

Get ScienceWise at ANU

Welcome to our first issue of *ScienceWise*, the monthly newsletter of Science ANU* and the science related National Institutes.

ScienceWise aims to bring members of the National Institutes an interesting cross section of science news, views and ideas from across our broad campus. The format is light, easily read while still being informative.

We're hoping that you've been kept up-to-date on seminars, public events and news from within your own area by your relevant National Institute, but we're aware that many members would like to know what's happening on the other side of the campus. *ScienceWise*, hopefully will help fill you in on the bigger picture.

Our intention is to bring *ScienceWise* out towards the beginning of each month. National Institute members will be alerted to its availability through an email to all members. You'll be able to download it from your National Institute website. Members will also have the option of receiving *ScienceWise* in a hard copy form through their own National Institute.

So, once again, welcome to this first issue. I hope, like you, that I'll be growing a little more *ScienceWise* with each month.

Prof Jim Williams
Chair, Science ANU



*Science ANU

has been established to provide a forum for communicating issues that overarch the ANU's science-related National Institutes. These include enhancing cross-campus interactions and communication, promoting ANU research and teaching activities, identifying outreach opportunities and coordinating campus-wide programs and events.

ScienceWise

April 2004

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ScienceWise is produced by
ScienceANU in association
with the science related
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<http://ni.anu.edu.au>

Ring of boulders

What's with the ring of boulders around the 'spacecraft'-like building outside of the Department of Chemistry?

The building is the Research School of Chemistry's new nuclear magnetic resonance facility, and the boulders mark the edge of its magnetic influence.

(Continued on page 6)



What's with the boulders?

NIB in NZ

The National Institute of Bioscience was recently invited to be a part of the Australian Science stand at the APEC Science Ministers' Meeting in Christchurch, NZ earlier this month. They attended as part of the Australian stand which featured other leaders in Australian biological sciences such as Australian Synchrotron and AusBiotech.

"Our presence did a lot to raise awareness of Australian bioscience overseas, and in particular, bioscience at ANU," said NIB Executive Officer, Jerry Skinner. "We've had a great deal of interest from both the NZ and Australian Science Ministers, and from senior science advisors from regional countries such as Korea and Malaysia," he added. In all there were around 1000 attendees to the event, which ran for 4 days in early March.

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Garry Moore, Mayor of Christchurch, shakes hands with Jerry Skinner while Pete Hodgson, Science Minister, NZ, and Paris Brooke, Communications Manager, AusBiotech, watch on.

Welcome to the AccessGrid

by Heather Slater

The AccessGrid is here, and ANU is well placed to explore it. The AccessGrid is a set of ICT resources that allows global networking of large groups of people in real time. It promises to transform teaching, research and business.

“Think of it as audio-visual conferencing between multiple groups of people over the Internet,” says Dr Markus Buchhorn, head of the ANU Internet Futures Group. “It uses advanced services like IP-multicast to more effectively transmit audio and video.”

Rather than relying on one camera or one computer terminal on each desk, the AccessGrid uses several cameras in one room or node. Every person in that room can see and hear all the other people in all the other AccessGrid nodes via large tiled video screens. A node is simply a space that houses the equipment and software needed to link to other nodes.

“Everyone can see and hear each other all the time,” says Dr Buchhorn. “This makes audience participation more immersive because everyone, no matter where they are situated, feels part of that group. This is totally different to the usual teleconference experience.”

New and emerging applications for

the AccessGrid are constantly being refined. For example, participants in different nodes can view PowerPoint presentations at the same time as the speaker is presenting them.

“The ability to share new applications on the AccessGrid is only limited by our ability to create new code for them,” says Dr Buchhorn.

There are currently three AccessGrid nodes at ANU. They’ve all been built by the Internet Futures Group and partially funded by various schools and faculties. One is housed at the Computer Science and Information Technology (CSIT) building. A recent NIEIS seminar on e-Science and the Grid was presented here and accessed by other nodes around Australia.

One node is in the Leonard Huxley building; and a third node is at Mount Stromlo where the Research School of Astronomy and Astrophysics is ensuring its new lecture theatre has the AccessGrid right from the start.

