugs in the future."

A selection of articles written about our paper:

Physical Review Letters
Print Issue of 29 July 2002

Phys. Rev. Lett. **89**, 050601 (2002)

Experimental Demonstration of Violations of the Second Law of Thermodynamics for Small Systems and Short Time Scales

G. M. Wang,[1] E. M. Sevick,[1] Emil Mittag,[1] Debra J. Searles,[2] and Denis J. Evans[1]
[1]Research School of Chemistry, The Australian National University, Canberra ACT 0200, Australia
[2]School of Science, Griffith University, Brisbane QLD 4111, Australia

(Received 04 March 2002; published 15 July 2002)

We experimentally demonstrate the fluctuation theorem, which predicts appreciable and measurable violations of the second law of thermodynamics for small systems over short time scales, by following the trajectory of a colloidal particle captured in an optical trap that is translated relative to surrounding water molecules. From each particle trajectory, we calculate the entropy production/consumption over the duration of the trajectory and determine the fraction of second law–defying trajectories. Our results show entropy consumption can occur over colloidal length and time scales.

URL: http://link.aps.org/abstract/PRL/v89/e050601
doi:10.1103/PhysRevLett.89.050601
PACS: 05.70.Ln, 05.40.-a

SCIENCE NEWS 27.7.02

SCIENCE NEWS
This Week

Law and Disorder

Chance fluctuations can rule the nanorealm

Whether it's the gasoline-to-motion transformation of automobiles or the electricity-to-cooling action of refrigerators, all processes squander energy. They vent that waste in the form of heat. It's a law of thermodynamics, and no one has ever witnessed a sustained violation of it.

On the minute scales of cells and molecules, however, brief reversals of the usual rules routinely occur. Tiny mechanisms run in reverse or draw their power from random, normally untappable thermal motion in the surroundings. Such small systems, on average, still obey thermodynamics laws, although some theorists predict that certain quantum structures may not (*SN: 10/7/00, p. 234*). Now, researchers in Australia report that they have experimentally confirmed a theory that enables them to predict how often and under what circumstances reversals will dominate the behavior of a classical tiny system.

The new observations could become a reality check on the burgeoning field of nanotechnology, the scientists say. Working in an unfamiliar realm, many nanodevice makers today can't predict which of their mechanisms will actually work as planned. Moreover, because the living machinery of cells and microorganisms also operates on the nanoscale, the Australian work could lead to new biological insights as well.

To track transient reversals of a thermodynamics law, Denis J. Evans of the Australian National University in Canberra and his colleagues manipulated latex beads about the size of red blood cells. They used an infrared laser as if it were an ultratiny tweezers.

Imagine pulling a toy submarine through calm water by a rope tied to its prow. Because the water provides drag, the boat will lag behind the puller and rope, that is, unless it gets some sort of push.

That's roughly what happens to the latex beads. When Evans and his colleagues tugged their beads through water with their optical tweezers, sometimes a bead would slightly lead the laser, says Debra J. Searles of Griffith University, a member of the team. In such instances, the random motion of the water molecules was contributing to the bead's forward motion.

In tests that spanned from one-hundredth of a second to 10 seconds, the scientists found that for periods up to almost 2 seconds, the thermodynamic reversals could dominate the bead-dragging runs. The results, scheduled to appear in the July 29 *Physical Review Letters*, confirm predictions of a theory about the effect of random fluctuations developed by Evans and Searles almost a decade ago.

Searles says the new findings will come as a surprise to most scientists because the prevailing wisdom has been that such reversals have a major impact only on much smaller scales of size and time. "It's a tiny bead, but it's still a lot of atoms," she says.

Daniel P. Sheehan of the University of San Diego is not wowed by the size at which the effects appear. After all, he notes, ever since the 19th-century discovery of Brownian motion—the jiggling of pollen-grain-size particles in fluids because of random molecular bombardment—scientists have known that thermal motion can push fairly big particles around.

However, Sheehan was impressed by how long the thermodynamic reversals could dominate in the new tests. "It goes against my intuition that you could see [that effect] for as long as a tenth of a second," he says.

The result suggests that random thermal fluctuations could become a proverbial monkey wrench for many nanomachines, Searles says. Instead of going forward, for example, they might sometimes go backward. Even so, she says, nanomachine makers may find the new work useful as a tool for predicting whether their plans may go awry. —P. WEISS

W.J. BINDER/PAGE MUSEUM

Breaking a law of physics

CANBERRA TIMES 15/8/02.

An experiment by ANU researchers suggests that even in the world of thermodynamics, everything old can be new again, says **Simon Grose.**

IN the ANU Research School of Chemistry they are proving physics wrong.

Professor Dennis Evans, the Dean of the school, and his team of researchers attracted media attention around the world after one of their experiments violated the second law of thermodynamics.

That's the one that says that if you have a hot cup of coffee in a cold room, the coffee will get cooler, rather than the room get warmer.

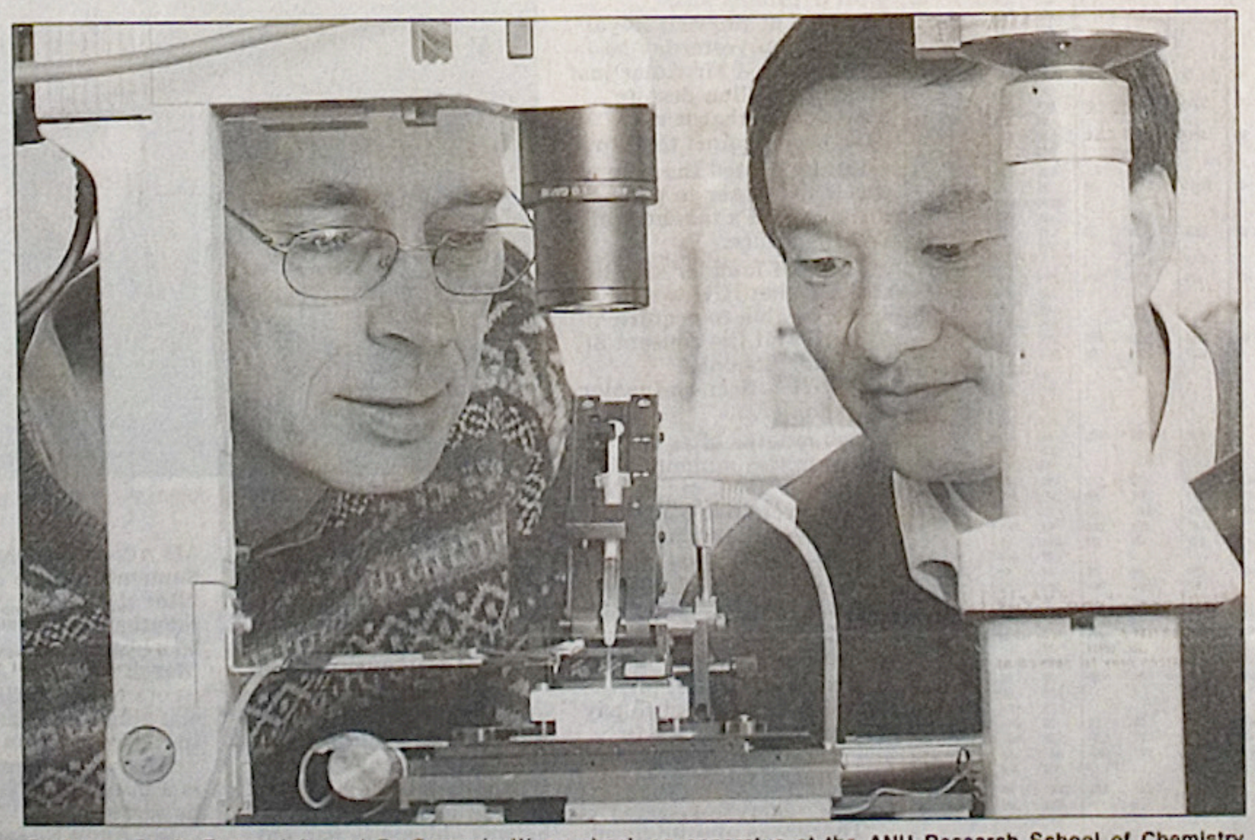
But to break this golden rule they had to use small things, like a bead less than one tenth of a millimetre in diameter floating in a pond of water in a very sensitive apparatus.

"It can measure forces down to 5 x 10^{-15} newtons," Evans said last week.

"The smaller the force, the longer you can observe the violation of the second law. If the force was larger you wouldn't be able to see it for so long." In the experiment, reported in *Physical Review Letters*, they used a laser beaming up through the water to drag the bead very slowly in one direction. They used the laser at as low a power as possible, just enough to keep the ball trapped in its beam.

The water slowed the ball's progress, but occasionally the ball jumped ahead of the laser when random arrangements of water molecules bouncing around it pushed it forward. That broke a law of physics, a phenomenon that has been noted before at nano level.

