

Civil and Natural Resources Engineering

CNRE News (Number 24 2011)



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Head of Department Message



Welcome to the 2011 edition of the Civil and Natural Resources Engineering magazine. The University of Canterbury, and the Department, has been through what is probably the most challenging twelve months in its relatively long history. And those challenges, in some ways, have only just begun. Soon after I wrote my Head of Department message for the 2010 edition, on 4 September, Christchurch was struck by a severe 7.1 magnitude earthquake that shut the campus for a few days and caused significant damage around the city. While somewhat disrupting our second semester of teaching the impact on the University was not great.

Five months later, on 22 February 2011, a major aftershock struck the region with an epicentre very close to the city itself. Those of you with strong connections to Christchurch will already know this quake brought down two multiple-storey buildings in the Christchurch CBD resulting in well over 100 deaths and leaving our city in mourning. Two further aftershocks on 13 June, while not as destructive, continued to disrupt life in our city and university.

These earthquakes have caused unprecedented disruption to our academic programmes. Following the 22 February earthquake, occurring as it did only a day after the start of the teaching year, the University of Canterbury campus closed indefinitely until careful inspections of buildings and their safety systems could be undertaken. The Department responded rapidly to these circumstances and sought out an alternative venue for delivering lectures and tutorials. Four weeks after the earthquake lectures were once again being delivered to our first and second professional students on a makeshift campus in the Avonhead Baptist Church facilities a couple of kilometers from the Ilam campus. And a week later our third professional and graduate students joined us. The success of these adventure, which lasted a month, can be credited to our students, who graciously accepted unconventional teaching spaces and an unusual timetable (8am starts, 6pm finishes and lectures on Saturday mornings), our staff, who quickly adapted their teaching resources and approaches to match our constrained environment, and the staff and management of the Church, whose generosity in welcoming us could not have been more

appreciated. Even so the first semester was "badly damaged" and it was necessary to cancel final exams and to teach right to end of the semester in order to ensure our students received a robust programme.

The earthquake on the 13 June, which closed the campus for a further week, interrupted the end of semester teaching and testing period and a number of final tests were pushed into the first week of semester 2 in order to relieve some of the pressure on our students and staff. At the time of writing we are four weeks into semester two teaching. Perversely the campus has closed for another three and a half days due to two unusually heavy snow falls, but otherwise our programmes are on track and our hope is that the remainder of the year will pass uneventfully.

The earthquakes of 2011 have no doubt brought with them personal and communal loss on an unprecedented scale in our city. Even our fellow New Zealanders seem unable to grasp the true extent to which the physical and social landscape of Christchurch has changed in a few short months. However, for me there have also been bright spots amongst these calamitous events. Community strength and generosity have been evident everywhere, from the student army that dug uncountable shovelfuls of silt and sand from properties around the city to our friends at the Avonhead Baptist Church, to the individuals who have helped their neighbours get by without running water or a working toilet. Members of the Department, staff and students, have also made their not insignificant contribution in the aftermath of the quakes, undertaking building inspections in hazardous conditions in the CBD and on campus, and instigating a major survey of the occurrence of liquefaction around the whole city. I pay tribute to these members of the Department who make us proud.

Our staff have also been playing a major role in the education of our community at large. A number of our structural and geotechnical staff have written articles for the Press newspaper, contributed answers to readers' questions in the same periodical, and participated in a highly successful series of lectures, sponsored by the University of Canterbury, that have tried to explain the engineering and geological aspects of the quakes in terms that the general public can understand and appreciate. In my view all of these activities have been important components in helping to stabilize our community by reducing the fear and uncertainty of its citizens.

To those outside Christchurch the earthquakes that have rocked the city are probably old news. A few snippets on the television news or in local newspapers probably remind them now and then that things in Christchurch are still not normal. The fact is that Christchurch and many of its institutions, the University of Canterbury amongst them, will never be the same again. The University, and by implication the Department of Civil and Natural Resources Engineering, faces serious short term, medium term and long term challenges. In the short term student enrolments are down around 10% with the attendant loss of income. Insurance premiums have sky rocketed and the fates of a number of buildings on campus are still unknown.

Teaching spaces have been lost, laboratories shutdown, libraries made inaccessible and social and recreation spaces off limits. The University is taking bold steps to confront these challenges including increasing scholarships, particularly for undergraduate students, hosting social events on campus, managing some of its resources, such as lecture space, in a more efficient way, and building two temporary villages of prefabricated buildings on its Ilam and Dovedale campuses. Don't be mistaken. The University is open for business as usual, and despite the impact on its resources it continues to provide the quality education for which it is renowned, albeit, sometimes in a different way.

Perhaps surprisingly life goes on despite the overpowering effects of the earthquakes. Curriculum change continues unabated. 2011 has seen the introduction of our new 15 point courses in the first professional year. Our initiation of a portfolio approach to teaching communication skills to our students is well underway with Dr Creon Upton, who has a PhD in English, employed on contract to assist the department in developing writing guides and other resources to support students in this traditionally challenging area.

A key initiative for the department at present is the establishment of a Seismic Engineering Centre that will focus our expertise in earthquake engineering, both geotechnical and structural, and provide the department with a vehicle for providing education, research and consulting/testing capability to the community. The Christchurch earthquakes have provided the impetus for this strategic development and we are looking outward to the profession, the community and local and national government to engage with the Centre.

We have had our opportunities to celebrate this year with Associate Professors Charley Fleischmann and Mark Davidson receiving teaching awards, Charley at the university level and Mark at the college level. Professor Andy Buchanan has been elected a Distinguished Fellow of IPENZ for his outstanding contribution to the profession over many years, and Associate Professor Stefano Pampanin was invited onto the panel of inquiry into the collapse of the buildings in the CBD.

Our graduating classes of 2011, 2012 and 2013 will be different from those of the past. Each of these cohorts will have experienced adversity in their studies that have caused them to find extra resources within themselves in order to succeed. While they may look back on the last 12 months as a time in their lives that they would have preferred not to experience, in the long term I believe that these students will be some of our very best graduates. They will be more mature, more thoughtful, more aware of their place in society and the responsibilities that brings, they will be stronger, and for many they will graduate with a passion for contributing to their community. The classes of 2011, 2012 and 2013 may well contribute more than their fair share of engineering leaders of the future.

Despite the adversity we face we, as a department, look forward optimistically to the future and the key role we can play in the rebuild of our city. We have never felt so relevant.

Celebrating Teaching Awards

Charley Fleischmann wins UC Teaching Award

Charley Fleischmann, Associate Professor in Fire Engineering, was recently awarded the UC Teaching Award for 2010. The award recognises



his excellence in teaching (including thesis supervision) in both undergraduate and graduate programmes.

Lis Bowman wins UCSA Teaching Award

Lis Bowman, Senior Lecturer in Geotechnical Engineering, was awarded the



Postgraduate Supervisor of the Year Award at the recent UCSA Lecturer of the Year ceremony 2011.

Mark Davidson wins College Teaching Award



Mark Davidson, Associate Professor in Environmental Fluid Mechanics, was awarded the College Teaching Award for 2010.

Charley's Teaching Philosophy

For me, receiving a university teaching award has been a highlight of my career at Canterbury. Having been hired here to teach into the highly specialized fire engineering masters program, I have always been very comfortable with small groups of students, teaching fire engineering where I personally know many of the "founding fathers" of fire engineering. So when I was asked to get involved in ENGR102 where there has been little new material since Isaac Newton's Principia was published created some interesting challenges for me. Walking into a class of more than 200 students can be a bit unsettling at times, and trying to engage with them has its own challenges. Yet I soon realized that most of the students we have at Canterbury are interested in engineering and it is up to me to make the material both interesting and relevant for them.

As engineers we solve practical problems for the betterment of society. As a teacher it is my responsibility to inspire and motivate students to learn how they can solve these problems. From engineering intermediate mechanics through to my postgraduate fire engineering courses my goal is to provide the best student focused learning experience to help students develop and extend their problem solving skills. As a teacher I strive to provide the students with problem based learning that is both relevant and interesting so that they are inspired and passionate about solving engineering problems. I am always looking for new things to make the lectures more interesting, whether it is a new structural photo for the intermediate lecture or talking about our recent research or consulting with the postgraduates, for me it is all about making my teaching interesting and relevant.

However, teaching is not simply about performing in the lecture theatre it is about providing a multifaceted experience that will reach as many students as possible. Catering for different learning styles, presenting relevant examples and online practice quizzes are some of the ways to create an environment where the students successfully learn the fundamental knowledge about engineering problem solving. With our ever evolving information age, student's skill sets and expectations are constantly changing which means we must constantly evolve our teaching styles and methods to adapt to their needs. Although there is an ever increasing demand for these digital resources I don't think academics will soon be replaced by these digital alternatives. I believe students still crave the human interaction with teachers to help guide their learning.