The next node will be built in the



Dr Buchhorn demonstrates the AccessGrid

David Salt

ANU Medical School. Here the Division of Information is interested in creating interactive learning centres. One way of using such an interactive environment in a medical school could be to link different nodes together on the AccessGrid to study things like the Visible Human Project (a digital atlas of human anatomy).

“It’s our job to look beyond today’s Internet,” says Dr Buchhorn. “The Internet Futures Group is peering into the future to find out how we can meet the University’s needs in education and research. In the end we aim to make the AccessGrid a transparent tool for people, in the same way that email and the Web have become transparent, so that it becomes an everyday part of working and research and education.”

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Beam me up

Time is colliding with space all over Canberra during May and early June as part of *metis* 2004. That’s because the theme for this year’s *metis* festival is ‘time’.

metis is a celebration that brings together contemporary artists and scientists to explore the intersections and possibilities of both art and science. Events will be staged in many of Canberra’s top venues including the National Portrait Gallery, the Discovery Centre, the Canberra Mu-



Part of a 4D ‘relativity’ movie produced by scientists from the Dept. of Physics. It will feature in *metis* 2004

seum and Gallery, and the National Museum of Australia (where a one day symposium will be staged on Saturday 15 May).

ANU will be staging its own event at the School of Art Gallery under the banner ‘beam me up’. It will feature the work of professional artists and ANU physicists which can be related to the areas of science fiction and time travel. Explore concepts of time travel, cosmology, teleportation and quantum optics from both artistic and scientific perspectives.

metis 2004 will run from the 6 May to the 5 June.

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Birds of a feather

by Heather Slater

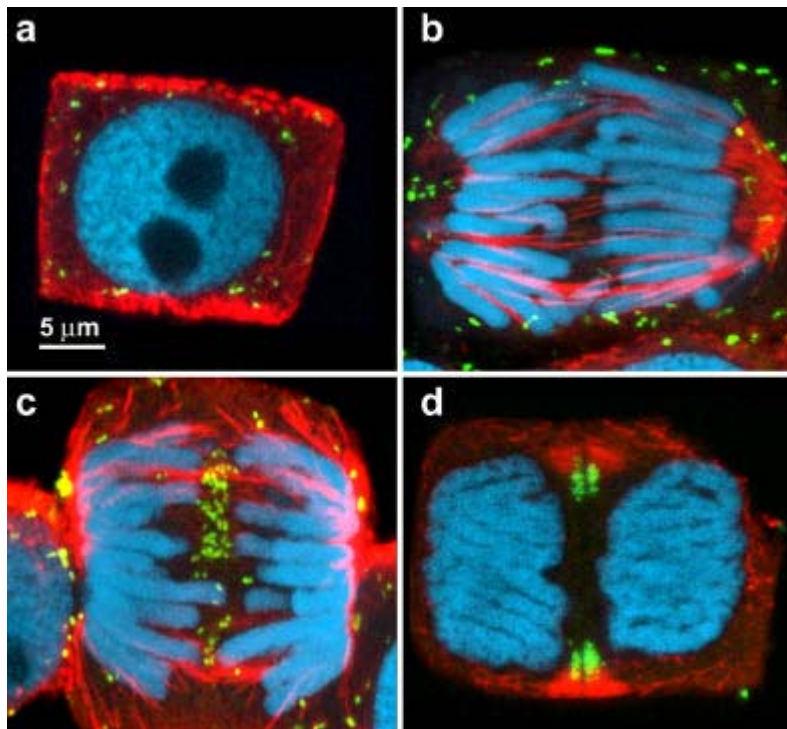
What strikes me most about working in engineering and information sciences at ANU is how few women students and academics there are in these disciplines. A bird's eye view of the research school that supports the Institute's office will reveal one female academic out of 25 academics, and 13 female students, out of 49 graduate students. (Looking a bit wider, there are currently 9 senior faculty female members spread throughout FEIT, MSI, RSI, RSE and FacEcCom involved in engineering, computer sciences, telecommunications and mathematics. There are 27 female junior faculty members.)