"If you make nano machines so small that the energy or the entropy produced per duty cycle of the machine becomes comparable to the thermal energy of a single water molecule in a solution, then you start getting into this regime where it will run backwards a fair percentage of the time," Evans said. "Like your Holden Commodore, taking heat, CO_2, water, and all the rest of it out of the atmosphere and generating petrol."



Professor Denis Evans, left, and Dr Genmaio Wang check an apparatus at the ANU Research School of Chemistry.

The research provides a practical demonstration of a theoretical resolution of the conflict between the second law of thermodynamics and equations of classical and quantum mechanics which are time reversible. The resolution proposed in 1993 by Evans and Debra Searles of Griffith University was a Fluctuation Theorem. This states that the probability of the second law of thermodynamics being violated decreases exponentially as the size of the system increases.

Possible applications of the work relate to biology where molecular interactions occur at such a small scale that the findings may be relevant. It also shows that there may be limits to the performance of nanomachines.

"What we want to do is a continuous version," Evans said. Rather than moving the laser in one direction, they will move it around in a circle and in other patterns.

"This will be a steady state rather than these transient states just after you start," Evans said.

"Mathematically there are a lot of differences between the two.

"In those experiments I predict that we will see some really crazy things where the ball will start to move before you turn the switch on, because of the connection between the second law of thermodynamics and causality."

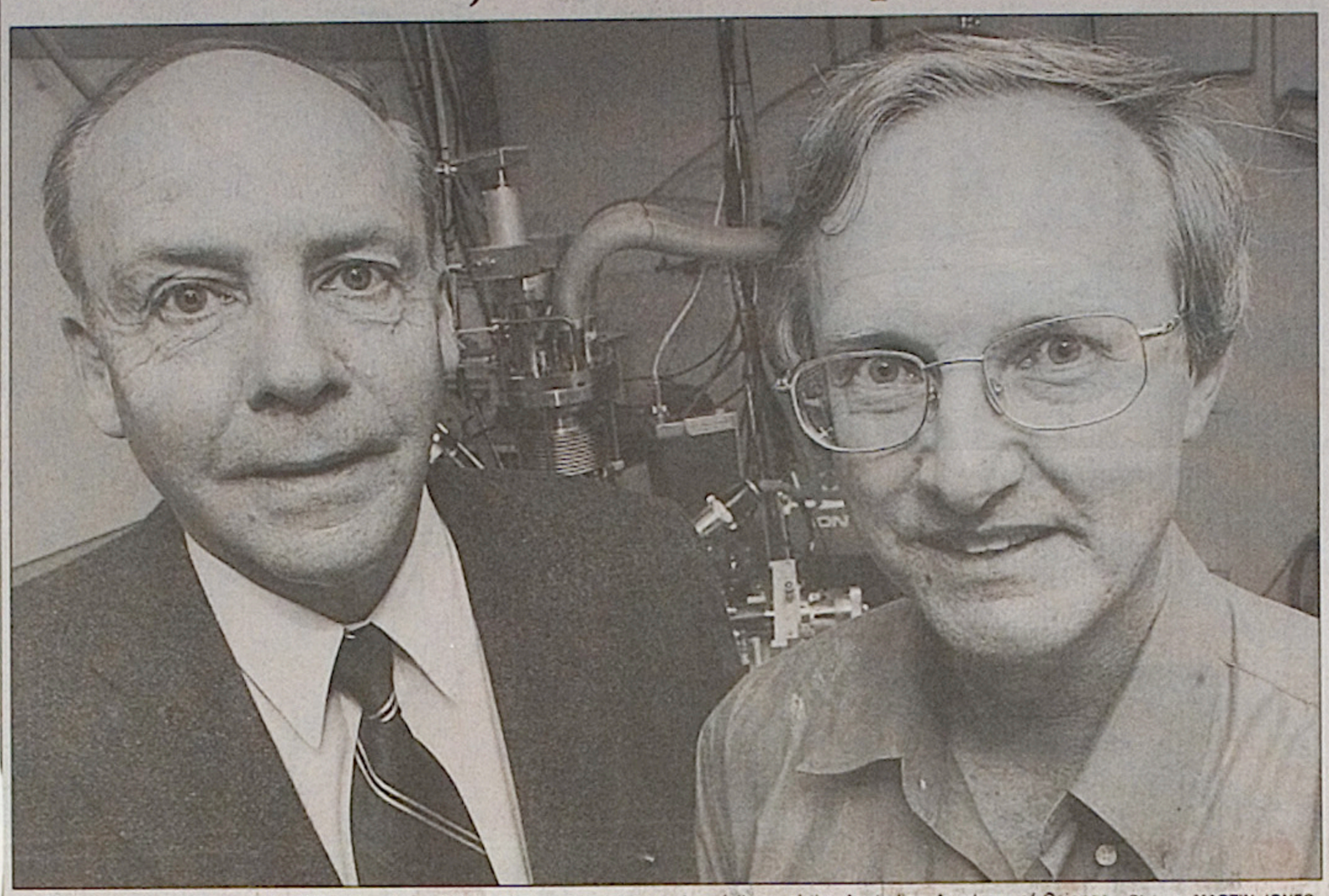
Computer modelling has shown this is likely. "Even a decade ago I didn't think you could extend thermodynamics to really small systems and relatively short times," Evans said.

"It's amazing that in the 21st century you can make a new statement about such an old subject."

http://rsc.anu.edu.au/~evans/

Geoff Lincoln
*Retirement
24/10/02

ANU academics join nation's top science 'club'



Professors Bruce Wild and Jim Williams, of the ANU, who have been named as fellows of the Australian Academy of Science. Picture: MARTIN JONES

By STACEY LUCAS

THE door to research funding was nudged a little wider at the ANU yesterday with the appointment of two academics to the country's most prestigious science "club".

Professor James Williams, head of the Research School for Physical Sciences and Engineering, and Professor Bruce Wild, of the Research School of Chemistry, were elected this week to the Australian Academy of Science. They, and 14 other new fellows, will sign the academy's charter book on May 1.

Professor Williams, who works in the field of materials engineering, said his election meant more than just personal recognition for a lifetime's work.

The Federal Government noted the number of fellows at a university among other factors when allocating funding, so the announcement was a boost for the entire research school.

"I see it as a recognition of the quality of physical science research carried out at the ANU. It further opens doors already ajar for funding to the ANU."

Professor Wild said he and his co-workers at the school carried out experimental work aimed at the chemical separation of molecules, that existed as left- and right-handed forms because of their shapes.

He said the molecules of particular interest to him contained phosphorus and arsenic as the key elements, and were of fundamental academic interest as well as being of importance to chemical industry when combined with precious metals to form catalysts.

The other new fellows include three academics from the University of Queensland, two from the University of Melbourne and two from the University of Sydney.

The Federal Government also announced $790,000 over the next three years for national institutions for social sciences and the humanities.

Education Minister Brendan Nelson said science on its own could not solve the important questions in life — who we were and for what we hoped.

Humanities and social sciences were critically important to answering those questions, he said.

CANBERRA TIMES

29.03.2003

ACT 19/6/03

www.canberratimes.com

It's hard to give credence to erosion worry

I WAS infuriated by the Chief Minister's comments reported in your article headed "More of Namadgi park reopens" (CT, June 14, p. 10). You report that the Chief Minister said that "most of the eastern half of the park would be open for visitors, and that a spokesman for Environment ACT said an estimated 50 per cent of the park was now open. However, areas that will remain closed because of environment protection and safety issues include traditional snow play areas in the Brindabellas.

The idea that a few bushwalkers walking along the Brindabella fire trail would increase erosion is simply unbelievable. Any such erosion would pale into insignificance compared to that produced by ACT forestry practices!

After the first significant rain following the fires I saw the soil washed down from the Pierces Creek pine forests across the Paddys River Road. In places the mud was 50cm deep and it covered more than half the road.

This erosion was the inevitable result of the fires and ACT forestry practices — not of bush walkers!

In terms of safety, I appreciate the Chief Minister's care for his citizens: "It is now winter and for safe and enjoyable bushwalking appropriate clothing and footwear are essential." But I'm afraid that after more than 30 years of hiking and climbing in the ACT hills and mountains further afield, I don't need advice from a politician about what technical gear I should take on my approach. Kosciuszko has been open to visitors — and *taxpayers* — for months!

DENIS EVANS
McKellar

Sausage Sizzle - Farewell for 2003 Craig Lecturer - Victor Sniecku

Victor Sniecikus - visiting Craig Lecturer 2003 - Farewell lunch

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The Chronicle News

Canberra's magnet draws experts to ANU

AN 800 Megahertz magnet weighing 4.2 tonnes and standing over three metres high has arrived at the ANU Research School of Chemistry from Germany and is set to begin deciphering the properties and structure of proteins.

