

**PROOF ONLY**

Civil and Natural Resources Engineering



# CNRE News



# Head of Department's Message



**The Civil and Natural Resources Engineering News is entering its 23<sup>rd</sup> year and we continue to value it as an important means of retaining contact with our past graduates, our supporters and others who are interested in developments within the department. The University of Canterbury has graduated over 100,000 students since its establishment over a century ago and there is no doubt that our department, one of the longest-standing departments in the university, has contributed significantly to that figure. So welcome to this hopefully informative and interesting update of the department in 2010.**

The last twelve months has certainly seen major changes in both the department and the environment in which we operate. I will try to capture some of these changes in my Head of Department's message and no doubt others will be apparent in the various articles that follow.

A change of particular importance to me was my appointment as the new Head of Department on 1 January this year. Alan Nicholson stepped down at the end of 2009 after five years in the role and later in this issue you will find a short article acknowledging Alan's contributions to the department during this time. We all wish him well in his return to "normality". I have been with the department for nine years and have acted as Alan's understudy for most of the last three years. Taking on the leadership of this department is a significant challenge for anyone

and once in the role one rapidly becomes aware of the responsibilities inherent in the job. They say that managing academics is like herding cats and it's true. However I will say that I have a particularly good herd of cats to manage!

The year 2009 brought a number of other major changes to the College of Engineering and the University of Canterbury. In January last year Dr Rod Carr, previously CEO of Jade software corporation was appointed to the position of Vice-Chancellor after the resignation of Professor Roy Sharp. Dr Carr brings a very interesting set of experiences and skills probably never seen before within a New Zealand university and certainly not at the University of Canterbury. While not steeped in the academic tradition he brings strong business and financial experience which is already making itself felt through a number of major reviews of the university support services. In his first year he has established two new research institutes, funded to the tune of \$1M per year for their first three years, and there is the prospect of new institutes being created this year. In addition Dr Carr has raised \$50M through a philanthropic bond that will allow major capital works developments to proceed apace.

The College of Engineering also has a new leader in Professor Jan Evans-Freeman who was appointed to the position of Pro Vice-Chancellor Engineering on the retirement of Professor Peter Jackson. Professor Evans-Freeman, who took up her post at UC in September last year, is an electrical engineer who has joined us from Sheffield-Hallam University in the UK where she held a senior management role.

The last 12 months have also seen some major changes in tertiary education policy at the national level. The government has introduced caps on the number of students who will be funded from the public purse, and withdrawn funding previously allocated to the university sector in an attempt raise academic salaries to an internationally competitive level. The financial outlook for the university in the short to medium term is relatively bleak, but within the department it's pretty much business as usual.

There have been a number of new staff appointments over the last year, and the department is now almost at its full complement of academic staff. You will find brief pen portraits of Drs Brendon Bradley, Cedric Lambert, Tony Abu, and Mr Eric Scheepbouwer later in the magazine.

Big changes are afoot in our undergraduate degree programmes, both civil and natural resources engineering, as we move towards a common course size of 15 points over the next three years. This move, adopted at university level by the Academic Board, requires us to reshape our courses so that students take only eight courses each year instead on ten. This review process has been ongoing for close to a year and has been very ably led by Associate Professor Mark Milke. Our changes for first professional in 2011 are currently going through internal and external processes and will be ready by next year. The planned changes for second and third professional are also well under way. As a department our commitment to provide the best undergraduate engineering education for our students remains undiminished and our hope is that some of the changes we are putting in place will enhance the skills they take with them on graduation, particularly in the area of communication and research skills.

The department has a strong research culture that brings many benefits to both the university and the wider community. You will find a number of articles later in the magazine that spotlight some of this activity and I am sure that you will be impressed by the diversity of the research work undertaken. One particularly exciting development on the national scene is the creation of a new Natural Hazards Platform by the Foundation of Research, Science and Technology. This platform, of which our department is a partner, is strongly focussed on research that will help to make New Zealand Inc. resilient to the impacts of natural hazards. We have traditional strengths in this area in both the structural and geotechnical groups, and more recently in the area of risk. We are hopeful that the new platform will deliver the department with a stable funding stream for this research on a ten year time scale.

I hope this brief introduction, and the later articles, demonstrate to you the continuing health and strength of the department. External factors are continually changing and setting us a variety of challenges, but we have learnt to respond to these challenges and we continue to contribute significantly within the university, at national level, and at international level in both our research activities and, perhaps most importantly, through our graduates.

*Associate Professor Roger Nokes  
Head of Department of Civil and  
Natural Resources Engineering*

# Change in Head of Department



## Farewell Alan

**The most significant change within the department has been the change in head of department that officially took place on 1 January this year. The department has farewelled Alan Nicholson after five years of guiding and leading the department. His contribution was celebrated at a function towards the end of last year and one of the mementoes of the occasion was the unveiling of a new plaque on the wall outside the head's office tabulating the heads of department since Harry Hopkins in the 1950s through to Alan in the new millennium.**

Alan's contribution to the department during his tenure as HOD has been substantial and I will not do it justice with just a few words here. He has guided the department through the transition from a semi-autonomous unit to a member of the new College of Engineering. In doing so he has enabled the department to retain its own high profile and identity, while at the same time contributing to the successful operation of the college. His skilful financial management and careful stewardship of our resources has enabled the department to expand through the appointment of departmentally funded postdoctoral fellows and through the provision of departmentally sponsored PhD scholarships.

Our department has been the most sought after by new intermediate students during these five years and Alan has managed the expansion of undergraduate numbers with care. We still offer our students a strong education that prepares them well for their future in the engineering, research and other professions that they choose to follow.

Despite being the largest engineering department in the university, and in fact one of the largest departments overall, the department has retained a strong sense of collegiality. Staff morale is high, as indicated by a recent survey of staff perceptions, and we continue to attract and retain high calibre academic, technical and administrative staff. Alan has played a key role in sustaining all of these measures.

A department's success is largely due to the successes of its staff and the teams within it. However the Head of Department to a large degree controls the environment in which these individuals and teams flourish and in this respect Alan has been a very successful leader of the Department of Civil and Natural Resources Engineering over the last half a decade. The department thanks him sincerely for his work on our behalf.

*Roger Nokes*

## Welcome Roger

The period 2005-2009 inclusive has seen the Department grow considerably, largely in the water-related areas (Environmental and Natural Resources Engineering) and to a small extent in Transportation Engineering. The development of greater strength in these areas has made the Department less vulnerable to fluctuations in the demand for teaching and research in any particular area of Civil and Natural Resources Engineering.

The growth has not been without difficulties. There has been a major effort put into making appointments, and I am pleased that those efforts have not been in vain, with very good appointments to academic, administrative and technical positions. We remain constrained by the shortage of suitable office, teaching and research space.

Much of the strength of the Department stems from the high level of commitment to working as a team, and there has been a substantial increase in teaching and research collaboration between staff within the Department. In my role as Head, I have been assisted greatly from having a team of senior staff who have willingly shared their knowledge and experience with me, along with other staff who have willingly taken on a range of tasks.

I am very pleased that Roger Nokes has been willing to take on the role of Head, and has the support of the Department in doing so. I believe the Department is in very good heart and is well-placed to thrive well into the future, and am confident that in due course, Roger will be making very similar comments when his successor takes over.

*Alan Nicholson*

## CNRE News – Number 23, 2010

*Editing/Design:* Daniel Tsang and Elizabeth Ackermann

*Printer Production:* The Caxton Press

Many thanks to all those who contributed articles and photos in the making of CNRE News.

CNRE News is an annual publication by the University of Canterbury Department of Civil and Natural Resources Engineering. It is for staff, students, alumni, friends and industry. Views expressed are those of the contributors, not necessarily the University.

*Enquiries should be directed to:*

University of Canterbury, Department of Civil and Natural Resources Engineering,  
Private Bag 4800, Christchurch 8140, New Zealand.

Attn: CNRE News Editor

# Engineer signs off after 42 years at UC



Professor Athol Carr still enjoys teaching engineering students after a 42-year career at UC.

**After 42 years at UC, Professor Athol Carr (Civil and Natural Resources Engineering) has retired – but he hasn't yet left the building.**

There's still a course to finish teaching this year, possibly another next year, a course in Italy to teach and Iceland to visit. He is also still helping supervise seven PhD students.

"I like to keep busy. I'd rather be busy than bored," he said.