New Post-docs

Dr Nadine Roth



Dr Nadine Roth arrived from Germany in January 2011. She got her first degree in Logistics from the University of Applied Sciences in Friedberg, Germany, in 2003.

Nadine continued her studies with a Master in Traffic and Transport at the Technical University Darmstadt. Afterwards, she stayed in Darmstadt for another five years, working as a research associate at the chair of transport planning and traffic engineering. Nadine worked on different research topics including the preparation of a project on the dynamic and seamless integration of production, logistics and traffic, and transport, as well as on other projects, like the opening of a research centre in Vietnam in 2010, and gained her doctoral degree in this time. During her stay at the University of Canterbury, she is doing research in Intermodal Aspects of Mobility Pricing, a project scheduled for two years and working with Professor Alan Nicholson.

Dr Sheng-Lin Lin



Dr. Sheng-Lin Lin is originally from an earthquake-prone area, Taiwan. A graduate of National Taiwan University, Sheng-Lin obtained his Ph.D. from the University of Illinois

at Urbana-Champaign in Civil Engineering (Structural focus) in 2010. Prior to his Ph.D. study, He worked as an Assistant Research Fellow at the National Center for Research on Earthquake Engineering (NCEE) Taiwan; and a Teaching Assistant at the Department of Civil Engineering at National Taiwan University.

Sheng-Lin's research interests and experience include seismic risk assessment, geotechnical earthquake engineering, numerical simulation and experimental testing, fragility analysis, structural analysis and design, and information technology applications in earthquake engineering.

CNRE News Number 24 2011

Editing/Design: Daniel Tsang and
Tonny de Vries
Printer Production: Toltech

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.

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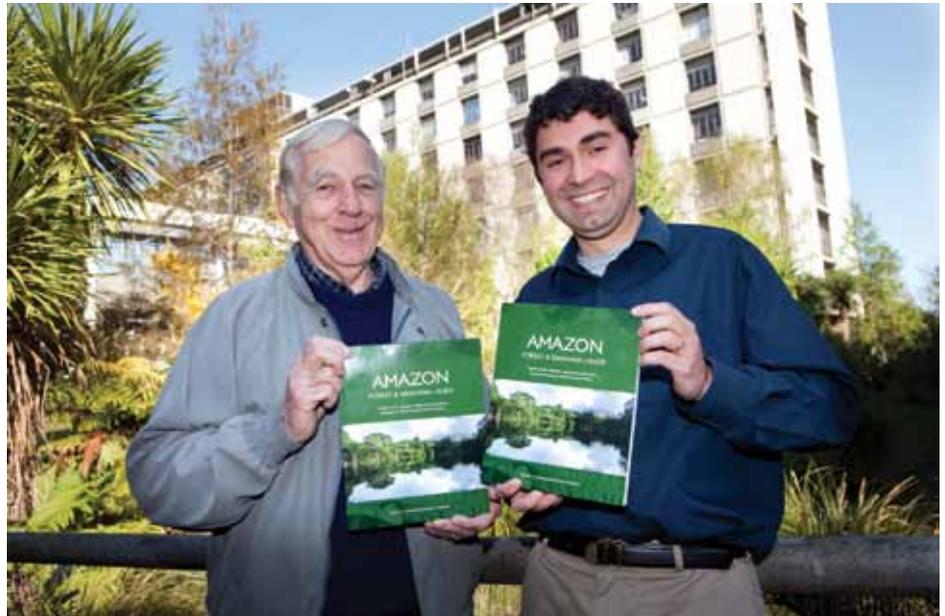
Water / Environmental / Hydro-Eco / Fluids

Water Research Workshop and Discussion Forum

On 1 July 2011, the Department hosted the first New Zealand Water Postgraduate Research Workshop. A total of 40 academic staff, post-graduate students, young water professionals, and leading figures in the water industry gathered to examine water research. A total of 11 students gave research presentations in the morning sessions. The afternoon session had presentations focused on water pollution issues by Garry Macdonald (Beca Infrastructure Ltd. and outgoing IPENZ President), Stephen Esposito (Solid Energy New Zealand), John Russell (Fonterra), and Mike Freeman (Freeman Environmental).

The workshop provided professional development support for the post-graduate students and the young professionals, while an emerging needs session developed suggested actions to address emerging needs in water pollution control. The participants at this session noted that large amounts of water quality data are collected for various reasons (e.g., consent compliance), but these data are too often not used in assessments of environmental effects. The result is a situation where water quality assessments are much less informed than they could be, which, in turn, increases the risk of poor decision-making with regards to water pollution control requirements.

The workshop was initiated and organized by Senior Lecturer Dr Daniel Tsang, Associate Professor Mark Milke, and Associate Professor Naresh Singhal (University of Auckland). It was sponsored by the Centre for Advanced Engineering New Zealand and the Waterways Centre for Freshwater Management, along with the Universities of Auckland and Canterbury. The mix of research, invited speakers, future-gazing, and professional development for young professionals proved a winning combination.



Book a Mix of Science and Anecdote about the Amazon

A book that is the culmination of 50 years of passionate research on the Amazon has been published by Dr Tom A Cochrane (Natural Resources and Civil Engineering) and his father, Dr Tom T Cochrane.

The book, Amazon Forest and Savanna Lands, is a guide to the climates, vegetation, landscapes and soils of central tropical South America.

As a young boy, Dr Tom A Cochrane was taken through the Amazon by his father who worked there in a variety of roles as a soil scientist. “I grew up with Dad being passionate about the Amazon region. He would sometimes take us on trips through the area which were very fascinating for a boy.”

Dr Cochrane has followed in his father’s footsteps, although his research focus is agricultural land use, soil and water conservation, and the conservation of natural resources world-wide. Dr Cochrane the elder is currently supervising Agrotecnologica Amazonica’s forest-savanna ecological conservation reserve in the Bolivian Amazon.

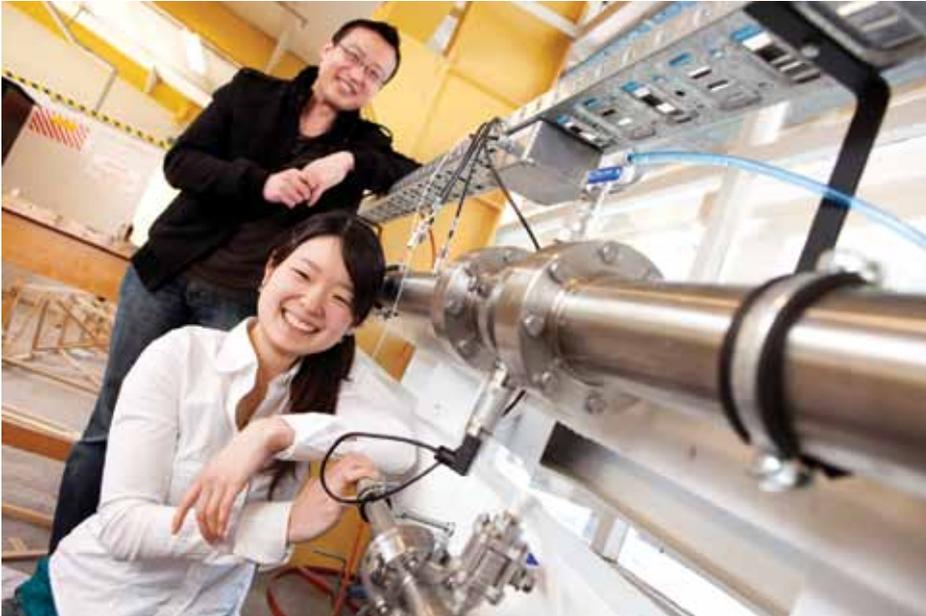
“Dad was contracted to Bolivia in 1963 by the British Tropical Agricultural Mission to study some of the least-understood lands of the Amazon. He loved the area and has stayed working in the Amazon region for more than 50 years,” Dr Cochrane said.

“We have gathered all this information over the years — people ask us for information all the time — so we thought why not put it all together in a book. It has been really nice getting together, working with Dad again, and has brought up some really nice memories,” said Dr Cochrane.

The book is a result of their research in the region and is intended to increase people’s understanding of it. It also includes technical information for better understanding tropical lands in general, and more specifically statistical prediction of fertiliser needs, calculations of osmotic potential and the development of a theory of solution flow through soils and plants, which Dr Cochrane said should be of interest to all soil scientists.