Known as a Nuclear Magnetic Resonance (NMR) spectrometer, it is so far the most powerful magnet of its type in Australia, and is also the only spectrometer facility that can be operated remotely with its operations viewed by webcam.

It will be made accessible to researchers around Australia.

NMR spectroscopy is much the same as Magnetic Resonance Imaging (MRI), but the data generated is recorded as spectrum lines, rather than as an image.

It allows chemists to record and zoom in on the spectra of single atoms in a protein, essentially mapping the proteins properties.

This research has scope to influence the pharmaceutical industry through improving techniques for drug development.

The new ANU NMR magnet facility will support the research of many groups throughout the country, and will be guided by Australian Research Council Federation Fellow and former Karolinska Institute Laboratory Leader Professor Gottfried Otting.

Housed in a specially designed building, the spectrometer emits a stable, static magnetic field, slightly greater than that of the Earth's.

It is not radioactive, nor does it emit an electromagnetic (oscillating) magnetic field.

It employs cryogenics to cool the temperature of the magnet to almost absolute zero (using liquid helium and nitrogen), a critical requirement for a super-conducting magnet of its size.

Picture: MELISSA STILES

THE ANU's Research School of Chemistry's Professor Gottfried Otting with the magnet which could hold the key to how proteins are made.

It is cooled to about 20 degrees above absolute zero to minimise thermal noise emitted by vibrating atoms of the magnet, producing a more sensitive and precise spectrum from the protein sample under analysis.

"This spectrometer will give us the opportunity to refine the technique of protein structure determination, and I'm sure lead to further exciting discoveries," Professor Otting said.

"It will also help consolidate this important area of fundamental research both at ANU and in Australia through the opportunity for collaboration with colleagues at other universities," he said.

The $4.2 million facility was funded by contributions from the Australian Research Council, The Australian National University and the universities of Sydney, New South Wales, Wollongong, Newcastle and the Australian Defence Force Academy.

One of the worlds most cited chemists and Head of the Biophysical NMR Spectroscopy Unit at the National Institutes of Health in the United States, Doctor Ad Bax, will attend the opening of the NMR spectrometer facility on Friday, March 19.

Dean of the Research School of Chemistry Professor Denis Evans said the new spectrometer would build on the Research School of Chemistry's existing top-rate facilities of mass spectrometry and sample analysis, as well as its excellent record in fundamental research and its ongoing collaborative objectives.

The University of Sydney's School of Chemistry, Professor Les Field, said the new spectrometer would lead to more detailed and precise measurements than had been possible.

"It will lead to new advances, particularly in the biological and biomedical sciences, and adds to the world-class research facilities that are available to Australian scientists," he said.

6 April 2004

The Chronicle News

Grace Daley from Dickson College and Francisco Silva from Marist College meet their supervising scientists, Dr Nick Dixon and Dr Madeline Headlam, from the Department of Chemistry at the ANU, at the launch of the 2004 CSIRO Student Research Scheme last week.

Students head to lab

GRACE Daley and Francisco Silva are just two of 81 Canberra students taking part in the CSIRO Student Research Scheme this year.

They will spend 20 hours in Dr Dixon's research laboratory where they will learn about gene technology to carry out a project called "Life in a test tube — making proteins without using living cells".

The launch ceremony, held at the CSIRO Discovery Centre, gave the students, parents, teachers and scientists an opportunity to get to know each other.

"We are very excited about what lies ahead this year. I think it will be a great experience," Grace said.

The scheme's ACT coordinator, Dr Kath Kovac, said the student research scheme gave year 11 and 12 students first-hand experience into what science research was really all about.

"They also learn science communication skills by making a poster and giving a talk to a class at their school."

Forty scientists from nine different research institutions, including CSIRO, the ANU, ADFA and the University of Canberra have generously volunteered their time to help.

The CSIRO Student Research Scheme is a national program that has been operating for more than 20 years and has seen thousands of students Australia-wide taking part in real-life science research.

The scheme is part of the Researching with Scientists Project, a collaboration between the ACT Education Department and CSIRO.

The Student Research Scheme is also supported by a wide range of organisations including the ANU, the ACT Department of Education, Youth and Family Services and Biotechnology Australia.

CIT 18/5/04

LEFT: Dennis Olsen, Amanda Muggleton, Anthony Hill, Mark Santos with Leisa Keen at the piano celebrating the launch of Teatro Vivaldi.

Reprise of a proven formula

IT'S OFTEN very hard to go back to a place you've been very familiar with and the launch of Teatro Vivaldi was no exception for me. The latest owners of this long-established eatery have swept through with ox-blood red paint and a container of theatrical memorabilia to create a very high-camp space well suited to its environment and ANU Arts Centre neighbour.

It's very different from the original that Susie Harrington created as a premier restaurant. Noel Coward is happily ensconced in the back corner, where dining will be interrupted by your rubber-necking to absorb and read of the life and times of the great man.

Anthony Hill and Mark Santos, the new owners, bring their London experiences to the space as former proprietors of a small hotel once owned by Noel Coward's mother. Anthony had been working on campus in the Research School of Chemistry and the opportunity to take on Vivaldi was what he and Mark had been looking for in a business.

The opening was the perfect opportunity for Dennis Olsen and Amanda Muggleton to slip into town and into a performance from their acclaimed Sydney season of *Darling! It's Noel* that they will bring to Canberra in August. For Teatro Vivaldi it showcased the space as an intimate venue for cabaret.

The crowd was a wonderful mix of restaurateurs, theatre folk, academics and party people, with Bill and Pat Stephens feeling right at home as memories of their School of Arts Café were evoked; they're delighted to see the reprise of a proven formula.

Canberra Times 5/6/04

ANU research germinates a new branch of thinking about plant power

By Graham Downie

ANU researchers claim to have overturned 20 years of thinking about the power plant which enables photosynthesis to occur.

The finding could take scientists a step closer to identifying a new sustainable energy source.

Professor Elmars Krausz, PhD student Joe Hughes and a team of researchers at ANU have found the wavelength of light needed for oxygen production is much longer than previously thought.

Using high-resolution lasers, they have also found the rate at which energy is fed into photosynthetic reaction centres is very strongly controlled by biological speed humps — a great surprise and opposite to what had been thought.

"Our entire existence is dependent on this critical process," Professor Krausz said.

"It makes the air we breathe and the food we eat, yet we don't know how it works.

"We have discovered that the special reaction centres that power oxygen production have been misunderstood for decades."

These discoveries would have a profound impact on the understanding and ability to control, modify and adapt natural photosynthesis, but would extend the potential of engineered chemistry which could copy nature via the technique of artificial photosynthesis. "By encouraging and modifying natural systems or by mimicking their tricks, we can deliver a new range of sustainable, non-polluting, greenhouse positive energy production sources."

Dean of the Research School of Chemistry Denis Evans said the finding was a breakthrough in the understanding of the chemistry that supported life. "This is one of the significant breakthroughs which change the course of research in a field," Professor Evans said.

Canberra Times Monday 14 June 04

QUEEN'S BIRTHDAY 2004 HONOURS LIST

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Emeritus Professor Athelstan Laurence BECKWITH
Bruce, ACT
For service to science in the field of organic chemistry as a leading researcher and academic, and through the provision of advice to government and the wider community on scientific matters.

Stalwart in science

Emeritus Professor Athelstan Laurence (Athel) Beckwith (AO), Bruce - For service to science in the field of organic chemistry as a leading researcher and academic and through the provision of advice to government and the wider community on scientific matters.

A century on, professor solves problem that stumped Einstein

By Daniel Landon

Solving a 100-year-old problem that even Albert Einstein got wrong is not something many scientists can boast about.

But the ANU's Professor Denis Evans has recently received formal recognition for leading a team that solved the second law of thermodynamics.

Professor Evans, the dean of the Research School of Chemistry, recently received the 2004 Moyal Medal, which is awarded to Australians who have made distinguished contributions to maths, physics or statistics.

His colleague, Professor Martin Banwell, has also been winning prizes. He recently received the 2003 Royal Society of Chemistry Award for Synthetic Organic Chemistry and the Novartis Chemistry Lectureship for 2004.

Along with collaborators around Australia and the world, Professor Evans developed a theorem about why particles a six millionth of a metre in diameter sometimes moved in the opposite direction than expected. The team at the ANU then verified the theorem in laboratory testing.

Einstein thought he had solved the puzzle of why tiny particles moved in such a way, but was incorrect.

Professor Evans said it was a thrill to be awarded the Moyal Medal, which was also recognition for the team of researchers.