His research interests include structural mechanics and dynamics, finite element analysis, computer-aided engineering, bridge vibration, earthquake engineering and engineering software. He is the co-author of two books, more than 300 academic papers and has supervised 46 masters students and 29 PhD students.

Professor Carr started at Canterbury when the University was on the town site in 1960 and moved in his second year to the new Ilam campus, finishing his degree in 1963. After a short stint working with a consulting engineer in Christchurch he went to the University of California, Berkeley, where he did his masters and

PhD degrees. Before returning to New Zealand he looked for work and approached Harry Hopkins, the then head of department, to see what was happening at UC.

"He told me that there was a job opening coming up. I sent in my CV and a copy of my thesis for the positions which closed on the 30 June and, surprisingly, on 13 July I got a cable to say that I could start as a lecturer on 1 February for \$4000 a year."

When Professor Carr took up his job at the University in January 1968, the Ilam campus was still in the early stages of being built.

That same year the University got the new IBM360 computer.

"I had heard rumours from the US about the 360, in particular about the poor precision and poor accuracy, which turned out to be true."

The IBM360 was one of the first mainframe computer systems. It used microcode to implement the instruction set, featured 8-bit byte addressing and binary, decimal and floating-point calculation with 128 kilobyte of

main storage. For the next computer purchase, Professor Carr was instrumental in ensuring that no further IBM 360 series computers were bought and the University instead acquired a Burroughs 67600 computer. At the time Professor Carr and postgraduate students were responsible for 10 per cent of all the University's computing.

His interest in simulating shell structures led to work for the Marine Department analysing ferrocement fishing trawlers. He was also interested in earthquake responses of buildings and bridges.

"The 80s was easier with the introduction of personal computers. They were slow, but they were a big change and with that my teaching of mathematics increased," he said.

In 1981 he was asked by the Dean of Engineering to investigate the possibility of a computer-aided design facility (EngCad) for the School of Engineering. The first computers were obtained in the mid-1980s and later the first ethernet cabling on campus was used to link the EngCad laboratory and the four engineering department's computers.

As computer capabilities developed so did Professor Carr's research in modelling, numerical analysis and methods for seismic behaviour of different structures including a wide range of materials and systems including concrete, steel, unreinforced masonry, energy dissipation devices and base isolation.

In 1976, a 20-year collaboration began with the Wool Research Organisation of New Zealand (WRONZ) at Lincoln into the modelling of wool yarns.

"Initially this was real 'blue skies' research, we had no real idea that this might be really useful. However, after two PhDs and one masters student we could model the yarn in tension, bending, twist and compression. At that stage the rest of the world was coming to see what WRONZ was able to do."

Although Professor Carr retired last month, his year ahead is still very full of academic commitments. In his spare time he intends to spend a bit more time restoring old tractors.

He will also work on further developing his computer software products that are currently used in 110 universities and building research institutes, as well as a few consulting practices around the world.

# New Staff



**My name is Brendon Bradley and I joined the department faculty as a lecturer in Structural Engineering in February 2010.**

Prior to this I spent a year working at GNS Science in Wellington as a seismic hazard

modeller. I am not really a new face to many, having completed my BE(Hons) and PhD here in the department in 2007 and 2009, respectively.

My research activities lie primarily in earthquake engineering, with interests including seismic hazard analysis and strong ground motion prediction; structural and geotechnical seismic response analysis; seismic risk analysis and risk communication; and the role of probability and statistics in civil engineering. Reconnaissance experience of the 2009 Samoan Tsunami also has me interested in building fragility models for assessing tsunami risk to New Zealand.

I am currently teaching undergraduate courses in engineering mechanics, engineering mathematics, and structural dynamics. Soon, when time permits, I hope to be actively involved in postgraduate teaching also.

If you have any questions on research or teaching in any of these areas feel free to come and talk to me. Thanks!



**My name is Cedric Lambert and I joined the University of Canterbury in January 2010. I was born in Spain and I grew up in France where I did all my studies.**

Before relocating to Christchurch, I spent 4 years in Brisbane (Australia). In Brisbane I worked for CSIRO as a postdoc in the Exploration and Mining group. My role involved the development of numerical tools based on Discrete Element Method to help mining companies improving the design of pit walls and the management of instabilities.

I graduated in 2005 from the Grenoble Institute of Technology with a PhD in geomechanics. The thesis was devoted to multiscale modelling of rock slope instabilities. My case study was the stability of the south east corner of the Acropolis in Athens (Greece).

In my recent research projects, I have applied DEM to various problems, strength of rock discontinuities, behaviour of rock masses, long term impact of leaching on concrete. I recently started a project on the management of rock fall hazard. My research interests are gravitational hazards in general (slope stability, landslide, rock falls...) and developing DEM applications for geotechnical problems.

I am really excited in being here and working again within a student environment. Very challenging though...



**I am Eric Scheepbouwer, I joined the University of Canterbury several years ago as a senior tutor, and I have recently accepted a position as a fixed term lecturer in Construction and Project Management in**

**the department of CNRE.**

Before I finished my BE(Hons) here at Canterbury I graduated in management and system engineering at the Royal Naval Institute (and partly at TU Delft) in the Netherlands. I worked for about 16 years before coming to NZ, starting in the RNL Navy and then as a consultant/project manager on assignments primarily in asset management and the transport sector. At this moment I am finishing my PhD in outfall discharges (fluids).

My current research focuses on complex project management; I am working on a US-led international research program (funded by the Transportation Research Board) into complex project management which aims to supply a teaching program for senior project managers. Closer to home I am working on finding out the factors that influence productivity in the NZ construction sector. While in NZ I also take advantage of the experiences with new innovative procurement strategies like alliances, early contractor involvement and performance based contracting.

Presently I teach in undergrad courses the topics relating to project management and management of engineering systems and I assist in several postgraduate courses of our Construction Management program. Whilst doing this I enjoy the collaboration I have with construction management academics and professionals from across the globe.

Their involvement helps me work towards making the teaching of construction and project management current and practicable by incorporating best practices from industry. In short, I enjoy being a part of the growing movement into improving project and construction management in this beautiful country!



**My name is Anthony Abu and I joined the Department of Civil and Natural Resources Engineering in November 2009, after completing a PhD in Civil and Structural Engineering from the University of Sheffield, UK, specialising**

**in the behaviour of Steel-Concrete Composite Floors under large deflections and in Fire.**

In that period I had brief stints working with a number of specialist Structural Fire Engineering companies including Buro Happold, UK and Vulcan-Solutions Ltd, UK.

I hail from Ghana, but have so far spent most of my time outside it: part of my primary education was in Nigeria; I did my undergraduate studies in Civil Engineering in the Turkish Republic of Northern Cyprus, before going on to Sheffield, UK for my doctoral studies. Now I'm in New Zealand as the Fire Service Commission Lecturer. It appears I have an affinity for islands.

My research is primarily on the behaviour and design of steel structures in fire conditions. The research is aimed at quantifying inherent fire resistances of structures, to allow optimisation of fire protection for safe and economic structures. The philosophy can be extended to other materials, such as concrete and timber – an area I'm particularly interested in due to the limited environment and the potential benefits Ghana can derive from the good use of its vast resource. At the University of Canterbury, I teach Structural Fire Engineering, part of the Masters in Fire Engineering (MEFE) programme, and assist with undergraduate teaching in structural engineering.

I am interested in collaborative research in these and related areas, so please do not hesitate to contact me.

# Water/Environmental/Hydro-Eco/Fluids



## Smart Markets for Groundwater Allocation

**Civil and Natural Resources Associate Professor Mark Milke has been working with Senior Lecturer Dr John Raffensperger and Adjunct professor E. Grant Read, both of Management Science, on the development of a smart market approach for groundwater allocation. The group recently published their work in the journal Operations Research in an article titled, “A Deterministic Smart Market Model for Groundwater.”**

The smart market is a periodic auction where commercial water users could trade water. The smart market is cleared with the use of an optimisation model that allocates water within the physical constraints of the groundwater system and environmental constraints. Unlike other market methods that make trades pairwise with government approval, users buy and sell through a common pool. A catchment manager makes payments to users who are willing to sell their allocation, and gives more water to those who would pay for it.

There are numerous benefits of the smart market approach. Through the use of a smart market, groundwater users may benefit from better allocation and the environment can benefit from better control. Additionally, government can benefit from a simpler allocation system that can be done quickly and with minimal transaction costs.