One young female academic in a nearby faculty once commented to me that she got more than a little irritated when it is automatically assumed (in a male dominated environment) that she is in administration simply because she is a young woman. Then she wondered if she was being paranoid, and making a mountain out of a mole hill.

Academic women and promotion is a hot topic in Australia. At ANU in 2003, only 26% of women eligible for promotion applied, compared with 34% of men. In response to this, the ANU Equity and Diversity Unit recently organised a workshop for women academics to talk about promotion and the issues that may dissuade women from advancing up the academic ladder.

NIEIS is actively addressing this issue, and has created a Women in Engineering and Information Sciences Fellowship for senior academic women. The 2004 recipient of this fellowship is Professor Lesley Ward. She's a mathematician and a graduate from ANU: she gained her PhD at Yale University. Currently, she's teaching at the small, selective, and technical Harvey Mudd College in the USA. The College has increased female student recruitment in technical disciplines from 25% in 1997 to 33% in 2004.

Lesley has planned a number of activities with three groups of women at ANU. These groups include PEERWISE, a peer mentoring network for academic women in science and engineering. She is attending meetings and helping to plan future PEERWISE activities and recruit other female speakers, as well as discussing her experi-



The mystery of the green dots

The Plant Cell Biology department of the Research School of Biological Science is trying to unravel the mystery of tiny organelles in plant cells called peroxisomes. They're involved in cell division, but their exact role is unknown. These images, taken by Dr David Collings, were produced using the RSBS confocal microscope. They show four stages in the process of cell division:

a = interphase: chromosomes (the blue material) are distributed throughout the nucleus; peroxisomes (the green dots) are random in the cell, and microtubules (red strands) are found only in the periphery.

b = anaphase: chromosomes are separating during cell division, and the microtubules form the 'mitotic spindle', the structure that separates the chromosomes. Peroxisomes are still random.

c = early telophase: chromosomes forming into the new nuclei, peroxisomes are gathering at the centre of the cell.

d = late telophase: chromosomes formed into two nuclei, one for each new cell. The peroxisomes have gathered at the centre of the cell where they form a ring (seen here in cross section only) immediately inside a ring of microtubules.

It is these microtubules that lay down the new cell wall material that divides the original cell into two new cells. The mystery is - what are the peroxisomes doing here?

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ences in moving up the tenure ladder in the US context.

She is also meeting with women graduate students across the disciplines embraced by engineering and information sciences to give encouragement and to discuss setting up a continuing peer mentoring group. During her time at ANU, Lesley will be meeting with the FEIT Women's Network for undergraduate students that provides mentoring and network-

ing opportunities to women.

Any women academics and post-graduate students in science and engineering who wish to be part of the secure database that NIEIS is creating so that you can flock together from time to time, should email nieis@anu.edu.au.

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Recommended reading: *Why So Slow?: The Advancement of Women* by V Valian, available from NIEIS.

Thruster makes waves

Plasma physicists at RSPHysSE together with researchers from the Cooperative Research Centre for Satellite Systems have teamed up to develop and test a revolutionary plasma thruster that might be the satellite motors of the future.

An enormous challenge for many satellites is that they run out of fuel and can't be kept in position. However, the new plasma thruster developed at the ANU might be the answer.

The Helicon Double Layer Thruster (HDLT) was invented by Dr Christine Charles using the helicon technology patented by Prof Rod Boswell. It uses radio energy to create a plasma out of a gas such as argon. These ions then pass through a sharp drop in electrical potential that, in the space of a few millimetres, kicks them to speeds of around 10 kilometres/second. This provides the thrust.

The plasma thrusters have advantages over



The HDLT with some of researchers who built it. Dr Christine Charles is in front, Prof Rod Boswell is stands behind to the right.

rocket engines in that they use an electrical power source (such as a fuel or solar cell) which gives them a long life. They don't have to carry the rocket's heavy chemical fuel load.

The ANU/CRC partnership has recently received a grant from the Commonwealth Government's Innovation Access Program to design and test a plasma motor for steering satellites to keep them in orbit, thereby keeping them in active service for much longer.