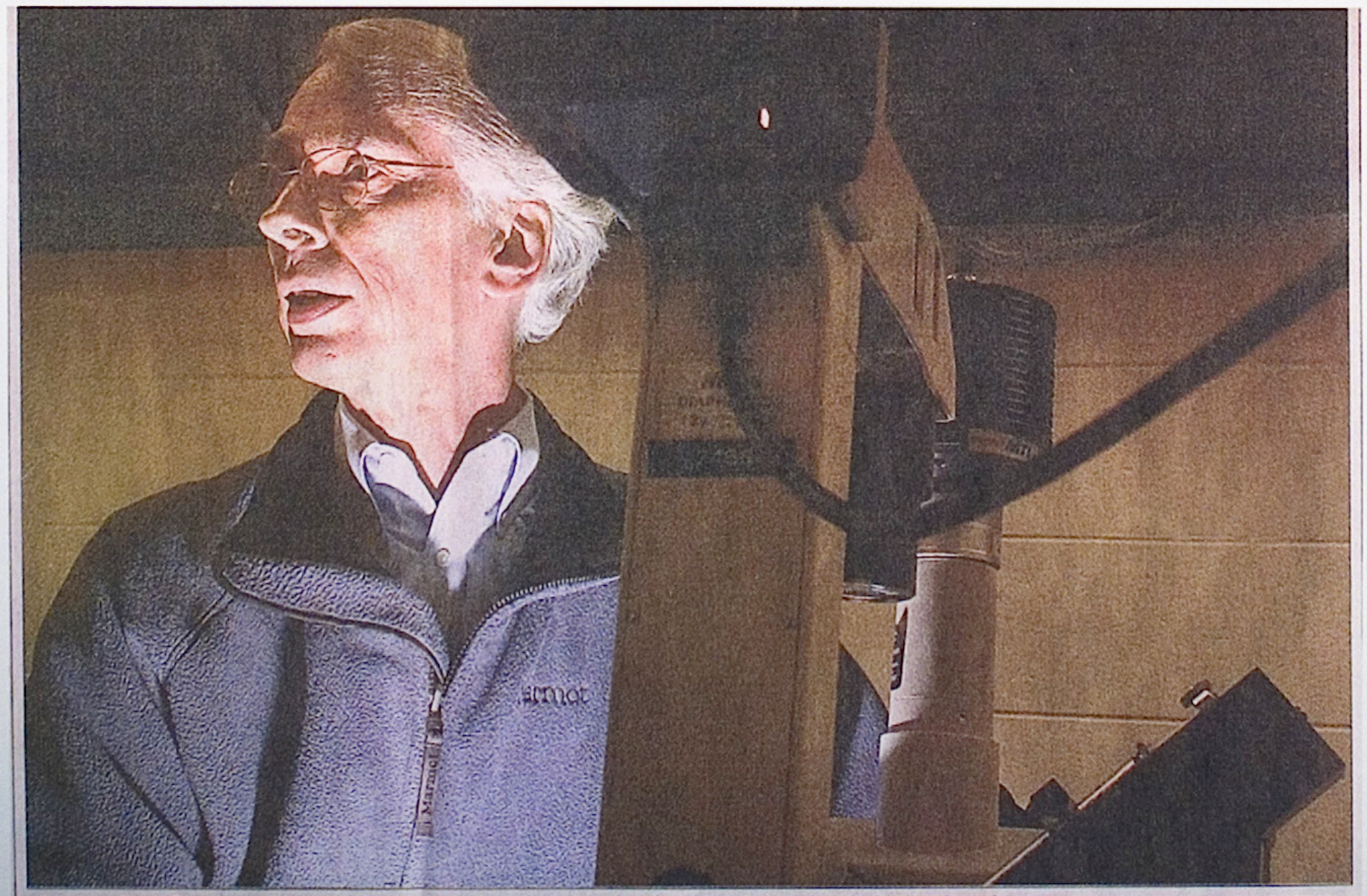
"It's a prize that's awarded by a maths department, and it's going to someone who's a dean of a chemistry school, and that's kind of a neat thing.

"People know of the work in chemistry and physics [departments] but I didn't expect to be recognised by a group of mathematicians."

His work had practical application in the field of nanotechnology.

Very small engines — such as an organelle (a tiny particle) within a cell — worked differently to a large petrol engine. A small motor would take one step back for every two steps forward, and there was nothing that could be done about it. "This is a law of nature we've basically discovered," he said.

CT - Wed July 7 2004



Professor Denis Evans recently received formal recognition for leading a team that solved the second law of thermodynamics. Picture: KIRSTY UMBACK

Professor Denis Evans
Dean, Research School of Chemistry
Australian National University

22 June 2004

MACQUARIE
UNIVERSITY ~ SYDNEY

Dear Professor Evans,

Macquarie University, through its Department of Mathematics, has established a Lecture Series in honour of Professor Joe Moyal. The lectures are given annually at Macquarie University by scientists who also receive a Moyal Medal for their distinguished contributions to research on mathematics, physics or statistics. The Moyal Committee has been set up, with representatives from each discipline, to choose the Moyal Lecturers.

On behave of the Moyal Committee, I am pleased to inform you that you have been chosen to be the Moyal Lecturer for 2004 for your distinguished contributions to physics.

The Moyal Medal committee has asked me to ask you when you would be available to give the Moyal lecture and receive the Moyal Medal for 2004. If it is possible, we prefer some time during the second-half term of 2004.

The previous medallists were Professor Joe Gani (Statistics, ANU) in 2000, Professor Gerard Milburn (Physics, University of Queensland) in 2001, Professor Alan McIntosh (Mathematics, ANU) in 2002, Professor Terry Speed (Statistics, UC Berkeley and WEHI Melbourne) in 2003. Your award will be the second for research in physics. On behalf of the Committee may I congratulate you, and let you know that we look forward to hearing your Moyal Lecture.

Professor Moyal was one of Australia's most versatile mathematical scientists, who made significant contributions to mathematics, physics and statistics. He was a Professor of Mathematics at Macquarie University for five years from 1973 to 1978 where his encouragement, support and example stimulated research activities in all three areas and increased the contacts between them.

The series of lectures is to highlight and stimulate further the interactions between the disciplines of mathematics, physics and statistics as a response to and an acknowledgement of the interdependence of these fields in which Joe had so successfully worked.

I look forward to hearing from you soon.

Yours sincerely

J. V. Corbett

John Corbett
Chair of the Moyal Committee.
Mathematics Department, Macquarie University
E-mail: jvc@maths.mq.edu.au

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http://www-math.mpce.mq.edu.au

THE AUSTRALIAN NATIONAL UNIVERSITY

ANU

MEDIA RELEASE

WEDNESDAY 30 JUNE 2004

CHEMISTRY BREWS UP SIGNIFICANT PRIZES

Researchers from the Research School of Chemistry (RSC) at ANU have achieved significant success, following three recent international and national awards.

Professor Martin Banwell has been awarded two prestigious prizes, the 2003 Royal Society of Chemistry Award for Synthetic Organic Chemistry and the Novartis Chemistry Lectureship for 2004.

Also, Professor Denis Evans, the Director of the Research School of Chemistry (RSC) has been awarded the Moyal Medal, for research contributions to mathematics, physics or statistics, by the Macquarie University Mathematics Department.

"These awards are further proof that ANU staff are committed to achieving excellence," ANU Vice-Chancellor Professor Ian Chubb said. "The Research School of Chemistry hosts some of the world's best talent in fundamental chemistry, and these awards are a testament to that.

"Professor Banwell's achievements are particularly noteworthy, especially in a year he was also elected a Fellow of the Australian Academy of Science, along with another RSC academic, Professor Christopher Easton.