“The book is an overview of the land resources of the Amazon in terms of its complex of climates, landscapes, vegetation and soils found throughout this vast, often misunderstood region,” he said.





“The Amazon is a very special place and deforestation is a big concern. The soil is very poor, so although people cut down trees with the intention of turning it into agricultural land, it will not be good for that purpose. The book is a resource so that people can look at the region and use the information to better use and protect it.

“I feel very strongly about the Amazon — it is the last large natural resource left in the world. Losing this is shameful and a huge concern.”

Amazon Forest and Savanna Lands is also a personal book for Dr Cochrane and his father and contains anecdotes about their time in such a special place.

“Once we were living for three weeks on a boat in the Amazon. One day we took a canoe out to get some soil samples, but where the river branches into flood plain tributaries we got lost. It started to get dark, the mosquitoes were biting badly so we put these big black plastic bags over our heads with small holes to see and breathe. We tried to sleep on this canoe, but luckily we were woken by a small light that was moving towards us. It turned out to be an Indian fishing in the river. He was able to navigate us back to the boat in the morning. Why wasn't he scared of us with black bags on our heads? We must have looked funny. We have included some of these stories to make the book more interesting.”

Pedro Lee wins Inaugural Research Award

Three University of Canterbury projects have been recognised at the inaugural Tech Jumpstart awards, each receiving \$20,000 to help the flow of ideas out of the lab and into the community.

The projects include a new colour model for digital movie cameras, a new algorithm that enables the flow of fluids to be measured in pressurised pipes, and the development of a novel prototype probiotic to improve animal health and wellbeing.

The awards, hosted by UC's Research & Innovation, attracted 18 new ideas from UC.

Speaking at the awards function on 12 October, Research & Innovation Director Nigel Johnson said funding for the Tech Jumpstart competition came from the Pre-seed Accelerator Fund (PSAF), funding intended to “take an idea with commercial potential, that already has established proof of principle and proof of concept and get it ‘investor ready’”.

He said Tech Jumpstart was created because the Unicom Investment Committee – a consortium with UC, WaikatoLink, AUT, Lincoln and Victoria universities – wanted to “flush out more ideas that might have commercial potential that could then be evaluated and developed into applications for PSAF”.

“The best way of flushing ideas out of universities is to offer money – hence the competition with the offer of \$20,000 each to three projects at each university. The Tech Jumpstart funding will enable initial technology development of the idea by employing student researchers and purchasing the necessary consumables.”

Dr Johnson said he was delighted at the success of the inaugural competition, with the 18 ideas put forward from UC the most of any of the participating universities.

Dr Pedro Lee (Civil and Natural Resources Engineering) said he was “very excited” about the progress that could be made with the additional funding.

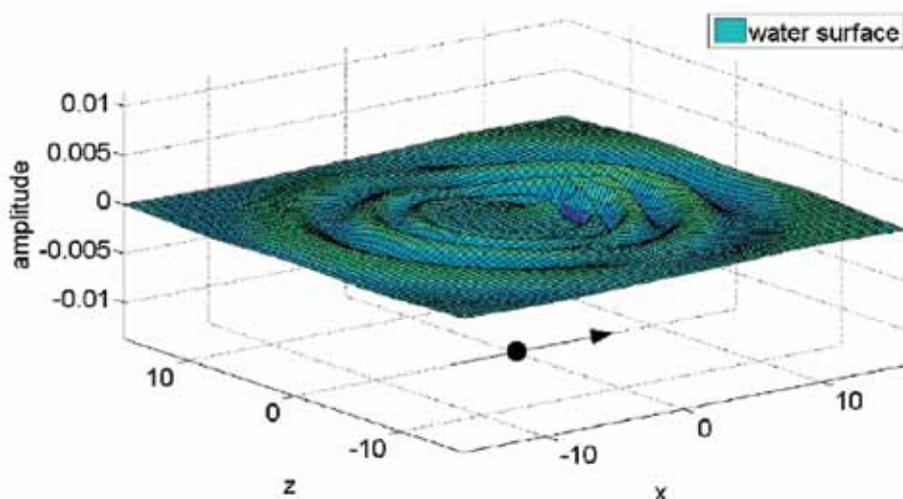
Dr Lee and PhD student Ayaka Kashima are working on a high speed, non intrusive unsteady flow meter.

“The technique is a non-intrusive method of obtaining instantaneous flow data from any pressurised pipeline system at up to the sampling limit of pressure sensors – 250,000 samples per second. This speed is far beyond the capability of flow meters currently on the market and makes it ideally suited for the measurement of flows in biomedical and fuel injection systems as well as characterising the pumps and turbines behaviour.

Dr Lee said the practical applications included real time measurement of blood flow in biomedical systems to monitor the behaviour of hearts and artificial heart components, and real time measurement of fuel injected into internal combustion engines to increase fuel efficiency.

“This will have application in any piping systems where you may need to know the flow rate at high speed.”

He said the award money will be split between market research, putting together a patent for the technology, consumables and equipment for testing, and supplementing Ayaka's scholarship.



Numerical model results: 3D wave field generated by a submarine landslide. The landslide moves in the x-direction from the origin, indicated by the black circle. This generates the wave field shown.

Tsunami Research

Colin Whittaker (PhD student) is working with Associate Professor Roger Nokes to investigate the generation and propagation of landslide-generated tsunamis.

Tsunami events represent a significant hazard to coastal communities. This has been highlighted by the tragedy in Japan earlier this year and the Boxing Day tsunami of 2004. An increased understanding of tsunami events will enable these communities to be better prepared for their occurrence. Landslide-generated tsunamis are particularly dangerous to adjacent coastal communities due to their large-amplitude waves and short warning times.

Colin Whittaker is undertaking his PhD research project on the generation and propagation of submarine landslide-generated tsunamis. He has recently begun a series of two-dimensional experiments using the 15m flume located in the Fluid Mechanics Laboratory. These tests use a mechanically-controlled rigid block landslide to determine the effects of landslide motion and submergence depth on tsunami wave properties. The use of a mechanical system to control the landslide motion allows a broader range of motion to be tested than in previous work, as well as improving experimental repeatability. The mechanical system itself uses a stepper motor and belt to drive a semi-elliptical aluminium block along a horizontal bottom boundary, and is controlled using software developed by the department's electronics technicians. Data will be captured using the Laser-Induced Fluorescence (LIF) and particle tracking velocimetry (PTV) techniques, and processed using the Streams software package.

Colin will also use the experimental data to validate results from his numerical model of the system which uses inviscid-irrotational flow theory. This means that the model is very computationally efficient, while still giving physically reasonable results. The model simulates the generation and propagation of waves within a three-dimensional problem domain, with emphasis on the effect of the landslide's lateral dimension on results. These three-dimensional effects will be further investigated in subsequent laboratory tests.

Energy News

Dr Ian Mason has received an invitation from a major European publisher to write a book on 100% renewable electricity systems.

Although the project is still in its formative stages, Ian says it is hoped to include contributions from groups in Australia, Europe and the USA, as well as the New Zealand work carried out at the University of Canterbury. Each group has modelled electricity supply versus demand at half-hourly or hourly intervals over extended time periods, and used varying mixes of renewable resources, according to the country or region involved. Says Ian "These scenarios use proven technologies, show that security of supply can be maintained and indicate practical pathways for implementation by 2020 (Australia) through 2050 (Europe)."

In October 2011, Ian will meet with energy researchers at the Pacific Institute for Climate Solutions and the Institute for Integrated Energy Systems at the University of Victoria, BC, Canada, and present a seminar there on a 100% renewable electricity system for New Zealand.

Desalination Plume Discharges

Adam Crowe (PhD student) investigating the fluid mechanics of desalination plume discharges into the ocean for his PhD research project with Associate Professor Mark Davidson.

Adam's research involves conducting scale physical experiments in the department's Fluid Mechanics Laboratory. He uses an optical technique called Particle Tracking Velocimetry (PTV) to determine velocity fields generated by these discharges into still ambient water representing the ocean. This research is important for validating numerical models used in desalination plant outfall design to minimise the severe impacts on the local marine environment. PTV experiments involve seeding the desalination plume discharge with particles that are illuminated by laser light source (shown in Figure 1). A video camera records the location of particles within each frame and velocity field data is extracted from the video frames using computational algorithms. Figure 2 below shows an experimental velocity field produced by an inclined desalination plume discharge impinging a horizontal boundary (representing the seabed) and spreading radially.