Dr. Rebecca Teasley, post doctoral fellow in Civil and Natural Resources Engineering, has joined the research effort with Dr Mark Milke and Dr John Raffensperger to extend the groundwater smart market work. Rebecca will be examining the effects of including surface water, particularly hydropower generation, into the groundwater smart market.

## Environmental Forensics on Campus

**Recent research within the University’s Hydrological and Ecological Engineering (HydroEco) Group involving environmental forensics of waterways running through the University has confirmed suspicions about contamination sources.**

Senior lecturers Dr Aisling O’Sullivan, Dr Tom Cochrane, and postdoctoral fellow Dr Daniel Wicke (Civil and Natural Resources Engineering) of the HydroEco Research Group have quantified stormwater entering the Okeover and Avon campus waterways since 2006. Ingrid Cooper and Will Jacobsen, UC Summer Scholarship students, were part of the HydroEco monitoring team that investigated metal concentrations specifically entering the Okeover from campus roofs and air-conditioning discharge over the summer.

The summer research project, which comprises part of the group’s overall stormwater monitoring and modelling efforts, was one of the first to utilise the University’s recently acquired inductively coupled plasma mass spectrometry (ICP-MS) instrument. The ICP-MS measures metal concentrations and is housed in a purpose-built facility in the Chemistry Department, which was officially opened last October.

The recent research confirmed suspicions the researchers had held about the impact of air-conditioning inputs and roof runoff on water quality in the Okeover stream. While contaminating sediments and metals including zinc, lead and copper enter these waterways from roads, carparks, and buildings within the whole stream catchment, there is additional copper contamination from deteriorating air-conditioning pipes and roofs made from copper on the University campus.

“We had a suspicion that our air-conditioning systems were a source of copper entering the Okeover but wanted to verify this through extended sampling and flow monitoring” said Dr O’Sullivan.

The University has three main air-conditioning inputs to the stream — the Erskine (Mathematics and Statistics), Engineering and Commerce



buildings. Although this water provided to the stream is essential for flow, it has not been entirely benign, said Dr O’Sullivan. Corroding air-conditioning pipes from the Engineering building had caused constant leakage into the stream and the researchers picked up copper levels two to five times higher than the Australian and New Zealand Environment and Conservation Council (ANZECC) guidelines for protection of aquatic species in the samples they took.

Water samples taken over summer were collected just prior to the pipes leading from the engineering building being changed from copper to plastic. Researchers will be able to follow up with new measurements to assess how clean the new pipes are compared to the old copper ones. Other recent work by Facilities Management that will support improved stream water quality includes new buildings not using any copper-based artesian cooling distribution pipework that then discharges into streams, isolating copper cooling pipework in the Commerce building, and substantially upgrading stormwater filtering in two large car parks.

The researchers also quantified the amount of copper entering the Okeover from copper roofing, and stormwater run-off from UC car parks when it rains.

“The levels of copper we collected from the roof run-off were substantially above the ANZECC guidelines. Although only for the duration of a storm event, these high concentrations can be detrimental to aquatic organisms,” Dr Wicke said. Additionally, zinc and copper from road run-off

originating from Ilam road and campus roads during storm events exceeded these guidelines. The road run-off findings are indicative of a range of contaminants that are likely to be entering streams from roads and carparks throughout Christchurch.

“In order to ascertain the most practical and cost-effective solutions for managing stormwater, we need to know the amounts we are dealing with. This is why we initiated our stormwater monitoring and modelling research on campus” said Dr O’Sullivan.

“Okeover Stream has been re-vegetated and is aesthetically pleasing but actually the water quality of the stream is quite impaired. Along with our freshwater ecology colleagues in Biological Sciences, we are hoping our research will help rehabilitate these campus waterways to restore their ecological integrity” said Dr O’Sullivan. Such research is also informing a pilot urban waterways community engagement project within the Okeover Stream catchment by Environment Canterbury staff in partnership with UC Sustainability Advocate Dr. Kate Hewson (Facilities Management).

## New Engineering in Developing Countries Course

**In 2009, a new course was offered in Natural Resources Engineering entitled ENNR 451 Engineering in Developing Communities.**

The course was taught by Drs David Wareham, Tom Cochrane and Tonny de Vries with the course objectives being to enable students to become familiar with a suite of tools relevant to the application of water, sanitation, and land engineering technologies in developing communities. Heavy emphasis was placed on being able to understand the issues associated with the design and implementation of engineering infrastructure in the developing world. A particular focus was on appreciating the interaction between technical and non-technical issues, especially as they relate to engineering in a culturally relevant and sustainable manner. Innovative assignments included dividing the class into teams of four and asking each team to put on a play illustrating some aspect crucial to education in a developing community, such as transmitting information about proper health and hygiene practices, water supply protection, and the issues associated with a lack of proper sanitation. The students did an excellent job of the plays and really got into the spirit of things, using innovative props and costumes to get their messages across. Another assignment again



involved teams of 4 with the objective being a fund-raising exercise such as an op shop, quiz night or sausage sizzle etc. A total of \$2,391.50 was raised by the class and this money went to supporting charities of their choice working in water and sanitation issues in the developing world. These included Engineers Without Borders, World Vision and Oxfam: Water for Survival. ENNR 451 is running again in 2010 but this time it is open to civil engineering students up to a maximum of 40 students.

## Research in Cambodia and Laos

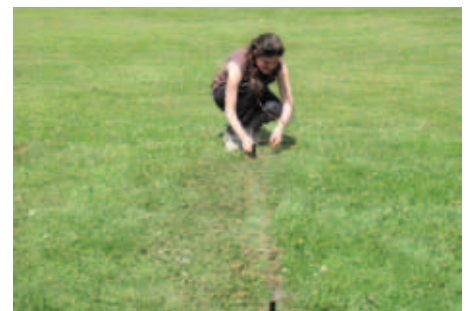
**Mauricio Arias (PhD student) and Tom Cochrane (lecturer) from HydroEco group travelled to Laos and Cambodia as part of a grant from the Critical Ecosystems Partnership Fund.**

The purpose of the trip was to explore needs and partnerships for a project to study the impact of dams on the hydrology and ecology of the Mekong River and the Tonle Sap (Great Lake). The Tonle Sap is connected directly to the Mekong by a river that flows downstream during the dry season and upstream during the wet season (very unique indeed!!). They met with various stakeholders including the Mekong River Commission, World Fish Centre, local government officials, and various NGO’s working in the region. For his PhD, Mauricio is planning to study sediment fate and lake ecosystem productivity as a function of hydrological changes brought about by the implementation of hydropower dams along the Mekong basin.

## Irrigation Installation

**An irrigation system of pop-up sprinklers was installed by Dr Tonny de Fries during the summer break beside the Biology Glasshouses.**

The system will enable five lawn irrigation regimes to be tested over a hot windy Christchurch summer. A lot of digging, blisters, and tired muscles lead to glee when the sprinklers were finally turned on soaking those trying to adjust them.



# Timber/Structural/Geotechnical

## STIC Research Consortium

**A large timber research programme is continuing in the Department, mainly funded by the Structural Timber Innovation Company Ltd (STIC).**

STIC is a Research Consortium funded by industry and government. The major shareholders are Carter Holt Harvey Wood Products, Nelson Pine Industries, Wesbeam, and BRANZ. The UC component of the research is in three main streams – construction and seismic performance of structural frames and walls, fire safety, and sustainability. This includes long-term testing of post-tensioned LVL beams and the development of new details for beam-column connections.

The Department hosted a STIC Research Workshop in November 2009, attended by all the UC researchers, plus teams of academic staff, Post-Docs, postgraduate students and visitors from the University of Auckland and the University of Technology Sydney (UTS).

The UC staff participants were Andy Buchanan, Stefano Pampanin, Alessandro Palermo, David Carradine, Stephen John, Bruce Deam, and Peter Moss, with help from Michael Spearpoint and Tony Abu (Fire Engineering), also David Evison (Forestry) and Alan Tucker (Mechanical Engineering).

UC presentations were made by PhD students Michael Newcombe and Asif Iqbal who are investigating seismic design of multi storey timber buildings, David Yeoh and Nor Hayati Ghafar who are studying timber-concrete composite floors, Manoochehr Ardalany who is testing LVL beams with holes for building services, Tobias Smith who is looking at cost and construction sequence, and Nicolas Perez who is rapidly becoming an expert in the operational energy required for heating and cooling of large timber buildings.