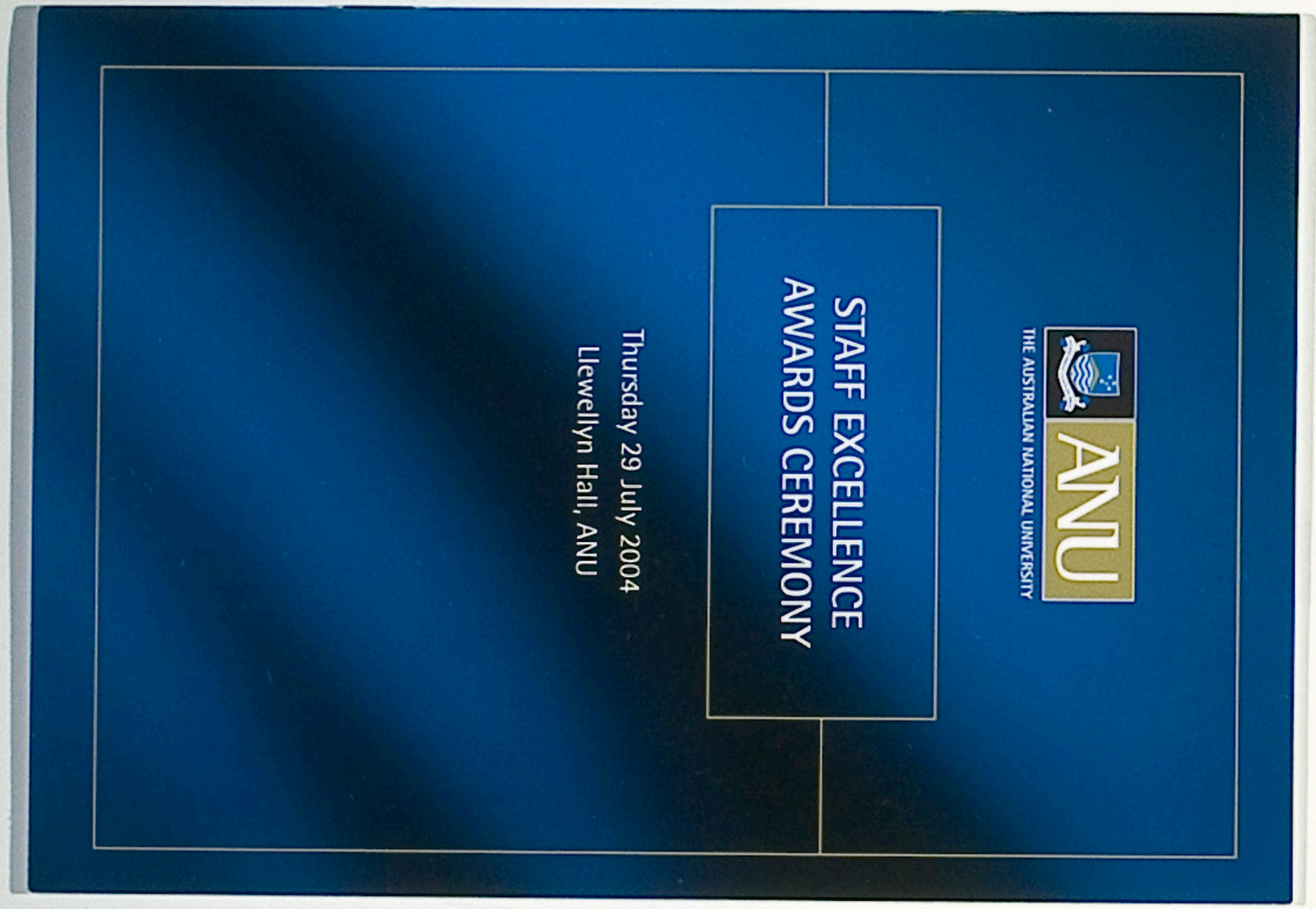
"Significantly, it was also the third time in five years that an Australian National University researcher has been awarded the Moyal Medal, which speaks volumes of our staff here," Professor Chubb said.

Professor Banwell is Head of Organic Chemistry at the Research School of Chemistry. His research focuses primarily on developing new methods for the synthesis of biologically active target molecules, such as lamellarin K, a sponge-derived compound that has significant potential in the treatment of certain forms of lung cancer.

Professor Banwell was awarded the Royal Society of Chemistry prize for the "elegant use of chemoenzymatic methods for the preparation of a wide variety of complex natural products including alkaloids and sesquiterpenes, as well as versatile strategies for the synthesis of troponoids and the lamellarins".

The prestigious Moyal Medal is named in honour of Jose Enrique Moyal, who came to Australia in 1958 to work in the Department of Statistics at The Australian National University. As recipient, Professor Evans will deliver the 2004 Moyal Lecture on Mathematics, Physics and Statistics.

Professor Evans research interests include non-equilibrium statistical mechanics and thermodynamics, and he has been involved in the development of nearly all the computer simulation algorithms used in the calculation of transport properties of classical liquids.



ALISON GREEN MRACI C Chem Email *publishing.ajc@csiro.au*

AUSTRALIAN JOURNAL OF
CHEMISTRY
AN INTERNATIONAL JOURNAL FOR CHEMICAL SCIENCE

Prof Lew Mander

This special issue of *Aust. J. Chem.* (Vol. 57 No. 7 2004) honours the career of Professor Lew Mander on the occasion of his 65th birthday on 8 September this year. Possibly best known for his synthesis of gibberellic acid (Fig. 1) – considered a brilliant landmark achievement – Professor Mander's research has centred around designing synthetic strategies for complex organic molecules.

Martin Banwell is Guest Editor of this issue, which opens with a foreword by Professor Sir Alan Battersby, a long-time friend and colleague of Mander's since he spent 1972 as a sabbatical year in the Battersby group at Cambridge. Battersby names Mander's 'scientific courage and adventurous spirit' as being characteristic of his attitude to research. Mander has received international acclaim marked by many awards, as well as 240 original research papers, 10 reviews and book chapters, two books and four patents.

Martin Banwell, in consultation with Lew Mander, compiled an invitation list and has attracted 17 contributions from around the world, which range from mechanistic organic chemistry (**Radom, Beckwith, Easton**) through organic natural product chemistry (**Pyne, Banwell, Kitching, Tietze, Steglich, Elix, Prager, Brimble, Willis, Warrener, Bowie**) and organometallic catalysts (**Ihara and Field**) to structural and functional genomics (**Orban**).

Professor Margaret Brimble and co-workers at the University of Auckland describe the first synthesis of a nucleoside mimic (see Fig. 2) using a spiroacetal framework as a pseudosugar. A novel enantiopure thiaestrane (Fig. 3) was synthesised via a double Heck reaction of a thiophene and a hydrindene derivative by Professor Lutz Tietze and co-workers at Göttingen University. Wolfgang Steglich and co-workers at the University of Munich report a novel and highly convergent method of attaining the arcyriacyanin system through cyclisation of suitable nitrophenyl precursors, while the first total syntheses (two) of the 14-membered ring macrodilactone colletotriene are described by Christine Willis and co-workers of Bristol University.

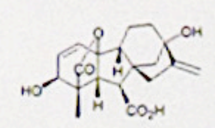


Figure 1.

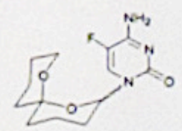


Figure 2.

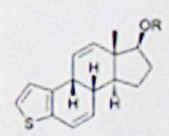
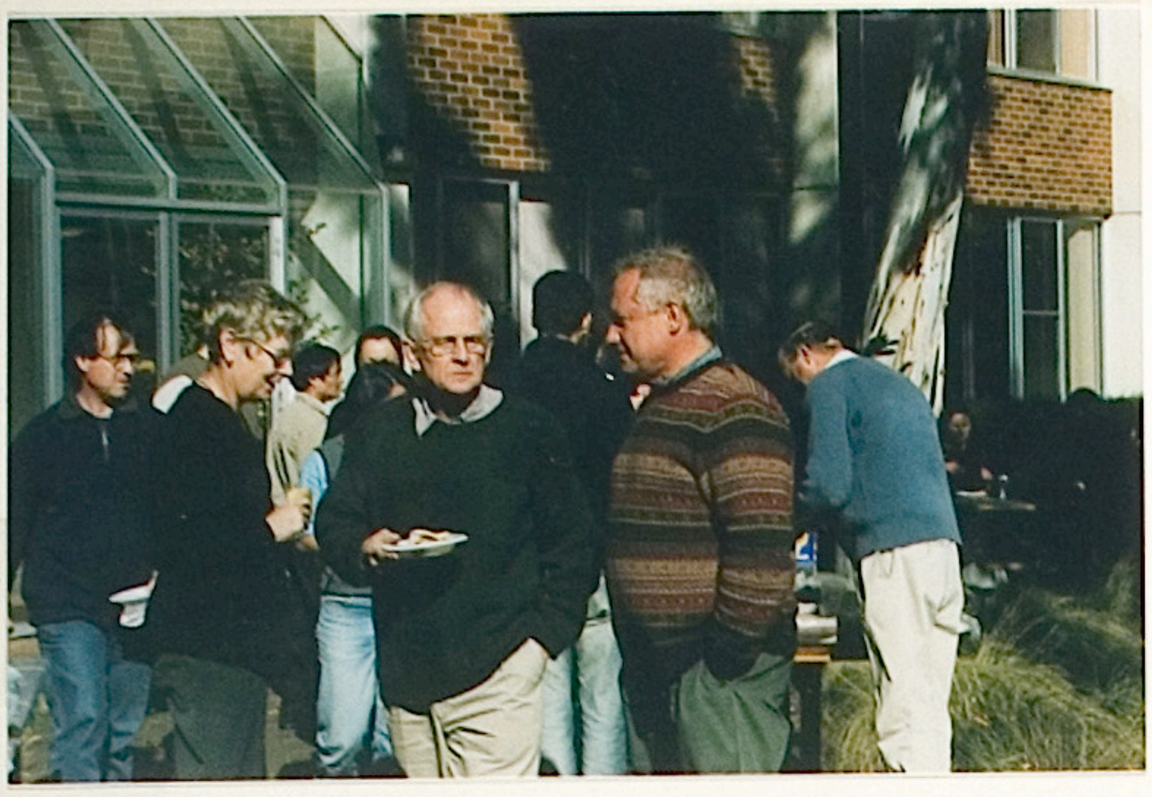


Figure 3.