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Tim Wetherell

New labs for RSPHysSE

The Erich Weigold Building is open for business and its new labs are already churning out sensational science.

Originally known as the Cockcroft Extension, the building began life back in May 2000 when a building audit at the Research School of Physical Sciences and Engineering identified the need for new lab areas. So, the old Round House came down and the new lab complex rose in its place. Before it was finished it was renamed in honour of Erich Weigold, the previous director of the School.

The key aim of the design was flexibility and functionality. The post-tensioned, reinforced-concrete-slab floor allows for large spans between the columns and hence for ease in adapting the internal structure of the building for future use. There are no false ceilings in laboratories allowing for exposed mechanical services such as compressed air, gaseous nitrogen and gas exhaust systems to be easily retrofitted. There are also a number of external gas storage cages for compressed gas bottles. These bottles are connected by stainless orbitally welded tubing into most of the laboratories.

Windows are double glazed and there's a solar-powered hot water system. There's also a cooling water circuit piped through the three floors of the building which cuts down on water wastage.

The Erich Weigold Building provides three floors of very functional and flexible lab space. Currently, the space is being devoted to experiments in Plasma Physics and Atomic and Molecular physics. The new plasma thruster is one of the rigs housed in the new space, and it's already making headlines. (See Thruster makes waves).

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Erich Weigold

Prof Erich Weigold was Director of RSPHysSE for over ten years (1992-2003). Prior to this he was Professor of Physics at Flinders

University from 1970-1992. He's made a massive contribution to the areas of atomic, molecular and condensed matter physics

(including pioneering the field of electron momentum spectroscopy), and been honoured with many awards throughout his career.

In February, Prof Weigold was appointed as the Executive Director for Physics, Chemistry and Geoscience on the Australian Research Council.



Kevin Lonsdale takes Prof Weigold through a presentation on the new building.

Footprints on campus

What's the size of your ecological footprint on campus? How would you express that as art?

The National Institute for Environment (NIE) together with ANUgreen are staging 'footprints on campus', an inaugural visual arts competition seeking to explore, through art, connections between staff and students with the University campus environment. It's open to all ANU staff and students.

You're encouraged to submit a drawing, a photo, a painting, a sculpture or a work in textiles that will raise and promote awareness on campus of environmental issues. The competition will open mid April and close mid July 2004. Prize winners will be announced in late August/early September, together with an exhibition of the winning entries.

Winners will receive great prizes in the form of gift vouchers from sponsoring organisations. The main condition of entry is that all submitted works must be freely available to be used by NIE and ANUgreen for promotional use.

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Big, bold and beautiful: a male Mountain log skink (*Pseudemoia entrecasteauxii*) in breeding colouration

Jessica Stapley

Will the real father step forward

Why do males prefer virgins? Why do females mate more than once? These are some of the questions that Jessica Stapley is addressing in lizards. Jessica, based at the School of Botany and Zoology, is trying to understand why such a diversity of mating systems exists in the animal kingdom.

"A litter of young will share a mother but each member may have different fathers," says Jessica. "This phenomenon is known as multiple paternity and appears to be widespread in many groups of animals, including our pet dog or cat."

Jessica identified that within lizards over 50% of all litters had multiple fathers. What's more, just because a male and female are observed together during the breeding season doesn't mean that the male will father her offspring. Understanding these patterns of behaviour will improve the success of captive breeding programs and may also help us better understand human behaviour.

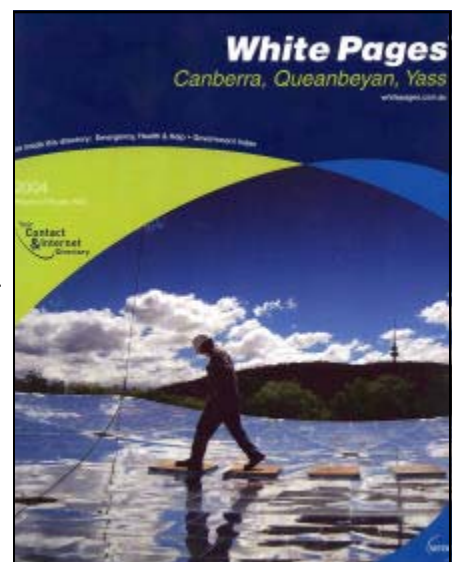
Because Jessica rarely gets to see animals mating she has to employ genetic techniques to identify which male is actually the father of each of the offspring. The technique is known as DNA fingerprinting. It's the same method as that used in humans when there's legal debate over who's the father.