Contributions were also made by Masters students Denis Pino, James O'Neill, Kevin Tsai, Gordon Grant, and Ricky Wong, as well as academic visitors Jesus Menendez, Simona Giorgini and Pasquale Riccio and summer scholarship students Robert MacGregor, Mike Cusiell, Chris Watson, Jeremy Green and Nathan Gilling.

The University of Auckland team was led by Professor Pierre Quenneville, focussing on long-span roof structures and fasteners, and the UTS team was led by Professor Keith Crews, focussing on timber and timber-concrete composite floors for multi storey timber buildings. Robert Finch, CEO of STIC, was involved in all activities.



## STIC Research Workshop

The Workshop was held in May with researchers from Canterbury and Auckland Universities, as well as UTS in Sydney over two days last week. The workshop was very productive and was a great opportunity to meet and make those vital connections.



## New Building Retrofit Technology

The Continuous Column Concept is being used to retrofit a number of buildings in Tokyo. This concept was developed by Gregory MacRae, a post-doctoral researcher, Yoshihiro Kimura, and his student Hiroyuki Tagawa.

The Architectural Institute of Japan (AIJ) recognised this concept by giving a young researchers award to Dr Kimura. Subsequently, the concept was used in an innovative way that was never intended! It is used as part of a retrofit solution for a number of multistorey structures in Tokyo.

The photo shows Associate Professor Gregory MacRae and a Chinese colleague in front of one building retrofitted with a continuous wall pinned at the base. This wall mitigates the possibility of large drift concentrations in individual stories. MacRae was invited to the 7th CUEE and 5<sup>th</sup> International Conference on Earthquake Engineering (ICEE) Joint Conference of Urban Earthquake Engineering (CUEE), Tokyo Institute of Technology from 3-5 March 2010 where he presented a paper describing the background, development and use of this very simple, but powerful, concept.



## Steel Structures Research Workshop

A two day workshop on Research Directions for Steel Structures was held at the University of Canterbury from 13-14 May 2010.

It was sponsored by the NZ Earthquake Commission, the NZ Heavy Engineering Research Association (HERA) and Steel Construction NZ (SCNZ). It was chaired by Associate Professor Gregory MacRae of the University of Canterbury and Charles Clifton of the University of Auckland.

More than 45 influential people from academia, from research organisations, and from industry participated. In addition there were three international keynote speakers. These were: (1) Professor Michel Bruneau from the University of Buffalo, New York. He is the former head of the Multidisciplinary Centre of Earthquake Engineering there; (2) Professor David Mukai from the University of Wyoming, an expert on heat straightening of steel; and (3) Professor Akira Wada from Tokyo Institute of Technology who is one of the most influential practical structural engineering researchers in Japan.

Structural steel is now involved in the majority of multistorey structures in New Zealand and recent NZ steel structures have won international innovation awards for their ability to withstand major earthquakes with almost no damage. This workshop was successful in establishing the research goals for NZ in the next few years.



## WCTE 2010

The 11th World Conference on Timber Engineering was held in Riva del Garda, Italy from 20 to 25 June 2010. Of the total of 650 delegates, there were twelve people from this Department, half of the Kiwi delegation.

Staff members attending were Professor Andy Buchanan, Associate Professor Stefano Pampanin, Senior Lecturer Dr Alessandro Palermo, Dr Stephen John, and Dr David Carradine. PhD students Nicolas Perez, James O'Neill, Manoochehr Ardaly, Mike Newcombe, Tobias Smith, and Mike Cusiel, plus ME student Denis Pino. Possible new PhD students Farad Homayoun Shad and Ema Cubrinovska were also in attendance, together with Robert Finch, CEO of STIC Ltd and Clive Tilby, Chairman of the STIC Board. Over a dozen papers were presented by UC students or staff. The next World Conference will be in New Zealand in 2012.



## Learning from Earthquakes Mission

Patricio Quintana-Gallo (PhD student) was on holiday in Valparaiso his home town in Chile when a 8.8 magnitude earthquake struck on 27 February during the early hours of the morning. He returned to Chile in April on a “Learning from Earthquakes Mission” sponsored by the NZSEE (New Zealand Society for Earthquake Engineering).

Patricio joined a team of 14 people with expertise and interest in different disciplines (structural, environmental, geotechnical, electrical engineers, seismologists, architects) lead by Peter Smith (NZSEE president) and Hugh Cowen whose main goal at the first stage was the preliminary assessment of the overall situation looking for equivalency with New Zealand.

Patricio thought it was a mess in aftermath of the earthquake.

“You see the number of deaths and we all know that most of them were preventable. The main disaster protection system failed badly. Both,

the government with no preparation for an event of this magnitude, and negligence of the Army organization in charge of the tsunami alert SHOA, led to a complete disaster. It was incredible that the official alarm of tsunami was given minutes after the first wave struck the shore in Talcahuano. Life-lines were also collapsed in Concepción area during a quite long period, according to the report of the people in the area.”

“I remember being in a situation where panic was everywhere, with contradictory and erratic information from the media. Overall my perception is that the Chilean reaction was poor. The earthquake was a good lesson.”

Overall engineered buildings performed overall well, but my concern is that in reinforced concrete at least, did the buildings remain with no damage, or did they undergo brittle inelastic incursions. Many buildings that I inspected in Valparaíso and Concepcion consistently has the same problem in the walls due to inadequate detailing and a lack of capacity design principles. Retrofit of these buildings will be needed in the near future.”

“Improving practical implementation is one of my PhD project objectives and it would be good to implement a real retrofit intervention in Chile and/or New Zealand. In Chile, there is an urgent need for assessment of structures before we think retrofit, but repairing buildings is an important issue now.”



## Debris Flow Research in Switzerland, Canada, and New Zealand

2009 was a busy year for debris flow research in the department. In May of 2009, PhD candidate Patrick Kailey and Senior Lecturer Dr Elisabeth Bowman traveled to ETH, Zurich, to conduct a series of debris flow experiments in a geotechnical drum centrifuge, as part of a project funded by the EQC.

Patrick took the long way home, stopping in Canada to do some field mapping with collaborators at University of British Columbia. They were then invited back to ETH for another short round of tests in December 2009. Patrick gives a light hearted summary below.

The things we do for research. In April last year, my supervisor Dr Bowman handed me a plastic container of suspicious looking white powder, which I had to pack in my luggage.

“This is Methyl Cellulose, we need it so we can increase the viscosity of the pore fluid we use during the debris flow experiments. Otherwise, at high g, the fluid drains out much too quickly and we can’t match consolidation behaviour between the model and prototype.”

Right. Somehow, I didn’t think that line would work on Swiss border agents. Fortunately, I learned that despite their steely demeanours, Swiss customs don’t check your luggage that carefully.

Once safely in the country, we conducted 17 debris flow tests with the help of Sarah Springman, Jan Laue, and especially Markus Iten, the centrifuge technician and my personal saviour on a number of occasions. The drum centrifuge at ETH is one of only a handful of drum centrifuges in the world. It allows us to run tests at stress levels that are much closer to field scale

than are possible in conventional flume tests, and unlike a traditional beam centrifuge, the surface of the drum can be used as a runout surface for debris flow deposition.

The first round of testing was focused primarily on modelling debris flow entrainment. Many catastrophic debris flows are triggered as relatively small translational landslides or rockfalls, then grow exponentially by entraining debris as they flow downslope. Despite its importance, the process of entrainment is not well understood because it is extremely hard to observe and measure in the field. However, centrifuge testing makes observing erosion possible. The flume’s clear, Perspex sidewall provided a cross-sectional view of the flow as it passed over the bed, which was recorded with a high-speed camera. Surprisingly, the mechanism of this erosion in our experiments was scour and progressive knickpoint retreat, not drained or undrained loading as hypothesized.

With these lessons in mind, my next stop was University of British Columbia, Canada. Canadian customs agents are friendlier, but decidedly more suspicious than the Swiss. Apparently they thought my set of sieves might be an incendiary device, and soon I found myself trying to explain why anyone in their right mind would sieve 80 kilograms of dirt (I still don’t know) and why accurately modelling debris behaviour requires a well-graded particle size distribution. Half amused, half confused, they eventually let me into the country.

From Vancouver, a quick 10 hour drive inland deposited me at the toe of the Hummingbird Creek debris flow, an event that, in the debris flow world at least, is steeped in mystery and lore

(Jakob 2000). On July 11, 1997, seepage and runoff resulting from a clogged culvert sent about three times the usual amount of water into the Mara Creek Catchment, initiating a 25,000 m<sup>3</sup> debris avalanche. Once in the gully, the avalanche evolved into a debris flow which entrained 23 m<sup>3</sup> of debris for every meter it travelled. The end result was 92,000 m<sup>3</sup> of deposition on the fan, making it the largest non-volcanic debris flow event ever recorded in British Columbia.