To paraphrase Alan Battersby, this Festschrift is a mark of the immense respect and affection held by the organic chemistry community for Professor Lew Mander.



— CRAIG BBQ 2004 —

Prof Peter Stang
The Craig Lecturer 2004

Awards send budding new leaders on their way

WINNERS: Matthew Baker, 22, left, of Turner, and Miranda Sissons, 34, of Campbell, with other award winners Catherine Vaughan and Ben Etherington at Government House. Picture: RICHARD BRIGGS

By Frank Cassidy

Eight budding new national leaders, including two from Canberra, were recognised with $1.2 million in international scholarships yesterday, with Governor-General Michael Jeffery presenting the 2004 General Sir John Monash awards for excellence at Government House.

Aimed at identifying and developing future local and world leaders, the awards recognise and reward outstanding academic achievement, demonstrated leadership skill and an altruistic commitment to community service.

Canberrans Matthew Baker and Miranda Sissons were among the awardees, winning $150,000 scholarships to universities in Holland and the United States respectively.

Major-General Jeffery said the scholarship winners, who ranged in age from 21 to 34, were all Australians who shared a passion for knowledge and excellence and wanted to share it.

"In each of them I perceive those wonderful characteristics of generosity of spirit, nous and a passionate desire to put service above self," General Jeffery said.

"These valuable awards help seed nation building by developing outstanding young Australians as future leaders in their fields."

Plans for future study unveiled by the recipients included high-level courses in science, the arts, environment, human rights, social justice, history and health. Mr Baker, 22, of Turner, who had already earned an honours degree in science from the ANU hoped to use his scholarship to attend Vrije Universiteit in the Netherlands to study biological nanomotors.

The former junior national fencing champion and accomplished classical musician, said a better understanding of the small molecular machines would have benefits for agriculture, manufacturing and medicine.

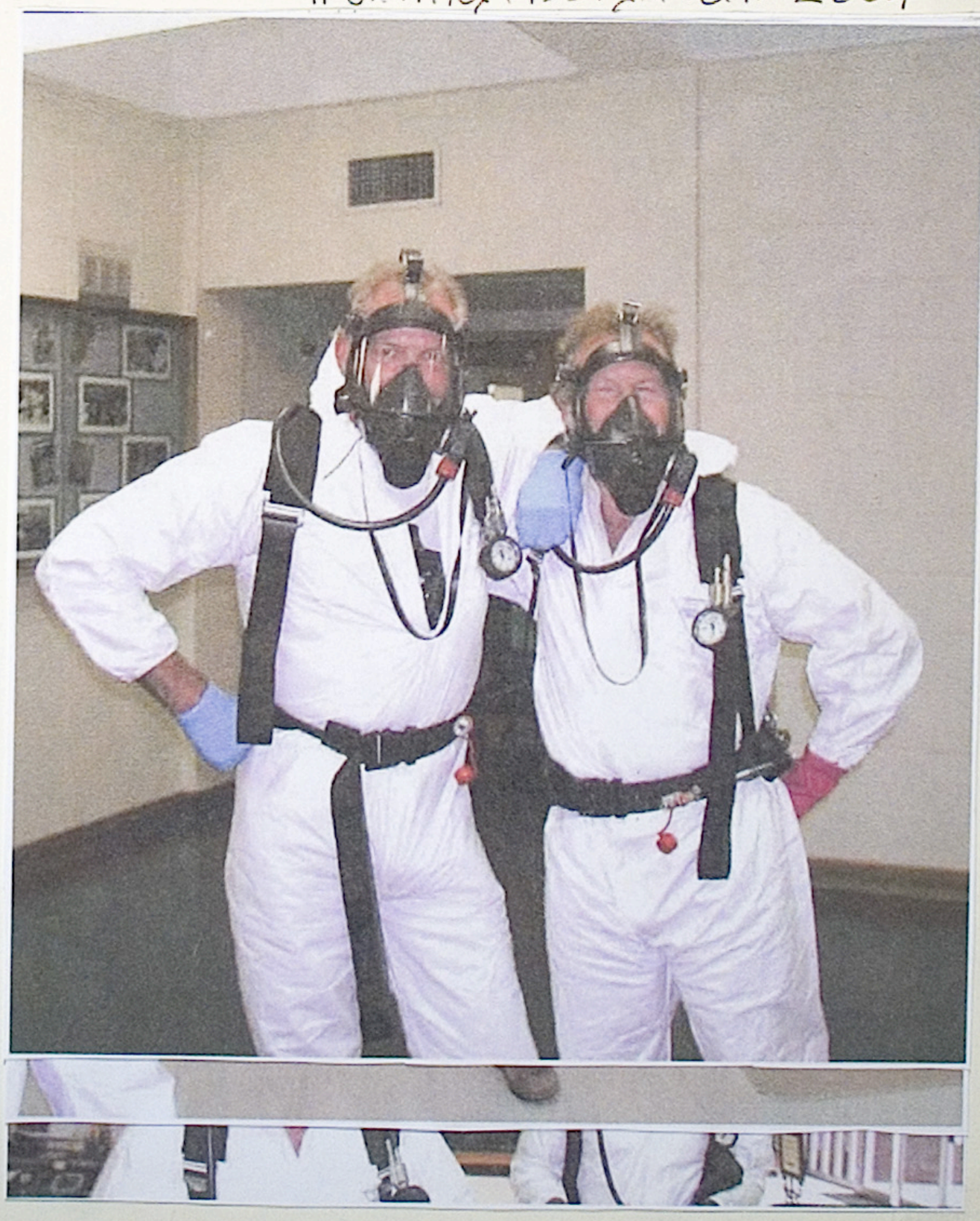
Miranda Sissons, 34, of Campbell was already working for a human rights organisation in the Middle East and hoped to go to Princeton University to further her understanding of human rights in an Islamic context.

She already held a degree in arts with first class honours from the University of Melbourne and an MA from Yale and hoped to make her academic expertise a resource for others in Australia, the Middle East and elsewhere.

Other scholarship recipients were engineering graduates Katherine Daniell and Olivia Thorne from South Australia; musician Ben Etherington from WA; and lawyer Andrew Hudson, public health specialist Catherine Vaughan and engineering graduate Sarah Milne, all from Victoria.

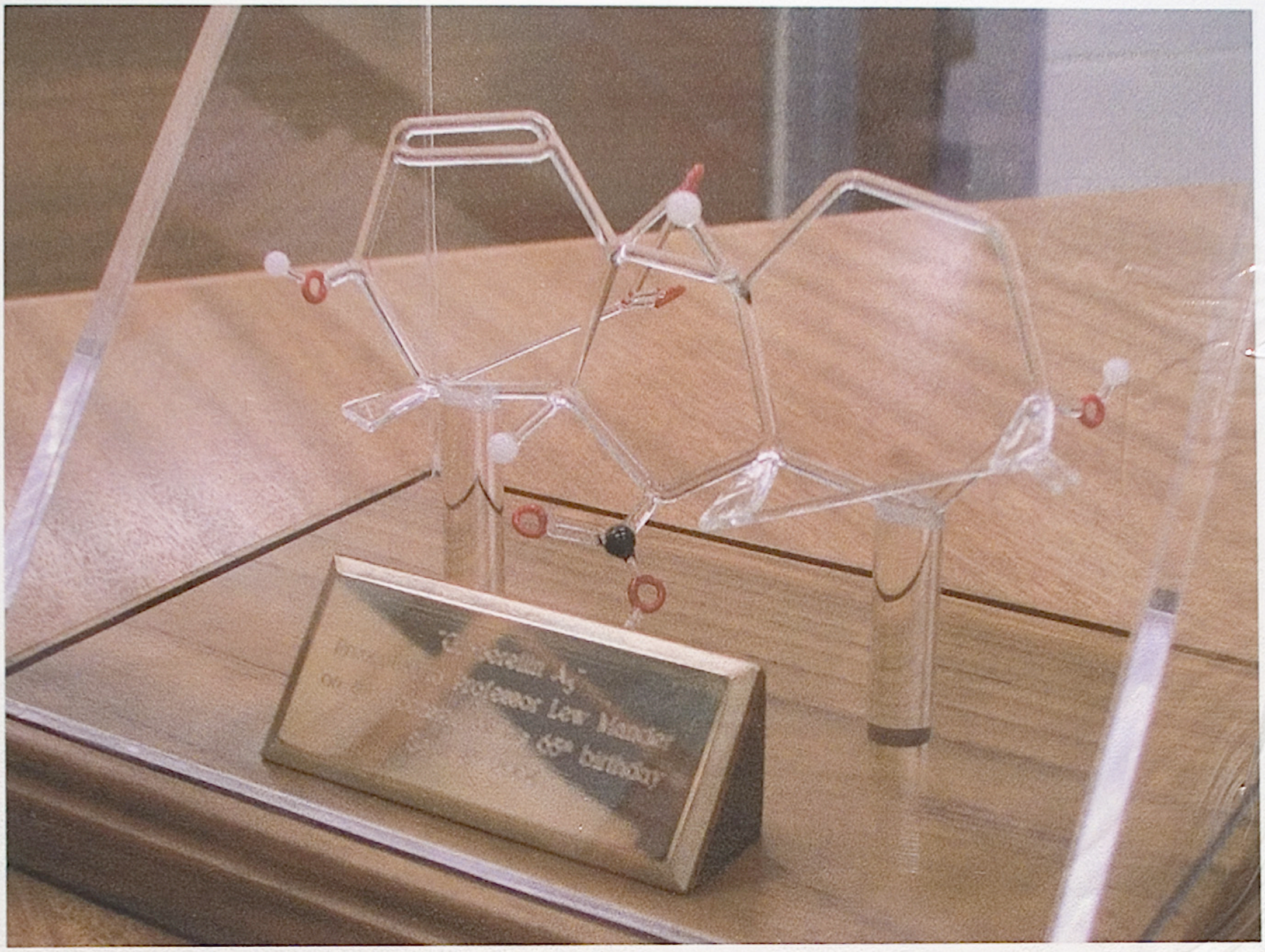
The awards were first presented last year and were supported by the Federal and ACT Governments and sponsors.