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Walking on sunshine

It's not immediately apparent but the cover of this year's White Pages features an ANU landmark. It's the Big Dish on the shores of Sullivan's Creek. This massive paraboloidal dish of mirrors tracks the Sun as it crosses the sky. Sunlight bounces off the mirrors (400 m² of them) and is focussed on to a solar boiler where it superheats steam that is used to generate electricity. The Big Dish is a demonstration device to show what's possible with innovative engineering and design. It was designed and built by ANUTECH and is now part of the Solar Thermal Facility, part of the Centre for Sustainable Energy Systems (FEIT)

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Green Steps to better environmental practice

Eleven students are about to be put through one of the most rigorous environmental training programs around. They'll experience a unique combination of education, training, internal change management and business engagement both on and off the campus.

It's called the Green Steps Training Program, and it's run by ANU's National Institute for Environment (NIE) in conjunction with the Monash Environment Institute (MEI) (at Monash Uni) and the Australian Greenhouse Office. It takes 10 undergraduate and postgraduate students through an innovative course in environmental change management.

In the first stage, students learn and

apply their skills at the ANU, working with the University's ANUgreen team to implement improved practice in designated University departments. Students' improve their understanding of environmental issues in the workplace, and develop communication skills.

which may include developing waste minimisation and energy efficiency strategies, assessment, action plans, implementation strategies, reviews and evaluation. In this second phase they'll be expected to deliver measurable outcomes for the organisations they're

working with. It's hoped that in some of the cases further employment may be negotiated between the students and the business.



The Program runs

from April – July 2004 and NIE hopes to continue running this program independently from 2005, with current students to conduct future training.

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Engineers reach out

by Heather Slater

The National Institute of Engineering and Information Sciences is a major sponsor of the Science and Engineering Challenge running over the 30 June and 1 July at Melville Hall. Budding engineers and scientists from the ACT and region will converge on the university to solve engineering problems, crack cryptic codes, develop computer programs, and design and build a range of telecommunications and engineering devices to hone their interest in science and engineering.

Engineering and information sciences will also have a much greater focus at the Australian Science Festival in August this year. Thanks to the support and dedication of several ANU computer scientists, robot enthusiasts, maths wizards, and materials engineers, high school students from Years 9 through to Year 12 from the ACT and surrounding region will be hunting mutants, building solar houses, simulating a simple mobile phone, testing

materials, and learning about e-Science. Our MAD workshops are designed to capture the interest of high school students today who are the undergraduates and PhD students of the future.

The workshops are interspersed with demonstrations and exhibits of the Ticuna racing car, Serafina (the autonomous submersible robot), robot@anu, the WEDGE Virtual Reality Theatre at CS&IT, and demonstrations of how a mobile phone works. High school students will have the opportunity to talk to ANU students about life and study at university, and what it means to be a computer scientist or an engineer.

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Visiting high school students measure the load strengths of different materials and configurations in the Department of Engineering.

David Salt

(Continued from page 1)

Ring of boulders

Step inside this line of boulders and compasses lose the plot. It also keeps cars and big machines away as the distortion of the magnetic field they're producing would disturb the sensitive magnetic measurements being made inside the building.

More info: http://info.anu.edu.au/mac/Media/Media_Releases/_2004/_050304spectrometer.asp

ScienceWise @ ANU is produced by Science ANU and the science related National Institutes. Edited by David Salt.

Enquiries and feedback should be sent to ScienceANU@anu.edu.au

For more information on news and events please visit our website:

<http://ni.anu.edu.au/events.asp>