Field surveying the flow, even 13 years after the event, was extremely valuable. There are only a handful of people world-wide with extensive experience mapping these events and my guides for the trip, Jonathon Fannin of the UBC civil engineering department and Peter Jordan, the regional geomorphologist for interior B.C., are a few of the elite. The data and field methodology that Jonathon and Peter have helped develop in B.C. have served as a model for the data-set we are creating in New Zealand. The size and catastrophic nature of the Hummingbird Creek event has also been a useful comparison to the smaller, less catastrophic flows mapped thus far in our data set. Gathering more field data and comparing to case studies of large, destructive events may eventually shed light on why some events entrain catastrophic amounts of debris while others do not.

When I returned to New Zealand after field mapping in B.C., I thought my jet-setting ways had come to end. Fortunately, we were invited back to ETH to do another set of experiments last December. 80 kilograms of sieving and a short flight later, I again found myself crammed into a giant spin-dryer, painstaking scraping up dirt. This time we focused on fixed bed tests, as we wanted to explore the effect of varying the moisture content, flow volume, and the pore fluid used in the experiments. The second round of testing demonstrated that, momentum considerations aside, the runout of the flow is largely controlled by consolidation processes. The results also suggest that the mechanics of channelized flow and unchannelized deposition are fundamentally different.

I’ve been back in New Zealand recovering from the travel bug for almost six consecutive months now, a personal record. However, it is infecting the geotechnical group more than ever. Kim Rait, a fellow PhD student will be leaving shortly for Norway to present her work on rock avalanche mechanics. Dr Bowman and Nicoletta Sanvitali, visiting researcher from the University of Padua and working on a Marsden-funded debris flow project, will present a paper in July on their flume studies back in Zurich at the International Physical Modelling in Geotechnics Conference, and Associate Professor Misko Cubrinovski is busy planning trips to Macedonia and Chili for conferences. The research journey can lead to some strange places, but wherever it leads, the geotech group will be ready to get its hands dirty, or at the very least, present a paper.

## First University Student Ever Named IPENZ Young Engineer of the Year



University of Canterbury PhD student Michael Newcombe has become the first university student to be named Young Engineer of the Year at the New Zealand Engineering Excellence Awards in recognition of his work on the development of an innovative timber construction technique.

After completing his first degree at the University of Canterbury, Michael did a Masters in earthquake engineering at the University of Pavia in Italy. He has continued to build on the research he undertook in Italy and is working towards a PhD on the design of reinforced wood structures using laminated veneer lumber held together by high-strength steel.

His research focuses on the use of timber as a structural material in multi-storey buildings and specialises on earthquake performance. He is part of the large research consortium Structural Timber Innovation Company (STIC) which is working to increase the use of wood in the construction industry.

Michael's research is based on an innovative UC timber construction technique enabling buildings to be assembled on site from prefabricated elements. In order to create strength, steel tendons are run through the centre of the timber beam and tensioned.

"They act like rubber bands connecting the entire structure," he says.

"STIC has been able to dispel a number of myths or mistruths about using timber in multi-storey buildings – such as fire safety, earthquake resistance and durability.

"Recently there has been renewed interest in multi-storey timber buildings within the New Zealand government sector that is having a flow-on effect to the private sector and international markets," Michael says.

Aside from the sustainability elements, the research by STIC has the potential to establish a new industry and add value to the forestry industry. A major element of Michael's PhD work has been the construction of a two-storey experimental building within UC's College of Engineering.

The experimental structure has performed extremely well in earthquake simulations, remaining undamaged after being subjected to the equivalent of a magnitude seven earthquake. This has been attributed to the inherent flexibility of timber.

The research work is now moving into the commercialisation stage, with a three-storey building using the new construction technology due to be built in Nelson.

The New Zealand Engineering Excellence Awards are the premier awards for New Zealand's engineering profession. The young engineer award is given to someone who is judged to have made the most excellent contribution as an engineer, as a leader and/or through community involvement. Those eligible for the award this year had to have completed the final year of their first engineering qualification in 1999 or later, and have been no older than 33 on 1 January 2009.

## Timber Engineering Update

### Test building to be relocated

The two-storey timber test building in the Structures Extension Lab is to have a new life as an office building. The building has been through a battery of seismic tests, carried out by PhD student Michael Newcombe, resulting in almost no structural damage. The building will be dismantled by the Mainzeal Construction team who built it a year ago, and it will be reassembled on concrete foundations near the Physical Sciences Library on the UC campus with a new roof and cladding. Architect Thom Craig has provided architectural services and the structural engineering is provided by Holmes Consulting Group, under the management of David Carradine.

### Timber seminars

Researchers in the timber engineering group gave a number of seminars during 2009, including a one-day seminar on seismic design of timber structures, presented in both Christchurch and Auckland. The main presenters were Stefano Pampanin, Michael Newcombe and Bruce Deam, with help from Andy Buchanan and industry participants. Timber engineering papers were also presented at a number of national and international conferences, including the conference of the New Zealand Society for Earthquake Engineering, the CIB W-18 meeting in Zurich, the Non-Conventional Materials Conference at Bath University, and others

### International collaboration

The Timber Engineering Group is part of an international research exchange scheme which will allow staff and PhD students to travel to and from European countries. This programme allowed Alessandro Palermo, Andy Buchanan, Nicolas Perez and James O'Neill to make academic visits before or after the 11th World Conference of Timber Engineering in Italy in June 2010.

# Fire/Transportation/Management

## Engineering Students Tackle Ilam Road Design Issues

**The ideas that have come out of a fourth year transport engineering project will be used in an actual upgrade of Ilam Road by Christchurch City Council (CCC) traffic planners. Six groups of four students recently presented their “real world” solutions to the problems of Ilam Road to an audience that included members of industry and the “clients” of the city council and the University.**

The student team comprising Matthew McAlpine, Pamela Wilson, Ian Robertson and Tharindu Hapugaskumbura won the best poster prize, which was sponsored by the Institution of Professional Engineers New Zealand (IPENZ). Their design suggested reverse-in angle parking with a meandering roadway, pedestrian crossings with signals and an off-street bus interchange.

“We have been so impressed with results that we have decided to incorporate a lot of what the students designed into our Long Term Council Community Plan (LTCCP);” said Mr Simon Ginn, CCC Network Planning Team Leader – Transport. “Transport improvements for Ilam Road are in our LTCCP. We’ll take concepts from each project and build on them. I said to the students that they’ll see elements of their work in our Ilam Road improvements, that is how impressed we were.”

The course is designed to give fourth-year ENCI498 students a “real world application” of transport problems and an insight into client relationships, said Senior Lecturer Dr Glen Koorey. “Ilam Road is a road with problems. In the past it had been put in the too-hard basket,” he said. “It is not a friendly road for pedestrians or cyclists. It’s difficult to get across. There are nearly 9000 pedestrians crossing each day, coupled with being on four bus routes. It’s chaotic and rather scary. “It was serendipitous in that Ilam Road was recently added to the LTCCP, so many of the ideas that the students have come up with may be put in place. It’s a great example of industry working with the University;” Dr Koorey said.

The groups replicated typical tasks undertaken by professional engineers to develop a viable solution for the site, such as traffic data analysis, intersection modelling, geometric design, cost estimation and public consultation. They also had to take into account a CCC plan to create a suburban bus interchange at the University. The student groups each had an industry mentor whom they met with once a week to review the tasks completed the week before. The next

hour included a lecture, with the rest of the day left clear for the students to complete the next weekly task that had to be handed in the following day.

The resulting designs were submitted with technical reports complete with cost and benefit analysis and posters explaining the proposals to a general audience. The final assessments involved 20-minute presentations to the clients, followed by a poster display session to an audience of staff members, friends and family, members of industry and IPENZ.

Dr Koorey said the projects differed widely. “There were quite a variety of street treatments, roundabouts, traffic signals. How they treated pedestrians, crossings and parking was all quite different – there were some very nice concepts,” he said. “I’m very pleased with the outcome.”