Training Assignment 2004



Present for Lew Mander's 65th Birthday, made by Chris Tomkins

Present for Lew Mander's 65th Birthday, made by Chris Tomkins



Superbowl to make drug delivery an exact science

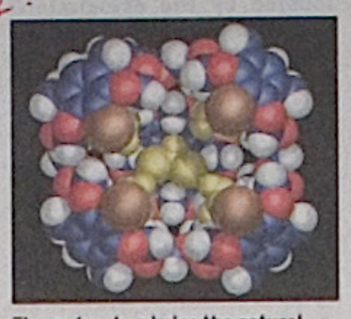
7/2/05 SYDNEY PAPER.

Deborah Smith
Science Editor

There is no way that Mike Sherburn, an Australian scientist, would miss watching the Super Bowl game between the New England Patriots and the Philadelphia Eagles on TV today.

Not that Dr Sherburn, a chemist at the Australian National University in Canberra, is an American football fanatic. Rather, his team of scientists has created a molecule that is shaped like a miniature open-air football stadium.

Dubbed the superbowl, it may eventually help deliver drugs to the right spot in the body. With its unique structure – a rigid, hollow sphere with a hole at the top – it can capture large drug molecules and store them inside. The team can also put a "roof" on the superbowl molecules if it wants, even though they are only a few nanometres across – about 100,000th the width of a human hair.



The molecule mimics the natural shape of enzymes in the body.

It took the chemists more than five years to devise a method to synthesise the superbowl, which is very big for a single molecule, with more than 600 atoms linked together. "But now we know how, we can make them from scratch in about two weeks," Dr Sherburn said.

Originally the team was going to call its creation, with four concave sides and a concave base, tureenarene, after a soup dish, he said. "But it doesn't have the same kind of impact as 'superbowl'."

Chemists have been interested in building bowl-shaped molecules for more than 20 years because they mimic the natural shape of enzymes in the body. And the Nobel Prize for chemistry in 1987 went to researchers who succeeded in assembling small ones that could encapsulate a small "guest" molecule of up to 10 atoms in size.

But the much larger superbowl can fit guest molecules of up to 100 atoms in its roomy interior, which also makes it suitable for environmental applications, such as capturing and removing polluting chemicals.

It could also act as a mini-laboratory for chemical reactions by holding up to five guest molecules in precise locations in its interior, the team concluded in a study published in the *Journal of the American Chemical Society*.

Although Dr Sherburn is a soccer man at heart, he is tipping the Patriots this year.

Stage is set – Page 29

ANU MEDIA RELEASE
News from The Australian National University

MONDAY 7 FEBRUARY 2005
'SUPERBOWL' MOLECULE TO HELP DRUG DELIVERY

A new molecule shaped like a miniature football stadium that promises many applications, including precision drug delivery, has been developed by chemists at The Australian National University.

The molecule is capable of capturing and releasing drugs and chemicals, and has the potential for removing environmental toxins, catalysing chemical reactions and allowing new chemical purification.

Developed by synthetic chemist Dr Michael Sherburn and colleagues at the Research School of Chemistry, it belongs to a class of artificial bowl shaped molecules first developed more than a decade ago to mimic naturally occurring enzymes in the body.

The superbowl molecule has a unique shape: a rigid hollow sphere with the top chopped off. It is made through a chemical synthesis that unites five concave surfaces: four sides and a base. The open top allows 'guests' (such as drug molecules) to pass in and out.

"This is a very hot area at the moment and there is lot of great research being carried out around the world, particularly with assemblies of small bowl-like molecules," Dr Sherburn said. "Our contribution is exciting and different because no one has made single molecule containers like this before."

Its molecular structure is enormous by chemistry standards, containing 268 carbon atoms, 320 hydrogen atoms and 52 oxygen atoms. Nevertheless, the superbowl structure is only a few nanometres wide, thousands of times smaller than the width of a single human hair.

The researchers have shown that the hollow interior of the superbowl molecule can hold 'guest' molecules of up to 100 atoms - substantially larger than existing molecular containers and importantly, is big enough to encapsulate most common medicinal agents.

"Our compound is a much larger version of the original bowl molecules, hence the name 'superbowl'. The original bowl molecules bind only the smallest 'guests' - one molecule of ethanol, for example. Our molecule has much greater capacity and selectivity than its predecessors and shows more promise for wider applications.

"The design allows us to do lots of new things, like changing the size and shape of the hole at the top of the molecule, which makes it easier or more difficult for, say a particular drug molecule, to pass in and out. This is ideal if you're interested in modifying the rate of release of a particular guest.

"We're particularly excited by the possibility of carrying out chemical reactions inside superbowl. The ability of one superbowl host to hold five guest molecules in precise locations in 3D space at the same time shows great promise for catalysis," Dr Sherburn said.

The research team - group leader Dr Sherburn, PhD student Elizabeth Barrett, crystallographer Dr Alison Edwards and PhD student Jacob Irwin from the University of Sydney - published their results in the 29 December edition of the Journal of the American Chemical Society.

An animation and images of the superbowl molecule are available from the ANU Media Office.

2004 STAFF PHOTO.

1997 STAFF PHOTO.

Photo of Birch

Rita Haradence
(Cornforth)
for historical
archives.

21/2/03

The I.A. Watson Institute

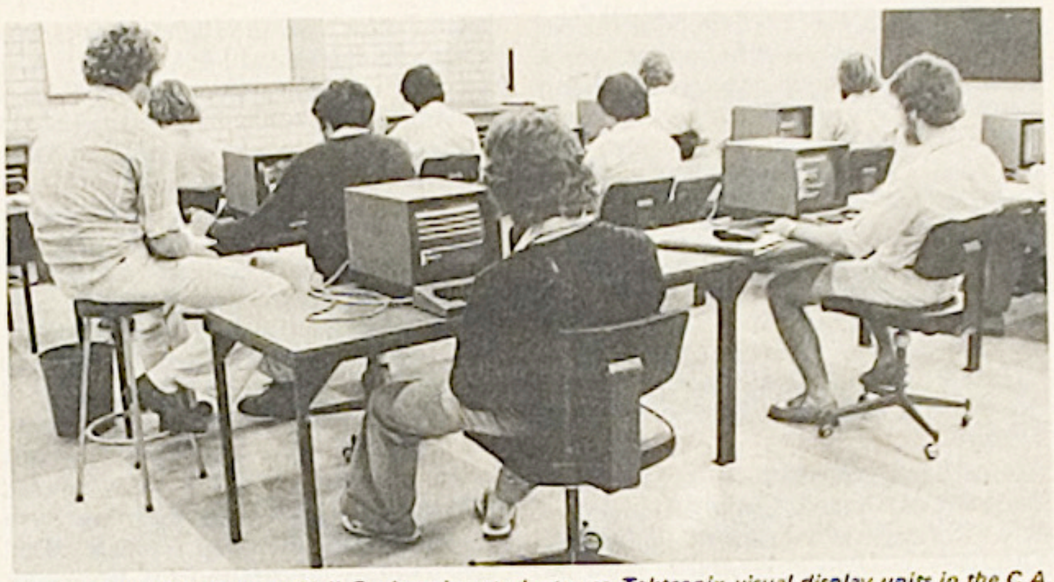
Last October there was a gathering at Narrabri at which our Plant Breeding Institute was renamed the I.A. Watson Wheat Research Institute in recognition of Professor Watson's outstanding contributions to wheat research.

Emeritus Professor Watson has done remarkable work in breeding rust resistant strains of wheat. Varieties of wheat developed by him and his colleagues at Castle Hill and Narrabri now occupy more than one-third of Australia's wheat acreage.

