# CE News

Number 15
February 2002

A Publication of the
Civil Engineering Department
University of Canterbury

## This issue



UNIVERSITY OF CANTERBURY
CHRISTCHURCH • NEW ZEALAND

# Departmental Staff

## Academic

| | |
|---|---|
| Chris Allington | Structural concrete design |
| John Berrill | Geomechanics, engineering seismology |
| Andy Buchanan | Timber and fire engineering, Head of Department |
| Des Bull | Structural concrete design, earthquake engineering |
| Athol Carr | Structural dynamics, finite element analysis |
| Bente Clausen | Hydrology, impacts on ecology |
| Nigel Cooke | Structural design (bridges), structural masonry |
| Rob Davis | Geomechanics, continuum mechanics |
| Mark Davidson | Fluid mechanics |
| Bruce Deam | Earthquake engineering, timber engineering |
| Charley Fleischmann | Fire engineering |
| Bruce Hunt | Groundwater flow, analytical analysis |
| Jason LeMasurier | Systems, engineering management, risk |
| Kevin McManus | Geotechnical engineering, foundation engineering |
| James Mackechnie | Concrete specialist |
| John Mander | Structural and earthquake engineering |
| Mark Milke | Solid waste management, uncertainty analysis |
| George Mullenger | History of civil engineering, continuum mechanics |
| Alan Nicholson | Transportation planning, traffic safety |
| Roger Nokes | Fluid mechanics |
| David Painter | Water resources engineering |
| Mofreh Saleh | Transportation engineering |
| Michael Spearpoint | Fire engineering |
| Alex Sutherland | Sediment transport, coastal engineering |
| Warren Walpole | Structural steel design, earthquake engineering |
| David Wareham | Biological nutrient removal, waste treatment |

## Retired

| | |
|---|---|
| David Elms | Risk analysis |
| Peter Moss | Structural dynamics, timber engineering |
| Bob Park | Structural engineering |
| Tom Paulay | Structural design |
| Ian Wood | Fluid mechanics |

## Support

| | |
|---|---|
| Louise Fitzgibbon | Postgraduate administration and enquiries |
| Denise Forbes | Accounts |
| Catherine Price | General and fire engineering enquiries |
| Pat Roberts | Undergraduate administration and enquiries |

## Technical

| | |
|---|---|
| Ray Allen | Workshop |
| Colin Bliss | Fluids lab |
| Melody Callahan | Graphics/Web |
| Peter Coursey | Computing |
| Nigel Dixon | Stores and purchasing |
| Grant Dunlop | Fire lab |
| Siale Faitotonu | Geomechanics lab |
| Frank Greenslade | Transport lab |
| Gary Harvey | Concrete lab |
| Brandon Hutchison | Computing |
| David Macpherson | Environmental lab |
| Russell McConchie | Structures lab |
| John Maley | Structures lab |
| Richard Newton | Electronics lab |
| Alan Poynter | Model Structures lab |
| Ian Sheppard | Fluids lab |
| Stuart Toase | Structures lab |
| Mike Weavers | Electronics lab |
| Kevin Wines | Structures lab |


**Credits:**

*Cover photo:* Mussells by David Plew - see page 14
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*Layout and Design:* Melody Callahan
*Editorial Assistant:* Catherine Price

*Printer:* Caxton Press

*Many thanks to all those who contributed articles and photos in the making of CE News*


*Be sure to visit our web site at:*
*www.civil.canterbury.ac.nz*

*Here you can just browse around, catchup with fellow alumni, see who's doing what research project, view course outlines or contact staff*

# The Head's Memo

Once again I wish to welcome all readers of CE News.

The Department of Civil Engineering is dynamic and buoyant, with lots of exciting projects planned or in progress.

A record number of 103 graduates have just completed their BE(Hons) degree, and most are about to start work. The job market for civil engineering graduates has been very aggressive this year, with many students being offered several jobs. In order to supply the market we need to attract an increasing number of talented young people from high school into civil engineering.

The Department was reviewed during 2001 by a combined team from IPENZ and the university, receiving excellent credit for the things we do well and good suggestions for improvements.

A major current initiative is a thorough overhaul of the undergraduate curriculum, strongly supported by the recent review. It is planned to introduce several new courses in 2003, retaining much of the current material but introducing changes to encourage more independent learning with less contact time for students and better integration between the various disciplines within civil engineering.

