FREEZE FRAME: A DAY IN THE LIFE OF AN ANTARCTIC GLACIOLOGIST

Ever wondered what happens when an Antarctic field party is deployed to a remote site to undertake their research? Here's a hands-on account by glaciologist **Dr Barbara Smith** from the Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC) and the Australian Antarctic Division (AAD), who spent this summer 'down south'.

"During the first voyage to Antarctica by the *Aurora Australis* this summer, a team of eight expeditioners was deployed by snow vehicles (hagglunds) to Law Dome, near Casey Station, to retrieve a 120 m ice core. The core will be analysed to help determine whether the extent of sea ice in East Antarctica over the past few centuries has been decreasing or not: recent research has identified a link between a chemical in continental ice and the maximum winter extent of sea ice. (see Curran *et al*., 2003, *Science* (302), 1203-1206 for more information.)

Our field program ran very smoothly thanks to meticulous preparation by our team and the Casey winterers who pre-deployed the main part of our camp before our arrival. The *A Factor*, or Antarctic weather, can easily prevent the best-laid plans from being carried out, but on this occasion there were no hitches. There was only one day of blizzard conditions to contend with during our 10-day stay, and luckily it was over by the time we had to pack up to leave.

Our camp consisted of a series of vans on sleds, a large living van (with six bunks, kitchen and dining area), a generator van (with electric incinerating toilet, shower, washing machine and dryer), a fuel sled, and even a refrigerated shipping container (to keep the ice cores frozen in case the sun's radiation warmed them above zero degrees). On our arrival we erected a drilling tent, a storage tent and polar pyramid tents. Meals were taken in the living van. The six men in the team slept inside the van, while the two intrepid girls opted to sleep in the polar pyramids! The daily average temperatures were around -18° C, with -25°C at night. Sleeping on snow that is at such a low temperature is a challenge, but the trick is to make sure you have lots of insulation layers between you and the snow.

This field project sounds quick and easy, yet it would not have been possible without the interaction of dozens of personnel in and outside the Australian Antarctic Division over several months. It's thanks to their dedication and innovation that projects like this can be completed with minimum impact on the environment and on the expeditioners in a busy station changeover period."

The ice core drilling team – left to right back: Tas van Ommen, Dominic Ferretti, Mark Curran, Annette Foster, Mike Woolridge. Front: Vin Morgan, Dom O'Sullivan, Barbara Smith

Dom, Annette and Vin setting up the ice drill.

The team consisted of ice core scientists from the ACE CRC, the AAD, the Institute of Antarctic and Southern Ocean Studies (Hobart), the National Institute of Water and Atmospheric Research Ltd (New Zealand), a field-training officer and a diesel mechanic.

EINSTEIN INTERNATIONAL YEAR OF PHYSICS

2005 is the **Einstein International Year of Physics**, a celebration of the 100th anniversary of one of the most momentous years in the history of science. In 1905 many scientists believed that the fundamentals of physics, and even nature itself, were completely understood. That cosy, self-confident attitude, however, was about to be shattered by a young man working in a Swiss patent office: Albert Einstein.

Einstein published three classic papers in 1905 that each transformed a different branch of physics: atomic theory, the nature of light, and relativity. In **atomic theory**, Einstein explained Brownian motion – the jerky, random motion of tiny dust grains when studied under the most powerful microscopes of the time. This behaviour is due to collisions with atoms in the air and was a confirmation of the theory of atoms, which was still unproven a century ago.

Einstein's second 1905 paper was on the **photoelectric effect**; the way that light can cause electrons to fly off the surface of a solid object. Ultraviolet light is much more efficient at knocking off electrons than visible light, and Einstein used this key to explain the effect as collisions between photons and electrons in the atoms of the solid. Photons were quite a new idea, the concept that light was divided into tiny packets of energy was not generally understood at the time. Einstein showed how this concept fitted with the theory of spectra formulated earlier by Max Planck and, since then, our understanding of light, and all other forms of radiation, has been based on quanta, tiny but indivisible packets of energy.

Einstein's last great paper of 1905 was the formulation of **special relativity**. This theory states that lengths of time and distance are not the same for everyone. An observer moving with respect to the earth is in a different 'frame of reference', which causes his or her measurements to disagree with measurements made in our frame. This theory was extremely controversial at the time. In 1916 Einstein published the even more astonishing theory of **general relativity**, which showed that space itself is curved by gravity. These ideas also forced a change in our philosophy of nature, as profound as that of quantum mechanics. No longer were past and future immutable, events in the past as seen by one observer are in the future for another.