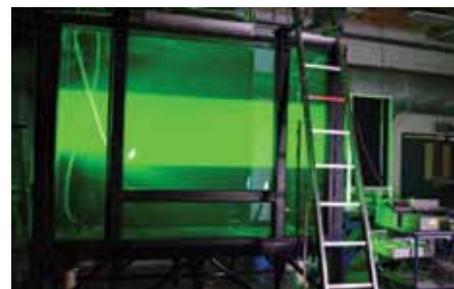


Figure 1 - Experimental setup

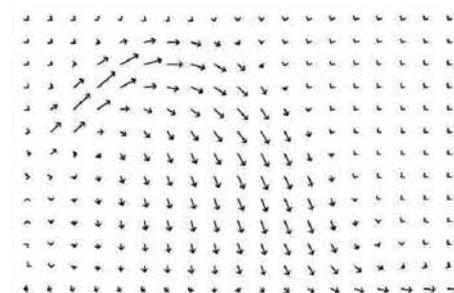


Figure 2 - Velocity field from desalination discharge



Mekong Hydrology and Foodweb Meeting

Dr Tom Cochrane and PhD Mauricio Arias were invited to a meeting on Mekong river hydrology and foodwebs held at the University of California, Santa Barbara Sedgwick Reserve field station.

Scientists and engineers from universities around the world got together to boost research collaboration and seek additional joint funding to study the link between hydrology and ecosystem productivity in the Mekong river and the Tonle Sap (South East Asia's Great Lake), the world's most productive inland fishery which sustains over 60 million people.

The Mekong river is currently undergoing rapid development (dams, irrigation schemes), which together with climatic change may alter natural flows and impact food security in the region. After very productive discussions and work, the meeting ended with a bang as the tree used for pre-meeting photograph collapsed (presumably an indication of the heavy burden of ecological problems they are dealing with!). Some of the more avid environmentalists are seen trying keep the tree from falling completely.

More about UoC's Mekong project can be found at www.mekongflows.org

Rain Garden Treatment

Joe Good (ME student) attended the International Water Association (IWA) - Cities of the Future Conference in Stockholm, Sweden (22-25 May 2011) where he presented a paper entitled Appreciating drainage assets in New Zealand Cities: Rain garden treatment and hydraulic efficacies.

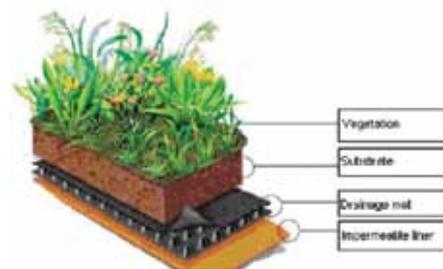
The conference focused on sustainable urban planning and water management and was attended by approximately 350 urban planners, engineers, regulators, and academics alike,

representing more than 65 countries. The diverse group of water professionals provided excellent networking opportunities and in-depth conversations representative of practical real-world situations where different disciplines are tasked to work together to solve the same problems. Conference highlights included a keynote presentation by Rob Skinner, a professorial fellow at the Centre for Water Sensitive Cities at Monash University and world leader in water sensitive urban design and conference dinner at the Stockholm City Hall, home to the Nobel Prize banquet.

Green Roof Technology

Green roofs are emerging internationally as a Low Impact Design (LID) for stormwater management in dense urban centres. Rooftops comprise a large proportion of the total impervious area in urban settings and also contribute substantial contaminant loads to drainage systems.

Significant opportunity exists to reduce runoff and contaminant volume and peak flow by retrofit of existing and in newer buildings with green roof systems. A particular benefit is that these can be constructed on an otherwise unusable space (rather than valuable ground space).



Green roofs have been successfully operating in other parts of New Zealand, especially Auckland, for a number of years but have not yet been trialled in Christchurch. It recently emerged from the Christchurch Expo that residents strongly expect Christchurch to be rebuilt as a more sustainable and ecologically connected city – something that is afforded by including green roof systems.

In late 2011, Christchurch's first green roofs will be trialled at the University of Canterbury campus on the newly constructed 'Oval pods'. The research will investigate the best technical designs and preliminary performance of pilot-scale green roofs under Christchurch's climate. The work can extend into Masters Research opportunities for 2012. This research is through a UC Sustainability Scholarship and is being supported by New Zealand's leading green roof experts from the University of Auckland and the Christchurch City Council. Contact Dr Aisling D. O'Sullivan for more information.

HydroEco's Water Quality Monitoring System Profiles on International Waterlink Site

A recent journal article published by members of the HydroEco group in Water Science & Technology IWA Publishing, by Cochrane, Wicke & O'Sullivan, which describes the development of a web portal for enhancing community awareness and engagement of water quality in urban waterways in New Zealand, has just been profiled on International Waterlink – (online platform for best practices and technical solutions in water management).

The data acquisition system is unique in the use of coupling a wireless mesh network technology and real-time monitoring of stream health. The system was developed using a mesh network of radio transmitters linked to flow and water quality parameters (i.e. turbidity, pH, conductivity and dissolved oxygen) so that real-time water quality data can be seen by end-users anywhere through the free webportal. Results are displayed on the dedicated Urban waterways New Zealand.

Timber / Structural / Geotechnical

Earthquake Engineering a Priority for UC Engineers

Canterbury's recent earthquake reinforces the importance of research projects being undertaken in UC's College of Engineering.

Academic staff members within the Department of Civil and Natural Resources Engineering have recently succeeded in securing two interim grants for major research projects as part of the Foundation for Research, Science and Technology's (FRST) Natural Hazards Research Platform, which was launched last year.

The platform is hosted by GNS Science, with NIWA and GNS Science acting jointly as "anchor" organisations. They have partnered with the University of Canterbury, as well as with Auckland and Massey universities, and Opus International Consultants. The platform brings together leading researchers to examine how natural hazards occur, their effects, and how we deal with them. It involves scientists and engineers from a range of fields, and provides long-term funding to projects focusing on geological hazards, weather hazards, engineering, including structural and geotechnical engineering, risk analysis and social aspects of natural hazards research.

The University of Canterbury is leading the world in damage-free or damage-resistant systems with applications to concrete buildings and bridges, steel and timber.

One of the projects currently being funded is on low damage structure technology, with a focus on long-term durability of structures. The technology is being applied to both steel and concrete structures but applicable to structures of other materials. The project is being led by Associate Professor Greg MacRae (Civil and Natural Resources Engineering) and Professor Geoff Chase (Mechanical Engineering).

The second grant is funding a research project on non-structural elements, which includes ceilings, facades, windows – the skin of a building – and internal partitions. Professor Greg MacRae and Associate Professor Stefano Pampanin together head this project.

"In a moderate level of earthquake, like the one we had in Christchurch, structural engineers provide buildings with strength so there is no structural damage, but some damage to cladding and ceilings is possible," Professor MacRae said.



"In a strong – or design level – earthquake, the strength of buildings is expected to be significantly exceeded. To prevent collapse and loss of life during this shaking, structures are provided with ductility by careful detailing to avoid a sudden or brittle failure. This means that while buildings should remain standing they may have large permanent displacements and significant damage. Because of this, these buildings may need replacing. We are not protecting our infrastructure during this level of shaking," he said.

"With the new technologies we're developing, structures will have no permanent damage after a much bigger earthquake than the design level earthquake, and this will be able to be achieved at almost no extra cost.

"With a moderate level shake, we still had \$4 billion damage. The level of earthquake we design for is a political decision," Professor MacRae said.

Preliminary discussions with the Natural Hazards Platform several months ago indicated that further research efforts to reduce both structural damage, using low-damage technologies, and non-structural damage were likely to be a priority. The recent earthquake highlights the necessity of this work as part of making robust building systems for New Zealand.

Another large research programme being undertaken by the Department of Civil and Natural Resources Engineering is on soil liquefaction led by Associate Professor Misko Cubrinovski. A series of projects focusing on liquefaction, lateral spreading and ground related damage during earthquakes are funded by the Earthquake Commission (EQC) and Environment Canterbury (ECan) including a long-term EQC Capability Funding in geotechnical engineering (CNRE) and geological sciences (GS). Seismic characterisation of Christchurch soils and in particular liquefaction has been the central theme in this research. The relevance of these studies has been highlighted by the recent earthquake in which liquefaction caused major damage to houses, roads and lifeline services such as cables, water, and sewage. Soil-structure interaction is an interdisciplinary research area where more work is needed to determine the best way to prepare soil for new construction, and reinstate structures affected by liquefaction or lateral spreading.

Such research has been stated to be of very high priority during discussions by reconnaissance teams at the earthquake information clearinghouse meetings and it is likely to be funded by EQC and FRST in the future.