At this gathering the Chancellor unveiled a plaque to commemorate the renaming of the institute. He remarked that "we are in the presence of a great scholar. Modest and capable, he moves among the most intellectually informed with the same ease with which he moves among the humblest of wheat growers."

The ceremony took place during the Institute's biennial field day, and Sir Hermann formally released the University's new mid-season wheat variety Shortim for commercial production.

Professor Watson recalled that when wheat breeding work started at Narrabri in 1938/9, there was such a shortage of funds for the research that they had to pull the harvester behind an old Essex Tourer. He thanked his colleagues in the University, and his collaborators in the Department of Agriculture and the Bread Research Institute, and expressed very great pleasure that the University had appointed Professor Barrie Latter to succeed him.



▲ *Third and fourth year Civil Engineering students use Tektronix visual display units in the C.A. Hawkins Computing Laboratory. The Laboratory, which has a Prime 300 central processing unit, was financed by contributions of just over $100,000 from Civil Engineering graduates.*

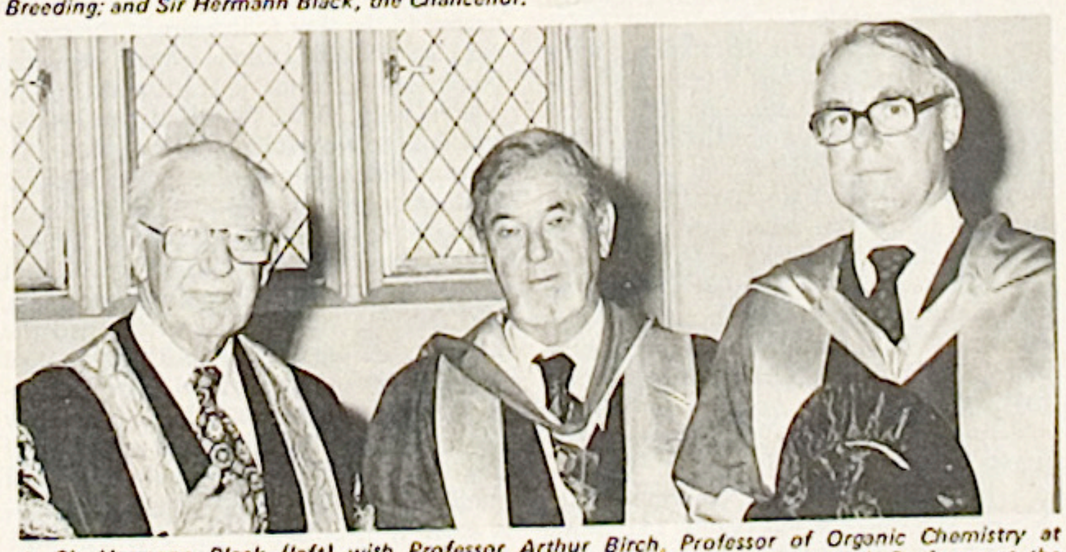
▲ *Pictured at the unveiling of a plaque to commemorate the re-naming of the Narrabri Plant Breeding Institute: (l-r) Professor I.A. Watson, in whose honour the Institute was re-named; Mr Nick Derera, Director of Wheat Breeding; Professor Barrie Latter, the new Professor of Plant Breeding; and Sir Hermann Black, the Chancellor.*

Honorary Degrees

On November 2 last there was a very pleasant ceremony in the Senate Room at which the Chancellor conferred honorary degrees of Doctor of Science on two of our very distinguished graduates, Sir John Cornforth and Professor Arthur Birch.

Sir John Cornforth was one of a remarkable group of students who graduated in Science in 1937 and '38. Arthur Birch, Rita Haradence and Ernest Richie all graduated with 1st Class Honours in 1937 and Birch and Haradence shared the University medal in Organic Chemistry. Cornforth graduated with 1st Class Honours and received the University medal in Organic Chemistry in 1938. The medallists all proceeded on Exhibition of 1851 scholarships to Oxford where they worked under the supervision of Sir Robert Robinson who had been the first Professor of Organic Chemistry at Sydney. John Cornforth and Rita Haradence were married in 1941.

Sir John, who is the Royal Society Research Professor at the University of



▲ *Sir Hermann Black (left) with Professor Arthur Birch, Professor of Organic Chemistry at A.N.U., and Sir John Cornforth, Nobel Laureate and Royal Society Research Professor at the University of Sussex. Professor Birch and Sir John were awarded the honorary degree of Doctor of Science at a ceremony in the Great Hall in November.*

There was never a Plaque made for the opening of the main RSC.

J Harper 10/2/95

Plants were donated by RSBS for our fish Pond when they moved out. These Plants died. The light over the pond was suggested by RSBS to Promote growth. There was never a plaque installed. J Harper 10/2/95.

Bird retired 1980 Died in ~~CC~~ 1995

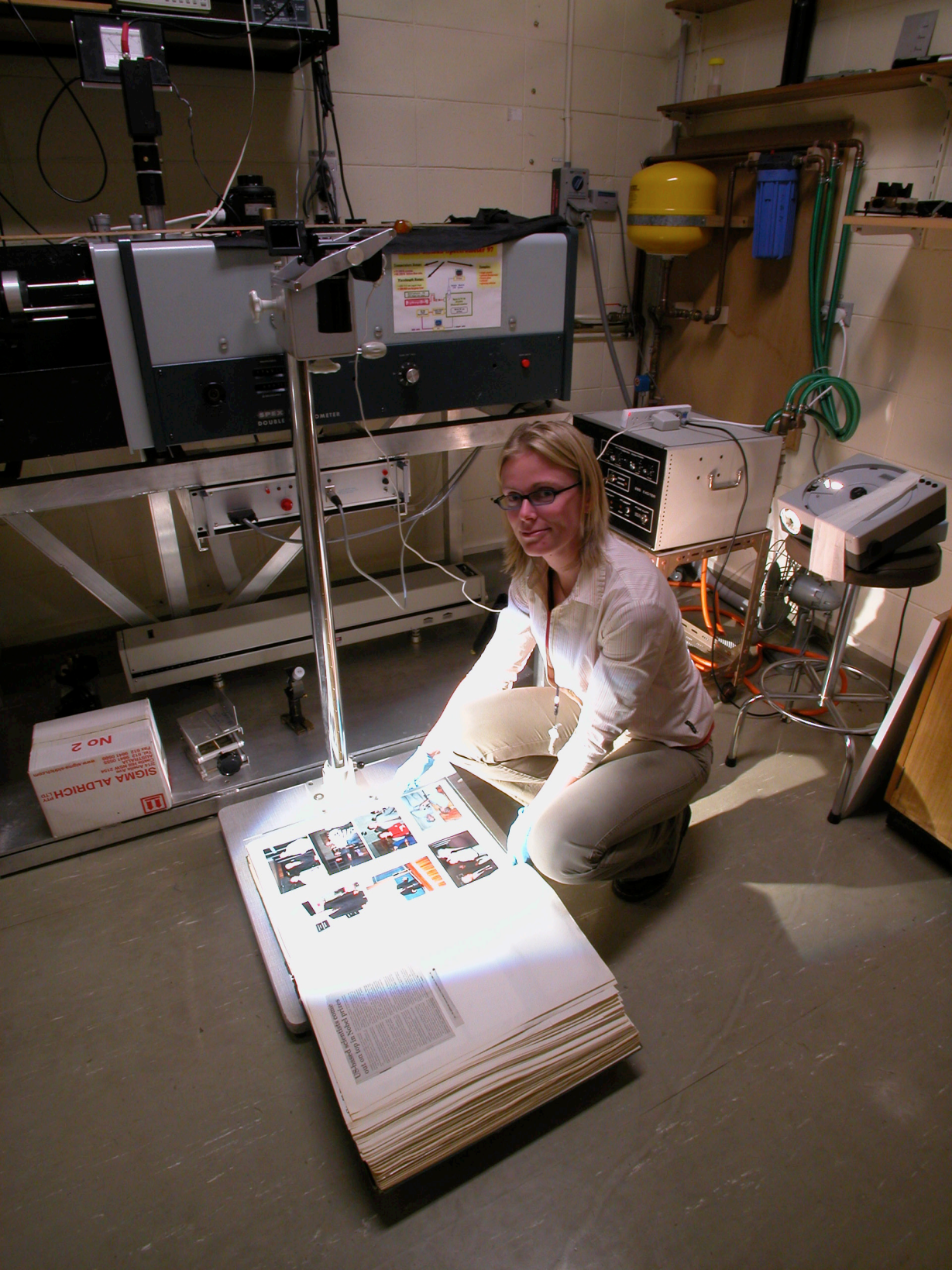
Bramleys Bar opened May 1994

BBQ opened Dec 1997.

John Hurst died 7 Sept 1999

Rod Richards. John Macleod retired Dec 1999 Martin Bennett Dec. 2000

Kenny Richardson retired Dec. 2000.


SIGMA ALDRICH
NO 2