In **Tasmania** the local branch of the Australian Institute of Physics is celebrating the Einstein International Year of Physics with an extensive series of public lectures, including a marathon series of four lectures in four weeks, each one by an expert in one of the areas that Einstein was working on in 1905.

In addition, there will be two international conferences held in Tasmania: one dedicated to quantum field theory and its ramifications, the other studying clusters of galaxies at the furthest reaches of extragalactic space. Research in the School of Maths & Physics is focused on these and several other subjects that follow on from the work of Einstein a century ago. We no longer have the misconception that physics has been 'all worked out'; today we are struggling to answer big questions that had not even been formulated in 1905.

For more information about the Einstein International Year of Physics and public lecture series, contact the School of Maths & Physics: Karen.Bradford@utas.edu.au Phone 6226 2439

The Huygens Probe. UTAS radio telescopes at Ceduna (South Australia) and Mt Pleasant (Hobart) were a critical part of a worldwide network that tracked the probe throughout its descent to Titan (one of Saturn's 33 moons) in January, 2005.

CALENDAR OF EVENTS

- **CSIRO Student Research Scheme** March. Offers senior secondary students the rare opportunity of experiencing professional scientific research by completing challenging projects under the guidance of a research scientist. www.csiro.au/education
- **CONSTAT 2005** 29-30 April, Hobart. The annual conference of the Science Teachers Association of Tasmania. Contact denise.devitt@education.tas.gov.au Phone 6233 6676
- **Australasian Schools Science Competition** May. A suite of assessments developed for primary and secondary students to provide diagnostic information about student abilities in core skills areas of the curriculum. http://www.etc.unsw.edu.au/
- **Australia Museum Eureka Schools Prizes** Entries close 13 May for Australia's premier science awards. www.amonline.net.au
- **ENGQuest 2005** Registrations close 14 May for this fun and excellent way of learning science and technology, and discovering what engineers do, and even how you can become one! Fantastic prizes for you and your school. www.engquest.org.au
- **University of Newcastle Science & Engineering Super Challenge** Out-build, out-wit and out-solve each other in a set of science and engineering tasks. Tasmanian regional challenges commence 11 July, followed by Melbourne Super Challenge (18-19 Aug) and Grand Challenge finale in Newcastle (19-20 Oct). Contact: Robert.Nelson@newcastle.edu.au or visit http://www.eng.newcastle.edu.au/teachers/index.html#challenges
- **Science Teachers Professional Development** June. Workshops will be held at the University of Tasmania in Hobart. Contact: JeannieMarie.Leroi@utas.edu.au or visit www.utas.edu.au/scieng

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At two-tenths the speed of light, dust and atoms might not do significant damage even in a voyage of 40 years, but the faster you go, the worse it is – space begins to become abrasive. When you begin to approach the speed of light, hydrogen atoms become cosmic-ray particles, and they will fry the crew ... So 60,000 kilometres per second may be the practical speed limit for space travel.

Isaac Asimov (1920-1992)
Author & Biochemist

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UTAS

WELCOME BACK!

Welcome to the new teaching year for 2005. I hope everyone had a very enjoyable and relaxing summer and you are recharged and ready to 'Get SET' go!

Many people often think that university campuses, like schools, are deserted over the summer, but that is far from the case. Most students are on holiday until classes resume in February, but the majority of staff have only a short break over Christmas and the New Year before returning to work. For academics it's often the best opportunity they have to carry out fieldwork, write research papers and grant applications, and prepare new teaching material. For administrative staff there are graduation ceremonies to organise, applications and enrolments to approve, students to advise, and timetables to prepare, along with the day-to-day operations of running a university.

The November-February period also includes two summer teaching semesters held before and after Christmas. These give students the opportunity to take additional classes to accelerate their graduation, repeat classes they may not have passed, or undertake special field-based courses. In the Faculty of SET, plant science students go to Mt Field National Park for five days, and geography and environmental studies students head to Bronte Park for a week. It's a great chance for students to get out and experience real fieldwork and techniques hands-on. Summer is also the time for high school students to take part in our Siemens Science Experience on campus (see our article on page 3 for more details and pictures).

I hope you enjoy reading our new-look *Get SET* in 2005, and that you and your students are able to take part in the activities and events that we keep you up to date with. Don't forget to let us know if there's something you'd like to see or suggest.

Prof. Jim Reid

Dean
Faculty of Science, Engineering & Technology

INSIDE

THE PRIME MINISTER'S PRIZES FOR SCIENCE

Nominations are now open for the **Prime Minister's Science Prizes** – a national tribute to excellent and dedicated work in Australian science and science teaching. Each award comprises a cash grant, a medallion and a lapel pin similar to those worn by recipients of Australian honours such as the AO.