## Transportation Research Board Meeting in Washington DC

**The Annual Board meeting was held on 10 to 14 January. For a sense of scale about this event: over 10,000 delegates attended this event, hosted over three hotels and comprising over 600 separate presentation, poster and committee sessions during 5-6 days.**

Glen presented a poster at TRB (co-authored with recent MEngSt student Elizabeth Mangundu). Dr Koorey is one of three international representatives on the TRB Bicycle Committee. Dr Koorey also managed to hop on a bike while in DC to do a tour of local facilities, hosted by the local Transportation Dept bike planners. (Note that the maximum temperature in DC during the 3 hour tour was a balmy 4 degrees! The picture is outside the new glass “bike station” next to Union Station.)

Lecturer Dr Eric Scheepbouwer presented a poster at TRB (co-authored with frequent visitor to the Department, Douglas Gransberg, who was also at TRB). Dr Scheepbouwer also gave an oral presentation at TRB and has also been nominated to join the TRB Construction Mgmt Committee.

Fred Pedroso, PhD candidate, presented two posters in the form of presentations – here he is busy with his talk on Dynamic Response Recovery Tool for Emergency Response within State Highway Organizations in New Zealand. He received positive feedback from people who worked in the most recent hurricane events in the USA and were pleased to see that our work had correctly and accurately represented and solved the issues that are commonly observed in major disasters. The Resorgs research team received various requests for further information.



## Transport Postgraduate Research Forums



There were two postgraduate research forums held in 2009 where Lecturer Dr Kenneth Kuhn presented his work designing scheduling algorithms for airport service vehicles. Senior Lecturer Dr Andre Dantas described his experiences working at MWH in Brisbane during his recent study leave. Attendance was strong at both presentations.

The forums allowed students and others interested in transport to meet and greet one another, while giving staff an opportunity to make official announcements regarding the transport programme at Canterbury. Look for more postgraduate research forums to come.

## Harry C. Bigglestone Award

Associate Professor Charley Fleishmann and Senior Lecturer Dr Mike Spearpoint were honoured to receive the 25<sup>th</sup> Harry C. Bigglestone award for the paper “Estimating Thermal Radiation Fields from 3D Flame Reconstruction” published in Fire Technology. The Harry C. Bigglestone Award is given annually to the paper appearing in Fire Technology journal that best represents excellence in the communication of fire protection concepts. The work involved contributions from researchers from Lincoln University, Tufts University as well as the University of Canterbury.

## WCTRS Young Author Award

The World Conference on Transportation Research Society (WCTRS) hosts transportation research conferences every three years. In 2010, over 1500 people attended presentations of over 1300 papers in Lisbon, Portugal. Lecturer Dr Kenneth Kuhn won the Young Author Award, given to the author of the highest rated paper written by someone under the age of 35. Dr Kenneth’s prize-winning paper was entitled “Pavement Network Maintenance Optimization Considering Multidimensional Condition Data” and challenged the common practice of combining data regarding the condition of an individual section of pavement into a discrete (often one-dimensional) composite condition index.

## Fire Engineering Update

### Fire Industry Advisory Committee

Industry leaders were again invited to the Department of Civil and Natural Resources Engineering to discuss the continued development of the fire engineering programme. The Committee represents major local and international employers, the New Zealand Fire Service and research providers. The panel used this year’s meeting to evaluate the roles of the Advisory committee itself and the New Zealand Fire Service Commission. It also discussed proposed course reviews in the Fire Engineering programme, the extension of the programme to include forest fires, future research directions and how best to improve links between fire engineering professional bodies and the department. Committee members in 2009: Chairman – David Barber (Arup Fire Australia), Paula Beever (NZFS), Michael Dixon (SFPE NZ Chapter), Darin Millar (Holmes Fire & Safety), Nick Saunders (Department of Building and Housing), Bob Taylor (FPANZ) and Greg Baker (BRANZ).

### News

Professor Nandivaram Elumalai Shanmugam and Professor Wan Hamidon Wan Badaruzzaman from the National University of Malaysia visited the Department on 19th March 2009. In particular they interacted with the Structures and Fire Engineering research groups and Malaysian postgraduate students. They were also given a tour of the research facilities at the department and a broad overview of the department’s research in steel structures and in fire engineering.

Professor Andy Buchanan was elected a Fellow of the Society of Fire Protection Engineers in July 2009.



Associate Professor Charley Fleishmann and Senior Lecturer Dr Mike Spearpoint, as part of the development of a web-based teaching resource for high school teachers on the science of fire, were interviewed and filmed burning pieces of furniture (<http://www.sciencelearn.org.nz/contexts/fire>).

# My Sabbatical Experience in Malaysia

**I was granted a sabbatical leave from 1 July 2009 to 30 June 2010. I spent the first half of my sabbatical leave as a Visiting Professor in the Department of Civil and Structural Engineering at the National University of Malaysia (locally known as UKM). I was there from July to November 2009.**

The University is located in a town called Bangi, about 50km south of KL. I knew that Malaysians are of three main races: Malay, Chinese and Tamil. But, to my surprise Bangi had 99% Malays; and even in the University I could rarely notice a non-Malay staff (there were many Chinese students though). My stay there also included the Muslim fasting month; i.e. Ramadan. During this month, most of the University cafeterias were closed and in the last one week none were open.

As I was being picked up and dropped off from/to my guest house by a University car, I had not rented a car and I could not go outside the university for my lunch. So, I had no other choice but to bring something (that did not deserve to be called a “lunch”) to eat so that my engine could get going throughout the day. Even in the evening, the only restaurant within walking distance of my guest house used to be full with dozens of local Malays gathered to break the fast (is that how the word “breakfast” started?). That one month was very tough on my stomach. Being a small town, Bangi did not have any public transport and Taxi; private vehicles were the only way to get around. I was really impressed with the prosperity of Malays in that village; almost every household had a car and a motorbike.

My guest house was reasonably good; I was provided with an air-conditioned one bedroom studio. It had a big open plan dining-living hall furnished with a lounge set, a dining set and a TV with satellite (ASTRO) connection and a small kitchen. Everything in the room including the carving in the frame of the lounge and dining chairs, the prints in the fabric cover of the sofa and chairs, the carpet, the paintings hanging in the wall, the scripts on the big hanging cloth demonstrated the Landlord’s fondness of Persian culture.

There was also a roofed and fanned patio outside with a nice set of couch and a table; with the view of the surrounding green forest and bushes it was perfect for spending the evening with a glass of beer/wine. A week after my arrival, I decided to take advantage of the beautiful setting and requested my driver to take me to a convenient store (I did not tell him that I wanted to buy beer; I knew he would not approve). I had guessed earlier that alcohol was easily the least



traded commodity in this 99% Muslim town, but I did not know that beverages were not sold in any stores except for one licensed supermarket in Bangi.

The guest house, despite being reasonably good, was located about 5km from the town centre and was in a small village called “old Bangi village”. There was nothing interesting to do in my spare time in this village. I used to be in the company of my colleagues in the office in the day, but in the evening I felt very lonely. With the lack of transport, I was stuck at the guesthouse; the TV and my cellphone were my best friends and everyday I used to talk to my family in Christchurch Weekends posed a bigger problem because I had to take the train to go anywhere and the nearest train station was about 3km away. Walking for half an hour in the humid and hot environment (the temperature used to be in the thirties) was not possible; I tried once and then gave up.

Through the watchman of the guest house, I negotiated with a neighbour to drop and pick me up to/from the train station in the weekends for 20 ringgits per trip. I used to go to Kuala Lumpur every weekend through this arrangement, but the neighbour refused to continue after 3 weeks as he understandably felt the money was not worth restricting his weekend freedom.

After suffocating for about 2 months, I decided to move out of the guest house and live in KL. My colleagues were surprised to hear that I was prepared to spend more than 2 hours to commute to/from the University every day. But for me the prospect of being able to go around in the city at will, having scores of restaurants in the vicinity to go for dinner/lunch, having a swimming pool/gym at my doorstep, the majestic view of the twin towers from my window was easily worth the stretched travel time. So for the rest of my stay, I moved to a furnished apartment on the 22nd floor of the May Tower Hotel and Apartments in downtown KL; and then started the happier days of my Malaysian sojourn.

I explored the cultural and commercial richness of KL during these days. With an efficient subway train network throughout the city, it was very easy to move around. Without any restriction I could go to visit different tourist attractions of KL whenever I had free time. Every evening, I used to go to a different restaurant for dinner, realising how rich KL was in terms of food varieties and how affordable the prices were. And every weekend, I used to join a group tour to different parts of Malaysia, which gave me the chance to savour and appreciate the cultural and geographical richness of Malaysia.