Staff on Expert Panels for Christchurch Earthquake

Associate Professor Stefano Pampanin, a structural engineer in our department and Emeritus Professor Nigel Priestley, a former staff member of our department and now an Emeritus Professor have been elected to serve as members of the expert panel which has been set up to assist the Department of Building and Housing with the technical investigation into the performance of the Canterbury Television, Pyne Gould Corporation, Forsyth Barr and Hotel Grand Chancellor buildings.

Emeritus Professor Richard Fenwick, a graduate from this department and now an Emeritus Professor is on the Royal Commission of Inquiry which was set up to look at the collapse of buildings in the Christchurch central business after the earthquake on 22 February. The inquiry will examine issues around the built environment in the Christchurch CBD including, but not limited to, the CTV and PGC buildings, as well as the adequacy of the relevant building codes and standards into the future.



Engineer Calls for New Approach to Engineering Infrastructure

The President of the Institution of Civil Engineers made a case for a 21st century engineering renaissance in the 2010 Hopkins Lecture held on campus recently.

Professor Paul Jowitt, who is also Professor of Civil Engineering Systems and Executive Director of the Scottish Institute of Sustainable Technology at Heriot-Watt University, delivered the annual lecture with a presentation titled "Now is the time" in the Ngaio Marsh Theatre.

Professor Jowitt discussed the need for a renaissance that would see the world's infrastructure built and rebuilt to ensure it could meet the challenges posed by climate change, environmental disasters, a burgeoning world and economic crises.

Head of Department Associate Professor Roger Nokes said Professor Jowitt's lecture provided a global perspective on the challenges facing the world today, with a clear focus on how civil engineers, in particular, have a major role to play in ensuring a sustainable future for the planet. He said the message was particularly timely given recent calamitous events around the world, and one that politicians, economists and community leaders needed to hear.

Professor Jowitt was an Erskine Fellow at UC in 1997 and his areas of interest lie in the development and application of systems-based solutions within civil engineering, the water industry, environmental management, risk assessment and sustainable development.

The annual Hopkins Lecture, hosted jointly by the University of Canterbury and the Canterbury branch of the Institution of Professional



Engineers New Zealand, was established in recognition of the distinguished service in the engineering field of Professor Harry Hopkins, who was head of civil engineering at the University from 1951 until 1978.

The lecture is delivered by an eminent speaker on a subject that will encourage discussion of engineering matters within the profession and promote public understanding of engineering issues.

Staff and Postgrads assist City Council in Building Checks

For the first few days and weeks after the Christchurch Earthquake many of our staff and postgrads were in the CBD assisting the Council with their building inspections. The inspections were primarily to assess which buildings were safe to enter, which ones were no-go areas, and which ones could be accessed on a temporary basis to retrieve valuables. The process helped in defining the cordoned areas, and the systematic reduction of the cordons as the days went by.

For our Fire Engineering staff and students, the work is still ongoing as major damage to fire safety systems has been observed all over the city. Currently they are assisting the city in the recovery process by helping to identify immediate fire protection problems and document details of active and passive fire protection failures, apparent access and egress issues, water supply failures and sprinkler system failures. The project is to help the recovery in the short term and improve fire safety design in the long term.



Design of Earthquake Proof Building

Recently Associate Professor Stefano Pampanin and Dr David Carradine from Civil and Natural Resources Engineering Department featured on CTV news discussing the seismic performance and relocation of the post-tensioned timber EXPAN building located which is located here on campus.

The building was originally a 2/3 scale specimen tested by Ph. D. student Michael Newcombe, and because the building had so little damage after being subject to numerous simulated earthquakes in the laboratory, it was decided that it should have a second life as a real building. It was carefully deconstructed, re-engineered by Holmes Consulting Group and reassembled on the lawn next to the Student Services Building off Engineering Road.

Thom Craig provided architectural services so that the structural frames and walls could be enclosed to create functional spaces that include an office for STIC (Structural Timber Innovation Company) CEO, Robert Finch, a meeting room and a space for displaying models and older test building has been part of research going on since 2004 and did have to be modified to create two full height storeys and comply with Christchurch City Council building requirements. It has been instrumented with accelerometers and has shown no distress or damage following any aftershocks or the earthquake of 22 February. The activity and interest in the building has been incredible and the post-tensioned timber technology will most surely be a part of the Christchurch rebuilding process.

continued overleaf

A Year in the Life – Paul Jowitt’s year as President of the Institution of Civil Engineers



Paul Jowitt, Heriot Watt’s Professor of Civil Engineering Systems and Executive Director Scottish Institute of Sustainable Technology, was the Institution of Civil Engineers’ 145th President in 2009-2010.

In this article he writes about the highlights of his Presidential year.

The Institution of Civil Engineers is the world’s oldest professional engineering institution, founded in 1818. Its first President was the Scot Thomas Telford whose period of office lasted from 1820 until his death in 1834. Thankfully, Presidents nowadays serve for just one year!

The role of the ICE President is several-fold – chairing the ICE Council which is the Trustee body of the Institution; Ambassadorial – internally to its 80,000 members worldwide and externally to key stakeholders ranging from Governments to society at large; and in providing Strategic Leadership for the profession.

It all makes for a hectic year which take the President to places furth the ICE’s magnificent headquarters building – One Great George Street in Westminster – to all regions of the UK and to places across the world to meet some of its 30,000 overseas members. All in all, it makes for a roller coaster year – but a memorable one. And it leads to unexpected reunions in unexpected places – in my case with some fellow students from my UG days at Imperial, many students I’d taught (some of whom kindly said they seemed to have benefitted from the experience!) and some former colleagues I’d worked with on various projects whilst at Imperial College, Heriot Watt and SISTech.

The year as President has a traditional rhythm set by particular events – starting with the Presidential Address on the first Tuesday in November. (“Now is the Time” - <http://www.ice.org.uk/getattachment/21ec2403-13ff-43ef-a883-5a23a1f25c27/Presidential-Address-2009.aspx>). And then the dates of Council, the UK Regional visits, the President’s Reception for Volunteers, the presentation of Awards and Certificates of Membership and so on. But there is a syncopation provided by many other events – presiding over specialist conferences on such as Innovate to Survive, the Role of Infrastructure

	Policy	Planning	Implementation	Review
Accelerate infrastructure				
Develop people				
Planning and delivery of sustainable infrastructure				
Procurement and delivery of sustainable infrastructure				
Building capability for sustainable infrastructure				

in International Development, Infrastructure Investment in Zimbabwe and so on – but perhaps mainly by the visits overseas. There is a programmed cycle to these – they aren’t undertaken on the whim of the President!

But they can accommodate some of the President’s particular themes for the year – in my case Critical Infrastructure, International Development and supporting Young Engineers. All these have been recurrent themes of my professional life as an Academic, as the Director of two spinout companies (Tynemarch at Imperial and SISTech at Heriot Watt), as a non Executive Director of Scottish Water and United Utilities, and in my various roles within the ICE on society’s expectations of engineers in the 21st century, international development, poverty reduction and climate change, and as the author of the ICE’s 6th International Brunel Lecture – “Engineering Civilisation from the Shadows”. (<http://www.ice.org.uk/Information-resources/Document-Library/Brunel-International-Lecture-2006--Full-report>).

I visited Christchurch, New Zealand to deliver the Hopkins Lecture two days before the first earthquake in 2010. Other visits took me to the Middle East (including Heriot Watt’s Campus in Dubai), Paris, Vancouver, Hong Kong and Sweden – the first ICE President to visit there since Telford! But undoubtedly the most important overseas visit was to Africa – Ghana, South Africa and Tanzania. This was of strategic importance – and reflected by my three key themes.

As I mentioned at the outset of this article, Thomas Telford was the ICE’s founding President. Telford came from lowly beginnings who took himself from being a stonemason to the foremost engineer of his time and leaving a vast legacy of civil engineering works that still survive and function today. Telford also wrote poetry. He left a bequest to the Westerkirk Parish Library. And throughout his life he mentored his young engineers. So it was fitting that when the ICE celebrated the 250th anniversary of his birth that the then President of the ICE, Gordon Masterton, introduced a President’s Apprentice scheme to allow a small group of young engineers to work shadow the President during his year of office.

They spent time accompanying the President to various ICE events and meetings in London and in the ICE Regions. The Apprentice scheme has been continued by successive ICE Presidents.