A highlight of 2001was the launch of a new masters degree in transportation, which will go live in 2002. The new MET degree (Master of Engineering in Transportation) has been established in collaboration with the University of Auckland, with major financial assistance of Transfund and the Land Transport Safety Authority. The new degree will attract full time students directly from the BE(Hons) programme, and practising engineers from throughout New Zealand who can study full-time or part-time.

We have several new strategies to boost the number of postgraduate students in the Department, in competition with the extremely strong job market for BE(Hons) graduates. Postgraduate opportunities in the Department are

excellent, with several new staff members looking for Master's or PhD candidates for exciting research projects.

This year we have welcomed several new staff members, including Roger Nokes and Mark Davidson in fluid mechanics, Mofreh Saleh in pavements, James Mackechnie in concrete and very recently Jason Le Masurier in management.

I want to acknowledge the help of Bente Clausen, Melody Callahan and Catherine Price in the preparation of this issue.

Your feedback is always welcome. Please visit our website at http://www.civil.canterbury.ac.nz.

*Andy Buchanan*
*Head of Department*

## Presentation Presentations

As usual staff and students have been busy attending and presenting at international conferences. This year we had several who received presentation prizes.

Andy Buchanan and Mike Spearpoint attended the 5th Asia-Oceania Symposium on Fire & Technology, Newcastle, Australia in December. Mike's paper on the use of web-related mark-up languages for the exchange of fire data was awarded joint third best paper of the conference.

Bente Clausen received a shared best-presentation prize for her presentation on 'How high are bed-disturbing flows in New Zealand rivers' at the Hydrological Society's conference, held jointly with the Limnological Society in Palmerston North in late November 2001. The presentation was based on work she had carried out with David Plew, a PhD student in our Department.

At the same conference, Manu Ward, a third professional year student, received the undergraduate student research prize for his presentation 'Feasibility of a Border Dyke Infiltrometer'. The presentation was based on his third-year project, in which he tested a model of a portable infiltrometer for measuring infiltration during border-dyke irrigation. (See page 14). Manu must have been the youngest conference participant, and he managed to keep the attention of a large number of attendants in a big lecture theatre – well done!◆

# Governor-General Visit

Her Excellency the Honourable Dame Silvia Cartwright and Chancellor Dame Phyllis Guthardt toured part of the University on 12 November 2001. Saving the best for last, Dame Silvia toured the Civil Engineering Department after visiting Law, Physics and Astronomy, and Electrical Engineering. She was given a tour of our research labs observing and discussing a number of projects ending with a presentation from PhD Candidate Jeff Matthews on his research into the safety of buildings during earthquakes. ◆

*Andy Buchanan, Daryl Le Grew, Dame Silvia, Des Bull and Russel McConchie listen as Jeff explains his research.*

# Study Leave in India

David Wareham was on study leave from the 1st of February 2001 to the end of January, 2002. The first half of his sabbatical was spent here at the University of Canterbury where he made a great deal of progress on several tasks which he had put on hold for a number of years (eg. papers written, transformation of handwritten lecture notes to computer etc).

The second part of his sabbatical was spent as a Visiting Faculty member at the Civil Engineering Department of the Indian Institute of Technology, Kanpur. The IITs are the top universities in India. His main task was to co-teach a postgraduate course in Ecological and Biological Principles and Processes, in particular the enzyme kinetics of the biochemistry section, the microbiology and the biological waste treatment section of the course. He had a class of 18 students who were very keen and a joy to teach.

He gave two seminars while at IIT. The first was entitled "A Brief Glance at Some Environmental Engineering Education Teaching Initiatives within the Civil Undergraduate Program at the University of Canterbury, Christchurch, New Zealand". As the name suggests, he described the water quality labs associated with ENCI 381 Environmental Quality Engineering and the environmental ethics simulation done as part of the ENCI 402 Systems course. The second seminar was entitled "The Use of Oxidation-Reduction Potential for the Control of Wastewater Treatment Processes Containing Anoxic Zones" a subject about which he has had a long-standing interest. During the semester recess when he was not teaching, in addition to looking at general sanitation issues associated with developing countries, he was able to get out and explore a limited part of India. ◆

▲ *Water storage tank in Thar Desert*

◀ *Dave and Sonia the camel*

*David Wareham*

# Instream Flow Methods

## A Master's course

In last year's CE News the new interdisciplinary Master's course on hydrology and freshwater ecology (ENCI633 Instream Flow Methods) was described briefly. So how did it go in 2001?