Amongst the places I visited is Putrajaya, the artificially established administrative capital of Malaysia with an impressive infrastructure. Indeed, the motorway connecting KL to Putrajaya is as good as you can find anywhere in the world, the Prime minister’s office and the square in front of it is second to none, and the artificial lake and the bridges over it are spectacular and the parliament building at the end of the main street elegant.

Melaka, a city about 150 Km south of KL was another destination. This is where the Malaysian independence was first declared. Melaka is the ancient capital of Malaysia full of historical monuments, including A’Famosa (the Portugese built fortress), the Sultanate palace and St Paul’s Church. Then, I went to Genting Highlands, the hill resort in the vicinity (just over 1 hour drive from KL) which is famous for its casino, theme park, cable car, and the biggest hotel in the world in terms of number of rooms. I went to Penang island (known as Pulau Pinang locally) in the North; the 6 hours bus ride from KL to Penang through Perak showed a significant variety of geological features (forests, plateaus, hills, farms) Malaysia possessed. Penang is an island city with Chinese majority connected to the mainland by an impressive and spectacular 13 km long bridge.

# Erskine Visitors 2009-2010

Cameron Highlands, the agricultural capital of Malaysia full of vegetable, fruit and tea farms was another stop and last but not the least the duty free Langkawi Island, one of the main tourist destinations in Malaysia, mainly because of its amazing beaches and beautiful sceneries. The spectacular cable car going to the hilltop and the fantastic Skybridge at the hilltop, which is an engineering masterpiece, are still fresh in my memory.

On a professional front too, the stay was productive. As per the conditions of the appointment, I taught a postgraduate course, gave a couple of research seminars and advised graduate students on their research projects. The course I taught; i.e. Theory of Seismic Design, was taken by 9 students, and to my surprise none of them were Malaysians; two were from China and the remaining 7 from Iran. I gave two research seminars during my stay; both were attended by a good number of postgraduate students and structural engineers from the industry. In addition, I was invited to give a keynote presentation in the Graduate Seminar organized by the Department.

I participated in several research meetings with research students of my main contacts; Prof Wan Hamidon and Prof Shanmugam. The visit also resulted in an agreement for me to co-supervise a new PhD student. Towards the end of my tenure at UKM, I was appointed as an external assessor for accreditation of Civil and Structural Engineering (CSE) and Civil and Environmental Engineering (CEE) programmes offered by the Department. Few days after I returned back to New Zealand, I sent an assessment report based on my experience and the information provided in the self assessment reports made available to me.

After four months in Malaysia, I was glad to be back in NZ with my family again and I brought with me very fond memories of the time I spent amidst very friendly and helpful people. I will definitely miss the varieties of affordable foods, the majestic twin towers, the elegant motorways, the convenient public transport of KL, and the cheap travel in Air Asia. What I do not remember with fondness is my suffocating time in the Bangi Guest house.

*Associate Professor Rajesh Dhakal*

Visitors	Institution	Interests	Date of Visit
Prof. Peter Fajfar	University of Ljubljana, Slovenia	Structural	18 Feb – 3 Apr 2009
Prof. Susan Tighe	University of Waterloo, Canada	Transportation	23 Feb – 5 Apr 2009
Prof. Douglas Gransberg	University of Oklahoma, US	Construction Management	21 Feb – 7 Jun 2009
Prof. Colin Smith	University of Sheffield, UK	Geotechnical	20 Apr – 10 Jun 2009
Prof. David Stevens	Utah State University, US	Environmental	25 Jun – 23 Aug 2009
Prof. David Purser	Hartford Env. Research, Hertfordshire, UK	Fire	7 Nov 2009 – 31 Aug 2010
Prof. Michel Bruneau	University of Wyoming, US	Structural	19 Jan – 16 Apr 2010
Prof. Daniel Yoder	Univeristy of Tennessee, Knoxville, US	Environmental	10 Jan – 10 Jun 2010
Prof. David Scott	Curtis University of Tech., Perth, Australia	Transportation	20 Feb – 7 Jun 2010
Prof. Shalom Hakkert	Tech. Israel, Haifa, Israel	Transportation	25 Apr – 15 Jun 2010

## New Post-Doc

Dr Sarah Delavan is originally from the small town of St. Johns, Michigan, USA and attended the University of Michigan, Ann Arbor. After receiving her Bachelors of Engineering in Civil and Environmental Engineering,

Sarah went on to a Masters of Engineering at the University of Texas at Austin in Civil and Environmental Engineering. Afterward, she was a faculty member at the Morrison Institute of Technology in Morrison, Illinois teaching courses such as Statics, Mechanics, Construction Materials, and Soil Mechanics.

Discovering a love of teaching, she went on to a PhD program at Georgia Institute of Technology (Georgia Tech) in Atlanta, Georgia in Environmental Fluid Mechanics.

Her research interests lie at the intersection of fluid mechanics and ecology: the effect of turbulence on animal behaviour and the effect of animal behaviour on the fluid.

# Research Grants (June 2009 – July 2010)

Name	Project
Aisling O'Sullivan	Monitoring & modelling water quality treatment & hydraulic efficacy of rain gardens in Christchurch
Aisling O'Sullivan and Tom Cochrane	Mitigating communities' contaminating impacts on their local waterways through an interactive real time monitoring partnership and dedicated web page
Andy Buchanan and Stephen John	To determine the cost of construction of commercial, multi-storey timber buildings
Cedric Lambert	Improved Management of the Rock Fall Hazard at the base of Highwalls
Daniel Tsang	Humics for acid mine drainage treatment
Daniel Tsang	Contaminated sediment stabilisation using activated carbon
Elisabeth Bowman	Seismic earth pressures and interaction loads in geosynthetic reinforced soil walls
Mark Milke	Disaster waste management: a systems approach
Misko Cubrinovski	Geotechnical & engineering geological characterisation of Christchurch soils
Misko Cubrinovski	Pile-group effects in liquefying soils
Misko Cubrinovski and Jarg Pettinga (Geology)	Assessment and Mitigation of South Island Geological Hazards
Sonia Giovinazzi	Enhancing the seismic performance of lifelines systems through resilience allocation and optimisation
Stefano Pampanin	Seismic Behaviour of Structural Connections with Post-Installed Rebars



## New Ruaumoko Welcomed

The University officially welcomed and blessed the carving, "Te Taonga o Ruaumoko" back to the Engineering Library on 10 September 2009.

The previous Ruaumoko carving was stolen during the 14<sup>th</sup> World Earthquake Conference in Beijing (2008) – a conference attended by most of the Department's Civil PhD students and staff.

Ruaumoko is the Māori God of Volcanoes and Earthquakes. Sir Tipene O'Regan, Assistant Vice-Chancellor (Māori) and Chairman of the Ngāi Tahu Māori Trust Board did the Blessing. The replica was created by master carver, Clive Fugill from Te Puia, NZ Māori Arts and Crafts Institute, Rotorua.

# Student Awards

## Students win Awards at Conferences

PhD student Charlotte Brown won the Special Poster Prize at the Intercontinental Landfill Research Symposium (Hokkaido, Japan) in June 2010, for her poster paper with Mark Milke titled “Disaster Waste Management – Landfills”.

ME student Anthony Stubbs, and MET student Bridgett Burdett won awards at the IPENZ Transportation Conference. Anthony won the Best Young Author Award for his poster paper with Mofreh Saleh titled “An Investigation of the Validation of the Shell Fatigue Transfer Function. Bridgett won the Best Presentation award for her Technical Note about a Transportation Group Study Tour as well as being highly commended in the Best Paper category for her poster paper with Alan Nicholson on “Speed Management on Rural Roads”.