Given my Presidential themes for the year – Critical Infrastructure, International Development and supporting Young Engineers – this prompted a radical change in the format of the Apprentice Scheme – they would work with me and lead tutors Charles Ainger (MWH) and Ron Watermeyer (SS Inc, South Africa) to produce an engineers toolkit for international development. It also meant that the net for the recruitment of the Apprentices would have to be cast wider than the UK to include graduate engineers who were actually working overseas. The twelve 2009-2010 Apprentices came from the UK, China, Nigeria, South Africa, Sri Lanka, Ghana, Hong Kong and Zimbabwe. Twelve different first degrees (including graduates from both Imperial and Heriot Watt!), twelve different employers, four women and eight men. And four were based overseas.

The result was “An Engineers Toolkit for a Developing World” (www.ice.org.uk/patoolkit) – an open source set of materials and ideas to help engineers plan and deliver infrastructure for international development, poverty alleviation and the UN Millennium Development Goals (MDGs). The culmination of a year’s work, the toolkit is a first in the civil engineering field. It was launched at the ICE in London on October 19th 2010.

The toolkit was produced through a series of high level CPD events – held in London, Durban, Johannesburg and at UNESCO in Paris – and delivered by experts from industry, academia and the NGO sector. The Durban sessions were augmented by a series of site visits to the world-class Moses Mabhida Stadium (venue for the semi-finals of the Football World Cup), the eThekweni Water and Sanitation Department’s secondary water mains replacement project (using labour-intensive construction methods and developing small-scale contractors) and eThekweni Zibambele Road Maintenance Project where impoverished households generate income by maintaining roads.

All these projects clearly demonstrated – at range of scales - the connection between the construction and maintenance of infrastructure and community livelihoods. The apprentices learnt about the role of infrastructure in the delivery of the UN MDGs and its impact in delivering social and economic objectives. In between these CPD events, the Apprentices worked offline and through email to with each other and the tutors to produce a set of 76 themed Method Cards.

These are arranged in 5 Themes:

1. Sustainable infrastructure
2. Climate change
3. Financing and anti-corruption
4. Procurement strategy and delivery
5. Capacity and Capability Building

And then applied across the four stages of a project, namely:

- **Policy**, which sets the agenda for the planning, procurement, delivery, maintenance and decommissioning of sustainable infrastructure.
- **Planning**, which links infrastructure needs to organisational objectives, policies and strategies?
- **Implementation**, where decisions are made regarding the design, procurement and delivery of infrastructure.
- **In-use**, where infrastructure is operated and maintained before being decommissioned in an orderly way.

The Toolkit had its International Launch in Ghana in April 2011 at the Ghana Institution of Engineers in Accra to over 60 engineers and then to over 350 students at the Kwame Nkrumah University of Science and Technology in Kumasi.

In between the launches in London and Ghana the Toolkit has been showcased at Engineers without Borders meetings and workshops in Manchester, Strathclyde and at the Royal Academy of Engineering in London in the UK – and in Kentucky USA where it drew a particularly positive response from Dirk Bouma (former Chair of the SE Technical Advisory Committee of EWB-USA). The Toolkit has featured various regional meetings of the ICE in the UK and Hong Kong, the Zimbabwe Institution of Engineers UK, the Nigerian Society of Engineers and the Association of Consulting Engineers. Almost all of these presentations have been undertaken by the Apprentices. The Toolkit has also featured in numerous magazine and journal articles (NCE, the South African Institution of Civil Engineering Journal, and the Global Urbanist) together with various in-house corporate newsletters.

And funding has been received from the Royal Academy of Engineering's "Ingenious" public engagement scheme to roll-out the Toolkit in the UK to companies, universities, school students and civil society. Twelve events are planned, and the search has begun to find suitable venues in each of the UK's 12 ICE regions. Plans are in hand to extend the Toolkit contents and turn it into an i-App, and UNESCO are funding the printing of 4000 hard copy samples of the Toolkit for worldwide distribution.

There is no doubt that the successful delivery of the Toolkit was the highlight of my year as President - a year full of so many. There were many who doubted it was possible and in the lead-in to my Presidency I was often asked "what was Plan B?" There was no Plan B. The Apprentices delivered. And that is what we expect our graduates to do. To deliver. To be confident. And to know your subject and its context. Now is the Time!

UC Research Offers Solution to Strengthen Vulnerable Buildings

An innovative solution for strengthening multi-storey concrete buildings was put to the test on the University of Canterbury's shake table earlier this month.

As part of a seven-year Foundation for Research, Science and Technology-funded project on "Seismic Retrofit Solutions for NZ multi-storey buildings" started in 2004, a three-storey reinforced concrete (RC) model building was put through two simulated earthquakes before an audience of staff, students and local television crews.

The particular research being tested – part of PhD student Patricio Quintana Gallo's thesis project but related to a much wider body of research being carried out by a team from the Civil and Natural Resources Engineering Department led by Associate Professor Stefano Pampanin – was an investigation of the seismic response of non-ductile pre-1970 RC frame buildings, before and after a rehabilitation or retrofit intervention. The objective was to upgrade the performance of such a structure when it is subjected to strong earthquake ground motions.

The model had been retrofitted with GFRP (Glass Fibre Reinforced Polymer) laminates, which are like bandages that can be wrapped around a building's damaged or vulnerable spots, a solution neither too invasive nor expensive and one that could provide a solution to strengthen this country's older RC buildings, as well as repair and strengthen the damaged ones, and make them far safer.

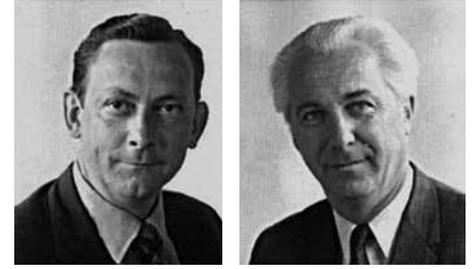
The use of advanced composite materials for seismic retrofit prior and after earthquake events is becoming, at an international level, a highly regarded solution as proven by the seismic repair and rehabilitation of many public schools after the L'Aquila earthquake in Italy in 2009.

The first simulation was based on the ground motions recorded in the CBD during last September's 7.1 magnitude Darfield Earthquake and the second shake test subjected the structure to the same ground motions of Chile's 8.8 magnitude quake in February 2010, which researchers believe would be relatively similar, in duration and intensity, to what we could expect in Christchurch from major seismic activity on the Alpine Fault.

Patricio said the testing proved that researchers had been able to reverse the "hierarchy of strengths" in the beam column joint region using the GFRP laminates, thus protecting the structure from a soft-storey or "pancake" collapse mechanism, and therefore proved the efficiency of their design for upgrading the performance of these older reinforced concrete buildings.



Park and Paulay Fund



A fund to commemorate the achievements and contributions of two of our department's renowned civil engineers has been officially launched at the University of Canterbury.

The Park and Paulay Fund, promoted by the University of Canterbury Foundation, has been established to honour the groundbreaking work of Professor Bob Park (1933-2004) and Professor Tom Paulay (1922-2009), both academics in the Department made significant contributions in the fields of structural and earthquake engineering.

Professors Park and Paulay received international recognition for their work, which they undertook both separately and together. Their major work, Reinforced Concrete Structures (1975), became a seminal work on capacity design and has been translated into many languages.

The fund, launched at a gathering of colleagues, family and friends, will be used to make awards to outstanding young engineers to help them develop into professionals able to contribute strongly to the fields of structural and earthquake engineering. The fund was initiated by Wellington consulting engineer Dr David Hopkins, a former student of both Park and Paulay.

Speaking at the launch, Dr Hopkins described the pair as "special people" and said it was fitting that a fund had been established in their honour.

He said the fund would encourage young engineers to emulate the work carried out by the two men and to aspire to the personal qualities demonstrated by the pair.

The fund was officially launched by Professor Paul Jowitt, President of the UK-based Institution of Civil Engineers, who was in the country to present the 2010 Hopkins Lecture. He said professors Park and Paulay notched up many outstanding achievements of worldwide significance. "Tom and Bob made a fabulous team and they were fantastic mentors and teachers as well as researchers."

Executive Officer of the University of Canterbury Foundation, Shelagh Murray, said donations have already been received from around the world. "We are hoping to achieve our target of \$200,000 to establish a capital fund for awarding of scholarships."

Fire / Transportation / Management



IPENZ Life Membership: Alan Nicholson

This citation records the award of Life Membership of the IPENZ Transportation Group to Alan John Nicholson in March 2011. It recognises his significant contribution and continuing service to the development and growth of the Group, the wider transport profession and to society.

After completing his BE(Civil) at the University of Canterbury in 1969, Alan commenced postgraduate study under a New Zealand Government Graduate Study Award, completing his ME(Civil) in 1971 and PhD in 1974. He joined the Ministry of Works and Development (MWD) in Christchurch working on bridges, dams and buildings. Between 1975 and 1976, Alan undertook a second Masters degree at the University of Birmingham under a Rotary Scholarship. He returned to Wellington to undertake organising and supervising research in the MWD head office from 1977.