With twelve students enrolled from four departments (Civil Engineering, Geology, Geography, Zoology) and two private companies, it could not have gotten a better start!

The first half of the course included a one-day field trip to the Opuha River, where we collected data to run a hydraulic-habitat model. We are grateful to Greg Skelton and Keith Chapman from Networks South, and David Attewell from Attewell Irrigation Consultants Limited, who made it possible to collect data at three different flows within the same day. Thanks also for organising such good weather for the occasion! We were also fortunate to have two people contributing on one afternoon each: Ian Jowett from NIWA, gave a review of his work on instream flow methods, and Angus McIntosh from the Department of Zoology broadened our understanding of especially freshwater fishes.

*Class fieldtrip to the Opuha River*

The second half of the course was built up by student presentations, covering topics such as bed instability, flushing flows, streamflow variability, and case studies of how minimum flows are set in New Zealand. The diversity of the students' background was a special bonus for this part of the course.

## Workshop at Auckland Regional Council

A compressed version of the master's course was held in form of a 2-day workshop at Auckland Regional Council. There were 13 participants from four regional councils (Aucland, Northland, Waikato and Bay of Plenty), all people who, in their daily work, apply instream flow methods for solving conflicts between water users, and who sometimes have to defend these methods in court. The biggest challenge facing water managers in this region relates to the small, weedy, sandy-bottom type of streams in this region, which poses various problems for application of some of the instream flow methods. ◆

*Bente Clausen*

## Silver Sponsors

**Mr Dudman, Thailand**

**Powell Fenwick Consultants Limited, Christchurch**

We wish to extend a special thank you to our Silver sponsors for their generous donations.

Each of these have been used to support a promising student to engage in research projects and assist with tutorials.

# CAPTIF Update

CAPTIF is currently 2½ years into a 4 year Transfund New Zealand research program looking at the effect of increased vehicle mass limits on the performance of thin surfaced unbound granular pavements. The first phase of the project looked at the relative effects of 8 and 10 tonne axles on a thin surfaced unbound granular pavement. A test pavement comprising four different pavement designs was constructed and subjected to 1,000,000 wheel passes. The pavement performance was modelled using the "Fourth Power Law" but the calculated exponents ranged in value from 2.8 to 9, compared to the historical value of 4. A new "compaction-wear" model was proposed and this model will be tested in the remainder of the research program. The pavement materials were also subjected to an extensive set of characterisations.

The next stage in the project was to measure the three dimensional pavement response when subjected to a matrix of load/tyre type/tyre pressure and speed combinations. This work was co-funded by Austroads, an Australian and New Zealand organisation made up of the state and national roading authorities in the two countries. After the completion of these tests, the axle load on the pavement that was subjected to the 8 tonne loading was increased to 10 tonnes and a further 300,000 wheel passes were applied. The pavement deterioration increased rapidly at first, but the rate of deterioration decreased over time to be equal to the deterioration rate from the first test. Following this, the thin asphaltic concrete surfacing was replaced with a sprayed chipseal.

*Laying pavement at the test track*

Fulton Hogan constructed a special radial spray bar in order to be able to apply a uniform application of bitumen around the track. The construction of the chipseal was successful and the surfacing was able to withstand 180,000 wheel passes before it failed during a period of hot weather in October. The purpose of this trial was to compare the relative flushing rates of a chipseal surface under the 8 and 10 tonne axle loads. Currently (December 2001), a new test pavement is being constructed for the next phase in the research program.

The next test pavement will consist of 5 sections, 2 different premium materials will each be laid in strong and weak pavement designs and a low quality material laid in a strong design. The pavement will be subjected to loading by concentric 8 and 12 tonne axle loads. ◆

*Bruce Steven*

# Campus Travel Plan

The University Facilities Advisory Committee's Transport Working Group, which is convened by Alan Nicholson, has been studying travel to and from the University. A major travel survey was undertaken in July 2000, and the data analysis has been done by Hamish Wilde. Hamish held a University of Canterbury Summer Scholarship for the period November 2000 to February 2001, and he completed the analysis as a final-year project in 2001.