The Prime Minister's Prizes for Excellence in Science Teaching in Primary and Secondary Schools honour our inspirational science teachers. Many of today's most prominent Australian scientists have credited their teachers with generating the interest and enthusiasm for science that they have carried with them throughout their subsequent careers.

Nomination guidelines and an application form can be viewed and downloaded as either an RTF or a PDF document at: www.sciencegrants.dest.gov.au/scienceprize/pages/home.aspx

Applications close Friday, 8 April 2005.

VISIT UTAS

Did you know that plants have brains and respond to electrical signals just like humans? What is the bacterial danger zone for food? And why does beer foam?

If your students are interested in the science of agriculture, then visit the University of Tasmania's **School of Agricultural Science**.

Tasmania's diversified food and agricultural sector has a reputation for products that are internationally competitive and among the finest and cleanest in the world. Therefore it is not surprising that the School of Agricultural Science attracts some of the world's best agricultural scientists to its teaching and research staff. The School has experts in areas such as horticulture, animal science, food microbiology, plant pathology, entomology, viticulture, plant physiology, agronomy and soil science who are willing to give demonstrations to visiting students. With a commercially-run farm just minutes from Hobart, visiting students can also experience first-hand sustainable farming practices used on a variety of traditional and new crops. And for those of you based in the north of the state there is also the option of visiting the Cradle Coast campus in Burnie.

The School also provides opportunities for professional learning for science teachers and science industry placement programs for students.

If you would like your class to visit the School of Agricultural Science or find out more about these programs, contact Sally.Jones@utas.edu.au or phone 6226 2620.

REDUCING DISASTER IMPACT ON PEOPLE: THE ROLE OF WARNINGS AND PREPAREDNESS

The Boxing Day tsunami that devastated many communities around the Indian Ocean provided a horrific reminder of devastation that natural processes can create when they impact on areas where people have chosen to live. Because they strike with little, or no, warning, research is increasingly focusing on factors that help people cope with disaster. **Professor Doug Paton** (pictured), from the School of Psychology, talks about his research on warning effectiveness and disaster preparedness.

"The tsunami disaster highlighted the need for a warning system. However, the value of a warning is a function of whether people respond effectively on receiving it. Research we conducted in US communities that have experienced tsunami revealed that this is often not the case. If we understand why, steps can be taken to enhance warning effectiveness.

People may not respond for several reasons. Some believe the warnings are inadequate because they fail to discriminate between local and distant tsunami – if local, it would hit within minutes, so why evacuate? Some don't respond because evacuating conflicts with concerns about being trapped in their car (e.g., roads blocked by the volume of fleeing traffic) or locating family members. Some residents think that because government authorities put economic and political concerns ahead of their safety (e.g., authorities believe warning information and signs adversely affect tourism/business development), evacuation plans are inadequate, reducing their willingness to act. Some people are reluctant to respond because they do not wish to appear foolish if they evacuate and it proved to be a false alarm or they assume others will come to their rescue no matter what happens.

From this knowledge, we are developing plans to counter these misconceptions, increasing the likelihood that people will act on receiving the warning. Getting people to act is one aspect of effective response; the other is ensuring they are prepared for what happens after they respond to the warning.

Being prepared (e.g., having an emergency plan and kit) enhances peoples' ability to cope with the loss and disruption that accompanies the disaster."

Douglas Paton is a professor at the University's School of Psychology in Launceston.

For more information on his research or studying psychology at UTAS please contact the School of Psychology on 6226 2237.

TEACHER PROFESSIONAL DEVELOPMENT: SCIENCE IN TASMANIAN INDUSTRY

Have you ever wondered where real-life science is happening in Tasmania?

Do science students ask you where they could get a job in Tasmania and you find yourself scratching for answers?

Would you like to use real examples of science-based industries in your teaching?

The answers to these questions could be found in professional development (PD) sessions organised as part of the University's *Skilling the Cradle Coast for the Twenty First Century* project (see *Get SET* 1). In 2004 two major PD events were held: one in the north-west and the other in the south. Both aimed to highlight significant science occurring in industry and research institutions, while bringing teachers in contact with professional scientists. Both events took place over two days and included:

- Industry and University tours
- Working scientists as guest speakers
- Practical activities
- Interactive discussions
- Dinner and evening forum

By connecting local industries and professional scientists with current research and contemporary issues, the PD sessions provided a broad experience from innovative science through to career options. Teachers who attended the PD sessions commented positively regarding the scope of science topics covered, enthusiasm of presenters, opportunities available and ideas generated. Information will be sent out to schools and colleges for events in 2005.