In 1981, he was appointed to a Senior Lectureship in Civil Engineering at the University of Canterbury. Here he began a distinguished academic career, becoming an Associate Professor in 1998 and a full Professor in 2009. From 2005 to 2009 Alan was Head of the Department of Civil and Natural Resources Engineering, overseeing nearly 60 staff and teaching and supervising over 500 students each year. In 2010 he was appointed Director of the Construction Management programme, which commenced in Canterbury.

Alan has made a major contribution to the education and training of a large number of transportation practitioners. He has mentored and assisted many students, including over 50 Masters and PhDs. In 1991 he developed, in collaboration with the University of Auckland,

the very successful five-day Fundamentals of Traffic Engineering industry course that, still to this day, provides a key stepping stone for new members of the profession. Alan was also appointed Director of Transportation Engineering at Canterbury in 2002 as he spearheaded the very successful industry-funded postgraduate programme in transportation engineering.

Alan has always had a strong interest in road safety, and pioneered statistical methods to assess hazardous locations and safety treatments. He has also contributed greatly to our understanding of transport network reliability, travel demand management and sustainable transport policies, long before they became “fashionable”.

Since 1981, Alan has been a research advisor and peer reviewer to various national road and transport agencies in New Zealand. He has also been a reviewer for many top international journals, including *Transportation Research and Accident Analysis & Prevention*. He has authored over 130 published conference and journal papers and book chapters in New Zealand and overseas. During his career, he has given numerous presentations and lectures in his specialty areas at conferences and universities worldwide.

Alan has taken a major role in the Transportation Group's growth and development, including serving on the National Committee from 1994 to 1996 and chairing the Group from 2003 to 2006. His expertise and contributions to the profession were previously recognised in 2000 when he was elected a Fellow of IPENZ.

It is in recognition of Alan's sustained commitment to the IPENZ Transportation Group, the engineering profession and society that we, his colleagues, make this award.

UC Academic Recognised by IBM

A proposed course, developed by a University of Canterbury academic and aimed at providing future engineers with the skills to manage modern transportation engineering problems, has received backing from one of the world's largest technology companies.

Dr Kenneth Kuhn (Civil and Natural Resources Engineering) has been awarded a Smarter Planet Faculty Innovation Award by IBM. He is one of only 50 academics worldwide from 40 universities to receive the award.



The awards, worth US\$10,000, were set up by IBM to help universities develop innovative curricula that address the global challenges of transportation, health care, water, energy and other systems.

Dr Kuhn's award was for a proposed course he had developed called “Improving Transportation System Efficiency and Safety through Asset Optimisation”. IBM will make Dr Kuhn's course notes and materials publicly available through its Academic Initiative.

“The idea behind the course was that a lot of the challenges associated with managing transportation systems today require balancing competing objectives and also require data analysis,” said Dr Kuhn.

“One of my favourite examples is when an airline pilot chooses a route to fly in an area where there is bad weather. The pilot and airline want to minimise how much fuel they use, but also the risk of making passengers uncomfortable. An air traffic controller has to ensure that the decisions of different pilots don't lead to conflicting flight paths. Decisions might be influenced by passengers' flight connections. The problem can be as simple or as complicated as you like. Another example would be figuring out when to change traffic signals. This sounds like quite a different problem, but again you need to trade-off safety and efficiency to some degree.”



Pictured (from left) are Carol Hirschfeld, Nick Borren (University of Canterbury), Stephanie Miller (University of Auckland), Richard Gray (University of Canterbury) and Tonkin & Taylor New Zealand Managing Director Doug Johnson. Photo supplied by www.christinesyme.com.

Dr Kuhn said decisions should be based on data describing what happens in different situations.

"Transportation domain knowledge is the most important but expertise in areas like probability and statistics, mathematical programming, economics and computer programming is very helpful for addressing modern transportation problems. I think companies like IBM realise this and are trying to influence how transportation engineering is taught."

Dr Kuhn said he was "very proud" to receive the award.

"I have only been an academic and an educator for a little over two years. One of the things that I think is great about this job is that I'm constantly learning - from my colleagues at Canterbury and elsewhere, as well as from the students. A lot of what I learned went into the proposal I provided to IBM."

Nominations for the 2011 Smarter Planet Faculty Innovation Awards are now open. IBM has announced the 2011 awards will focus on Smarter Commerce, Smarter Communication and Smarter Energy.

IBM's lead for the Academic Initiative in Australia and New Zealand, John Schilt, said "building a Smarter Planet starts with developing future leaders who understand the value of how information technology can be applied to create real insight into data and organisational performance".

Tonkin & Taylor / ACENZ Best Practical Work Report Awards

ACENZ and Tonkin & Taylor proudly present an annual award to three Engineering students. The Association introduced the student award in 1996 with Tonkin & Taylor's support from 2010. This award highlights the importance of written communication skills that are essential for report writing in the business of engineering, and promotes career opportunities within the consulting engineering industry.

Fourth Year Engineering students are invited to submit their Practical Work Report as part of the Bachelor of Engineering Degree prescription. The reports are judged on report writing and the student's ability to describe the work they carried out and their experience gained, rather than on the duties undertaken.

The winners each receive a framed certificate, a cash prize of \$1500, complimentary delegate registration to the ACENZ annual conference and travel expenses covered to attend the INNOVATE NZ Awards of Excellence to receive their award.

Two out of the three winners this year were from our department.

Nicholas Borren – University for Canterbury for his work report on Hanlon & Partners, Dunedin
 "A standout report – a really clear report, had a really good experience and learned a lot."

Richard Gray – University for Canterbury for his work report on Beca, Auckland

"A commercially astute report – a good understanding of work scheduling processes & project phases, seemed to have learnt a lot technically and enthusiasm came through."

Stephanie Miller – University for Auckland for her work report on Dunning Thornton Consultants, Wellington

"Great report, easily understood with a nice personal touch, value identified and sensed she really enjoyed her experience."

10th International Association for Fire Safety Science Conference at University of Maryland, USA

In late June Charley Fleischmann, Mike Spearpoint and Kai Li along with current students and graduates attended the Tenth International Association for Fire Safety Science conference at the University of Maryland, USA. This conference is considered to be the world's preeminent fire science conference and is only held every three years.

This conference was a busy time for everyone. Charley gave a keynote paper, is co-author of another paper and chaired a session, Mike is the proceedings editor, presented one paper, is co-author of two other papers, chaired a session, was one of the two IAFSS committee election scrutineers, co-presented three posters, presented two fire science images and won one of two awards for honourable commendation for a paper given at the previous conference. Kai presented two posters and chaired a session. Kevin and Greg both presented a paper each and Ed presented a poster. Dave chaired a workshop on sustainable buildings.

The next conference in 2014 will be at the University of Canterbury so it's time to get organising for that event.



continued overleaf



Fire Engineering Update

Fire Industry Advisory Committee

The annual meeting of major local and international employers in the fire engineering industry took place in November 2010. The committee used this year's meeting to assess the impact of the changes in University funding and the new 15-point course structures on the Fire Engineering programme, among other general educational matters. Committee members in 2010: 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). Among others, the committee concluded that:

- Incentives need to be devised to encourage more student completions
- From 2012, the Fire Engineering programme goes into a 15-point structure, with some rigid prerequisites on entry into the Master of Engineering in Fire Engineering (MEFE) program.
- The university should look into offering CPD courses for engineers, especially in numerical modelling

Scholarships

New Zealand Fire Service Commission scholarships, worth a total of \$25000, were awarded to Garth Hay, Mahesh Andhe and Phillip Spellman.

ISO TC92/SC4 International Meeting

The University hosted the ISO/TC 92/SC 4 "Fire Safety Engineering" meetings on campus in April. The meetings gave the opportunity for staff and students to observe the development of standards from the inside and to interact with a host of international experts. Charley was also kind enough to host all of the delegates, their guests and our students at his home for dinner over two consecutive evenings.

NZ Fire Research Workshop

In August Tony Abu and Mike Spearpoint took part in a Fire Research Workshop organised by BRANZ and hosted at the Department of Building and Housing. The meeting helped inform BRANZ on its Building Research Levy investment process and discussed future research goals of the wider New Zealand research community. It is hoped that this Workshop can become an annual event for research providers, users and funders who have an interest in fire research related to the built environment

U3A

Also in August, Mike was invited to give a talk to the University of the Third Age (U3A) on our recent research. U3A is a learning community organised by and for people who are in retirement and the audience was interested to hear about the wide range of research activities carried out by the students and staff.