Our students also did well at the NZSEE Conference held on the weekend of 26-28 March. These include:

- Euving Au – Best student poster
- Masoud Moghaddashi – NZSEE research scholarship
- Ben Leslie – Best student presentation
- Michael Newcombe – Best research paper

## Civil and Natural Resources Prizes 2009

Prize	Name
CCANZ 2 <sup>nd</sup> Professional	Andrew Stirrat
CCANZ 3 <sup>rd</sup> Professional	Doug Latham
Civil Engineering Prize	Pieter Vanderpoel
MWH NZ Ltd/Jim McFarlane Memorial Prize	Georgia Whitla
R W Morris Prize for Coastal and Ocean Engineering	Pieter Vanderpoel
MWH Geotech Eng Prize	Anna Philpott
NZ AA Prize in Traffic Engineering	Matt McAlpine
Roading NZ Prize in Pavement Engineering	Pieter Vanderpoel
Tonkin & Taylor Prize in Geomechanics	Doug Latham
Traffic Design Group Prizes	Pieter Vanderpoel
MiTek Timber Engineering Award 1 <sup>st</sup> Prize	Tom Armstrong Nathan Joyce Michael Kean Trung Le Hugh Burnett Janelle Cowley
2 <sup>nd</sup> Prize	Ashby Brown Clifford Ford Donxu Li James Marriot Amy Richards
3 <sup>rd</sup> Prize	Sam Barkle Kevin Chu Luke Dobney Richard English Julia Toner
Environment Canterbury Prize in Natural Resources Engineering	Alexandra Ross
Tonkin and Taylor Prize for Hydrology	Alexandra Ross
Natural Resources Engineering Prize	William Jacobson

# Postgraduate Completions 2009–2010

2010: Name	Degree	Thesis
David Yeoh	PhD(Civil)	Behaviour and design of timber-concrete composite floor systems
Perry Jackson	ME(Civil)	An investigation into the deformation behaviour of geosynthetic reinforced walls under seismic loading
Robert Buonomo II	MEFE	Fire resistance of connections in pre-stressed heavy timber structures
Phung Le	MEFE	Assessment of fire safety for intermediate floors in the New Zealand Acceptable Solution C/AS1
James O'Neill	MEFE	The fire performance of timber-concrete composite floors
Julie Saunders	MEFE	The prediction of smoke detectors activation times in two storey house fire through CFD modelling

2009: Name	Degree	Thesis
Brendon Bradley	PhD(Civil)	Performance-based assessment and design of structural and geotechnical systems
Dion Marriott	PhD(Civil)	Improved Seismic Retrofit Solutions of Existing and Future Reinforced Concrete Buildings
Sudan Raj Panthi	PhD(Civil)	Effects of arsenic on the denitrification process in the presence of naturally-produced volatile fatty acids
H-H (Brian) Peng	PhD(Civil)	Seismic performance assessment of reinforced concrete buildings with precast concrete floor systems
Koichi Sugioka	PhD(Civil)	Fatigue Assessments and Mitigation for Orthotropic Steel Decks of Highway Bridges
Roger Harrison	PhD(Fire)	The Design of Smoke Management Systems involving the Thermal Spill Plume
Mun Kit Cheong	PhD(Fire)	Assessment of Credible Vehicle Fires in Road Tunnels
Anthony Parkes	PhD(Fire)	Modelling fire growth histories
Alvaro Gonzalez	PhD(Trans)	Transportation Engineering: Pavement Materials; Foamed Bitumen Mixes
Glen Koorey	PhD(Trans)	Incorporating safety into rural highway design
Alistair Boys	ME(Civil)	Assessment of the seismic behaviour of poorly detailed reinforced concrete columns
Mark Flintoft	ME(Civil)	Optimising the use of re-circulating well pairs for the determination of aquifer hydraulic parameters
Tobias Smith	ME(Civil)	Feasibility of multi-storey pre-stressed timber buildings
Emma Heyes	MEFE	Human behaviour considerations in the use of lifts for evacuation from high rise commercial buildings

# Academic and Research Staff

**Roger Nokes:** Fluid Dynamics, Mixing in Stratified Flows and Open Channels  
Head of Department

**Misko Cubrinovski:** Geomechanics, Geotechnical Earthquake Engineering  
Deputy Head of Department

**Gregory MacRae:** Structural Engineering  
Director Postgraduate Studies

**Mark Davidson:** Fluid Dynamics Director  
Undergraduate Studies

**Anthony Abu:** Structural and Structural Fire Engineering

**Elisabeth Bowman:** Geotechnical Engineering, Geomechanics

**Brendon Bradley:** Structural Engineering and Seismic Hazard Analysis

**Andy Buchanan:** Timber, Fire and Earthquake engineering

**David Carradine:** Timber Engineering

**Brian Caruso:** Water Resources Engineering

**Tom Cochrane:** Natural Resources Engineering

**Andre Dantas:** Transportation Planning, Public Transportation

**Roger Dawe:** Surveying

**Bruce Deam:** Earthquake and Timber Engineering, Computer Modelling

**Sarah Delavan:** Environmental Fluids Mechanics

**Tonny de Vries:** Bioresources Engineering

**Rajesh Dhakal:** Structural Mechanics, Reinforced Concrete

**Charley Fleischmann:** Fire Engineering, Compartment Fire Modelling

**Sonia Giovanazzi:** Risk Management

**Glen Koorey:** Transportation and Traffic Planning, Road Safety

**Kenneth Kuhn:** Infrastructure Management, Public Transportation Planning

**Cedric Lambert:** Geomechanics, Rock Mechanics

**Pedro Lee:** Fluid Mechanics, Hydrology

**Kai-Yuan Li:** Fire Engineering

**James Mackechnie:** Concrete Engineering

**Ian Mason:** Environmental Engineering, Composting

**Mark Milke:** Environmental Engineering, Groundwater Quality

**Alan Nicholson:** Transportation Planning, Traffic Engineering

**Aisling O'Sullivan:** Natural Resources Engineering, Ecological Treatment Technologies

**Alessandro Palermo:** Structural Mechanics, Reinforced Concrete/Precast Prestressed Structures

**Stefano Pampanin:** Structural Mechanics and Design, Reinforced and Precast/Prestressed Concrete

**Mizanur Rahman:** Geotechnical Engineering

**Mofreh Saleh:** Pavement Engineering

**Eric Scheepbouwer:** Engineering Management, Engineering Dynamics

**Allan Scott:** Structural, Materials Engineering

**Erica Seville:** Risk Management, Engineering Systems

**Michael Spearpoint:** Fire Engineering

**Rebecca Teasley:** Hydrological Optimisation, Management of Water Resources

**Daniel Tsang:** Environmental Engineering, Site Remediation

**David Wareham:** Environmental Engineering, Biological Nutrient Removal

**Daniel Wicke:** Environmental Engineering

## Administrative Staff

**Elizabeth Ackermann:**  
Departmental Administrator

**Louise Barton:** Postgraduate Administrator

**Alan Jolliffe:** Administrative Services Manager

**Catherine O'Shaughnessy:**  
Undergraduate Administrator

## Technical Staff

**Shaun Cosgrove:** Electronics Technician

**Peter Coursey:** Computer Technician

**Nigel Dixon:** Structures Laboratory

**Grant Dunlop:** Fire Engineering Laboratory

**Siale Faitotonu:** Geomechanical Laboratory

**Mosese Fifita:** Structures Laboratory

**Brandon Hutchison:** Computer Analyst

**Gavin Keats:** Structures Laboratory

**John Kooloos:** Transportation Laboratory

**David MacPherson:** Technical Services Manager, Environmental Engineering

**Russell McConchie:** Fabrication and Testing

**Peter McGuigan:** Environmental and Natural Resources Engineering

**John Maley:** Structures Laboratory

**Tim Perigo:** Structures Laboratory

**Alan Poynter:** Model Structures Laboratory

**Ian Sheppard:** Fluids Laboratory

**Stuart Toase:** Structures Laboratory

**Michael Weavers:** Electronics Laboratory

**Bob Wilsea-Smith:** Fire Engineering Laboratory

**Kevin Wines:** Fluids Laboratory

## Adjunct Positions

### Professor

**Desmond Bull:** Structural Concrete Design, Earthquake Engineering

**Nigel Priestley:** Structural Engineering

### Associate Professor

**Richard Fenwick:** Structural Engineering

### Senior Fellow

**Larry Bellamy:** Structural Engineering

**Kelvin McManus:** Geomechanical Engineering

**Bryon Pidwerbesky:** Transportation Engineering

**Robert Spigel:** Fluids Mechanics

**Shane Turner:** Transportation Engineering

## Retired Staff

**John Berrill:** Geomechanics, Engineering Seismology

**Athol Carr:** Structural Mechanics and Dynamics, Finite Element Analysis

**Nigel Cooke:** Structural Mechanics, Structural Design (Bridges)

**David Elms:** Civil Engineering Systems, Risk Assessment

**Peter Moss:** Structural Mechanics, Structural Dynamics

**George Mullenger:** History of Civil Engineering, Continuum Mechanics

**Hugh Thorpe:** Groundwater, Fluid Mechanics

**Warren Walpole:** Structural Steel Design, Earthquake Engineering

**Ian Wood:** Fluid Mechanics, Civil Engineering Hydraulics