To find out more contact David.Russell@utas.edu.au or Timothy.Wilson@utas.edu.au

SUMMER SCIENCE AT UTAS

In January, Year 9 students from around Tasmania took part in the **Siemens Science Experience**. This is a three-day program run by universities nationally with the aim of inspiring students to continue their science at secondary and tertiary levels.

On the UTAS Hobart campus, 52 students learnt about freshwater invertebrates, looked at the micro-textures of rocks, synthesised polymers (or made slime!), investigated the dynamics of free-falling eggs, experimented with lasers, wrote computer programs and looked at food safety issues. Other activities included finding out about earthquakes and tsunamis, learning about human behaviour and why we listen to people 'wearing white coats', solving maths puzzles, watching soccer-playing robots and examining the effects of bushfires on ecosystems.

Students tasted university life by enrolling, finding lecture, practical and tutorial rooms, sitting exams and, finally, attending the 'graduation' ceremony – all in less than two hours! Students also visited the Australian Antarctic Division, CSIRO Marine Research Laboratories, the Tasmanian Aquaculture and Fisheries Institute and toured Cadbury's chocolate factory.

Thirty students were kept busy at the Launceston campus attending sessions in aquaculture (involving oysters!), chemistry, computing, and human life sciences. For the first time, sessions were offered in psychology, and in environmental science where students assessed the water quality of the North Esk River.

Presentations were given by Vicki Colwell (Australian Red Cross) and Young Tassie Scientists Michael Grose (IASOS) and Cameron Potter (engineering) on their research. Quarantine Tasmania also demonstrated a detector dog finding concealed plant material. The local sponsor, Rotary, hosted a BBQ lunch on the final day for participants and their families.

Students build a tower in the Great Egg Drop Challenge at the School of Engineering.

Identifying freshwater macroinvertebrates at the School of Zoology.

CONGRATULATIONS, IT'S A BABY (LOBSTER)!

UTAS scientists are proud to announce the arrival of their first baby rock lobster.

This is a significant breakthrough for Dr Arthur Ritar and his team, who are the first in Australia to produce hatchery-reared rock lobsters from eggs spawned in captivity at the University's Tasmanian Aquaculture & Fisheries Institute (TAFI). It is also a world first when you consider that no unwanted broad-spectrum antibiotics were used in the culture.

"This is a major achievement in the move towards sustainable farming of lobsters," said TAFI's Director, Prof. Colin Buxton. "It is also a triumph in terms of technical complexity because the delicate lobster larvae progress through 11 stages of development and up to two years in the open ocean before the final metamorphosis into a tiny colourless lobster. We have already shortened this larval period to 12 months in the hatchery."

Dr Ritar attributes their success to improvements in husbandry, system design and feeding practices, and also to his dedicated team of researchers.

"Because of the high technology experimental facilities at TAFI we can hold a broodstock population as well as increasing numbers of rock lobsters at all stages of development," said Dr Ritar. "A key ingredient has been a better understanding and control of larval health. Minimising bacterial diseases has been a key to our success and will have significant applications to the intensive hatchery rearing of other species."

The baby lobster, affectionately know as Peter to his 'parents', remains in good health at TAFI's Marine Research Laboratories in Taroona.

Dr Arthur Ritar (Senior Research Fellow) and Dr Greg Smith (Postdoctoral Research Fellow) examining cultures.

Peter – Australia's first hatchery-reared rock lobster.

IG NOBEL PRIZE WINNERS!

Congratulations to **Claire Trenham** and **Rohan Martin-Hughes**, who were the winners of our **Ig Nobel Nano-Lecture Competition** (see *Get SET* 3). Claire and Rohan's efforts follow in the footsteps of some of the world's greatest thinkers, who themselves were asked to create seven-word nano-lectures at the 2004 Ig Nobel Prizes in the USA.

Here are Claire and Rohan's nano-lectures about the Faculty of SET's 12 distinctive schools:

AGRICULTURAL SCIENCE	We take cows and make 'em better.
AQUACULTURE	Red fish, blue fish, breeding new fish.
ARCHITECTURE	The unholy union of art and engineering.
CHEMISTRY	Too much acid, explosives and stinky stuff.
COMPUTING	Coffee and pizza make for happy coding.
EARTH SCIENCES	Geology is not geography, you cretaceous cretin!
ENGINEERING	Bridges are good, but beer is better.
GEOGRAPHY & ENVIRONMENTAL STUDIES	Geography is not geology, cabbage for brains!
MATHS & PHYSICS	Evaluating pi...galactic nuclei...why oh why?
PLANT SCIENCE	It's okay officer, it's for scientific use.
PSYCHOLOGY	It's all about getting a girlfriend, mate!
ZOOLOGY	We know who heads the food chain.