Fires and Earthquakes

The impact of the recent earthquakes on buildings has necessitated the investigation of the robustness of fire protection systems. The Fire Protection Association (FPANZ), with the assistance of the University, has commissioned a new report on the performance of fire safety systems post-earthquake. The project has won some sponsorship from the Natural Hazards Platform, and aims at cataloguing post-earthquake fires and the response of active and passive fire protection systems to inform industry (and potential standard reviews) on the successes and failures of these systems.

Track Me Back

Calling all Engineering Alumni – New Zealand needs you!

Track Me Back's engineering employment partners including Fletcher Building, City Care, Aecom, Aurecon, SKM, Transpower and Beca are looking for your skills now. By registering with Track Me Back these industry leaders will be able to match your skills with their requirements and contact you directly about job opportunities often before they go to market.

Simply visit www.trackmeback.co.nz to view their 3 page Employer Profile telling you about each one's business, culture and benefits with links to their careers sites for more information. By registering you will also be help let those involved in the Christchurch Rebuild know about your skills and when you might be available. Sign up for 'Hot Jobs' new monthly jobs bulletin direct from New Zealand's leading employers.

Erskine Visitors 2010-2011

Visitors	Institution	Interests	Date of Visit
Prof. Fabio Biondini	Technical University of Milan, Italy	Geotechnical/Earthquake	15 Jul – 15 Sep 2011
Prof. Jonathan Fannin	University of British Columbia, Canada	Geotechnical/Earthquake	15 Sep – 15 Oct 2011
Prof. Roberto Leon	Georgia Institute of Technology, US	Geotechnical/Earthquake	10 Feb – 10 May 2011
Prof. Say Kee Ong	Iowa State University, US	Environmental	7 Feb – 10 May 2011
Prof. Thian Gan	University of Alberta, Canada	Environmental	1 Jul – 6 Sep 2011

Research Grants (August 2010 – July 2011)

Principal Investigator	Project
Tom Cochrane	Rivers at Risk: Modelling and Monitoring the Potential Impacts of Large-Scale Disruption of the Hydrological Cycles of the Mekong River Basin on Bio-diversity and Natural Systems
Misko Cubrinovski	Liquefaction Hazard Investigations in residential areas of greater Christchurch
Rajesh Dhakal	Assessing New Zealand Buildings' Risk of Pounding Induced Damage
Greg MacRae	Non-structural Elements in Building Seismic Performance
Roger Nokes	Experiment Investigation of Interactions between Stratified Fluids and Porous Obstacles
Aisling O'Sullivan	Getting the Storm Water Message Across
Alessandro Palermo	Damage-Free Bridges
Daniel Tsang	Improving Lyttelton Harbour's Sediment Quality

Earthquake-Related Research Grants

Since the Earthquake of 4 September 2010, many staff have been involved in earthquake-related research/reporting and the following projects have been undertaken.

Principal Investigator	Project
Anthony Abu	Post Earthquake Fires and Damage to Fire Safety Systems
Misko Cubrinovski	Liquefaction Impact on Pipe Networks
Misko Cubrinovski	CBD Foundation Damage
Sonia Giovinazzi	Hospital Functions and Systems
Sonia Giovinazzi	Temporary Housing Issues
Sonia Giovinazzi	Recovery of Life Lines
Alessandro Palermo	Bridge Performance
Stefano Pampanin	Reinforced Concrete
Stefano Pampanin	Stairs

Postgraduate Thesis Completion 2010-2011

2011

Name	Degree	Thesis
Govind Acharya	PhD(Civil)	Model development of landslide, water induced erosion and hydrology applying GIS and other tools
Weng Kam	PhD(Civil)	The development of selective retrofit strategy and techniques for reinforced concrete structures within a performance-based approach
Craig McCauley	PhD(Civil)	Engineered wetlands for passive treatment of complex mine waste waters
Vinod Sadashiva	PhD(Civil)	Building regularity for simplified modelling
Amy Stephenson	PhD(Civil)	Benchmarking the resilience of organisations
Julia Valigore	PhD(Civil)	Algae biomass for coupled biofuel production and wastewater treatment
Li Qi Chen	MET	Bus service reliability study
Christopher Lai	MET	The comparison of indices for analysing transportation networks
Alastair Waller	ME(Civil)	Effects of design of base isolation in structures at varying places
Jeanette White	ME(Civil)	Biogas generation potential of coconut copra as a carbon source in the anaerobic digestion process
Ricky Wong	ME(Civil)	Cost and time of multi-storey post tensioned LVL timber structure compared with concrete and steel

2010

Alejandro Amaris Mesa	PhD(Civil)	Development of advanced solutions for seismic resisting precast concrete frames
Frederico Pedrosa	PhD(Trans)	Dynamic response recovery tool for emergency response within state highway organisations in New Zealand
Nastaein Qamaruzzaman	PhD(Civil)	Waste biodegradability tools to assess biological treatment options
Sean Rees	PhD(Civil)	Characterisation of undrained behaviour of Christchurch soils
James Rotimi	PhD(Civil)	The framework for effective post-disaster reconstruction in New Zealand
Euving Au	ME(Civil)	The mechanics and design of slotted reinforced concrete beams
Henry Brammer	MEFE	Examination into the reliability of secondary water supplies
Bridget Burdett	MET	Influence on safety of perceptual speed management treatments on New Zealand rural roads
Robert Fleury	MEFE	Evaluation of thermal radiation models for fire spread between objects
Jeremy Gaskin	MEFE	Effectiveness of skylight ceiling vents
Gordon Grant	MEFE	Evaluation of timber floor systems for fire resistance and other performance requirements
Marcus Le Quesne	MEFE	Saltwater modelling of fire gas flow through a horizontal ceiling opening
Benjamin Leslie	ME(Civil)	Development and validation of a non-tearing floor precast concrete structural system for seismic regions
W-H Tsai	MEFE	Charring rates for different cross sections of laminated veneer lumber
Rebecca Wardell	MET	Influences on transport policy makers and their attitudes towards peak oil

Staff

Academic and Research Staff

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

David Wareham: Environmental Engineering, Biological Nutrient Removal
Deputy Head of Department

Greg MacRae: Structural Engineering
Director Postgraduate Studies

Mark Davidson: Fluid Dynamics
Director Undergraduate Studies

Umut Akguzel: Structures

Lis Bowman: Geotechnical Engineering, Geomechanics

Andy Buchanan: Timber, Fire and Earthquake engineering

David Carradine: Timber Engineering

Brian Caruso: Water Resources Engineering

Tom Cochran: Natural Resources Engineering

Misko Cubrinovski: Geomechanics, Geotechnical Earthquake Engineering

Roger Dawe: Surveying

Bruce Deam: Earthquake and Timber Engineering, Computer Modelling

Sarah Delavan: Environmental Fluid Mechanics

Tonny de Vries: Bioresources Engineering

Rajesh Dhakal: Structural Mechanics, Reinforced Concrete

Charley Fleischmann: Fire Engineering, Compartment Fire Modelling

Matthew Hughes: Geotechnical Engineering

Sonia Gionvinazzi: Risk Management

Glen Koorey: Transportation and Traffic Planning, Road Safety

Kenneth Kuhn: Infrastructure Management, Public Transportation Planning

Pedro Lee: Fluid Mechanics, Hydrology

Kai-Yuan Li: Fire 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

Thanapon Piman: Hydrologic Modelling

Nadine Roth: Traffic Management, Mobility Pricing, Commercial Traffic

Mofreh Saleh: Pavement Engineering

Eric Scheepbouwer: Engineering Management, Engineering Dynamics

Allan Scott: Structural, Materials Engineering

Michael Spearpoint: Fire Engineering

Daniel Tsang: Environmental Engineering, Site Remediation

Creon Upton: Communications Skills Advisor

Kam Weng: Structures

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: Structures

Associate Professor

Richard Fenwick: Structures

Senior Fellow

Larry Bellamy: Structures

Kevin McManus: Geomechanics

Bryan Pidwerbesky: Transportation

Erica Seville: Risk Management, Engineering Systems

Robert Spigel: Fluids

Shane Turner: Transportation

Paul Weber: Geotechnical, Environmental

Emeritus Professors

Athol Carr: Structural Mechanics and Dynamics, Finite Element Analysis

Rob Davis: Geomechanics and Continuum Mechanics

David Elms: Civil Engineering Systems, Risk Assessment

Ian Wood: Fluid Mechanics, Civil Engineering Hydraulics