The results reveal between 1993 and 2000:

- the proportion of students driving to University increased from 33% to 41%, while cycle use decreased from 38% to 15% and walking has increased from 18% to 33%

- the proportion of staff driving, cycling and walking changed very little, and is 62%, 18% and 13% respectively.

The increasing car use is not consistent with the view that "we should care for the environment" (strongly supported by 86% of students and 92% of staff ).

The City Plan requires the University to provide approximately one on-site carpark per four equivalent full-time students, to reduce the on-street parking and enhance road safety and efficiency. Restrictions have also been imposed on parking in several streets.

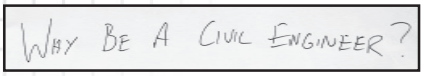
Increasing car use results in greater peak-period congestion. Unless some action is taken, car use will probably continue to increase, necessitating further car-parking restrictions in neighbouring streets and road capacity increases. The University may well need to provide more on-site car-parks, even if student numbers do not increase. If student numbers increase substantially, this will further aggravate the situation. If a parking building were constructed (to conserve the open, green space on campus), the cost would be considerable, and would mean less money being available for teaching and research.

The Transport Working Group is working with the Christchurch City Council and Canterbury Regional Council (Environment Canterbury) to investigate options for encouraging the alternative modes of travel (buses, cycling, walking and ride-sharing). Student numbers could then increase without a commensurate increase in on-site car-parking.

In a number of countries (e.g. UK and USA), major employers are required to develop Travel Plans to encourage employees to use more efficient and sustainable modes of travel. There is growing interest in having such plans in NZ, and the University of Canterbury may be one of the first employers in NZ to have a Travel Plan. ◆

*Alan Nicholson*

# Annual Planning Workshop




Was discussed at the Department's annual planning workshop in April. Around 70 people including academics, technicians, support staff, post-graduates and members of the Professional Liaison Committee gathered in the Student Association Building to discuss the Department's goals and plans, with Steve Dakin facilitating. An important item on the agenda was a review of the undergraduate curriculum including the teaching and learning techniques.

The morning was dedicated to a review and discussion of the department's goals. Stimulating talks were given by Vicki Buck, former Mayor of Christchurch, and Peter Leslie, manager

of Pacific Architect Engineering (PAE). Vicki Buck spoke on creativity and the importance of teaching people how to think. Peter Leslie gave an employer's view of the department's graduates and stressed the importance of good communication and leadership skills. Katherine Hill, a PhD student, and Lauren Waring, a second-professional-year direct-entry student, gave critical and courageous reviews of the learning process and teaching style in the department. This was followed up by a presentation on teaching techniques by Victor Chen from the University's Education, Research and Advisory Unit (ERAU).

In the afternoon the group split in two. One group discussed the undergraduate degree and how a revised Curriculum can be implemented. The other group learnt of how pending changes in the purchasing system would affect them. Lynne O'Donoghue, the Project Manager for the UC Finance system upgrade, answered many and varied questions from technical and support staff. ◆

# David Wilkinson Commemorated

A special issue of Journal of Hydraulic Research (JHR) was dedicated by the IAHR fluid mechanics section in memory of David Wilkinson, who was Professor of Hydraulics in the Department from 1995 till his untimely death in December 1998, just prior to the opening of the Second International Symposium on Environmental Hydraulics (ISEH). He was in Hong Kong as an invited symposium speaker, and at the time of his death he just finished lecturing together with other section members in a pre-conference international short course on 'Hydraulics and design of sea outfalls'. During the symposium the fluid mechanics section met and unanimously supported the idea of preparing a special JHR issue on environmental hydraulics in honour of David Wilkinson.

David is known for his contributions to environmental fluid mechanics, and his earlier paper on 'Rapidly varied flow phenomenon in a 2-layer flow' (Wilkinson and Wood, Journal of Fluid Mechanics, 1971) is one of the most widely cited works in the field. David had a warm and strong personality, and is missed in the Department. ◆

## Postgraduate Courses Available in 2002

Courses to be taught in Block mode are identified with (B).
Full-time or part-time enrolments are welcomed.

### First Semester

| | | |
|---|---|---|
| | Risk Assessment | Milke / Spearpoint |
| | Structural Dynamics & Earthquake Eng | Carr / Deam |
| | Earthquake Engineering Colloquium | Deam / Berrill & Visitors |
| | Concrete Materials and Practice | Mackechnie |
| | Environmental Geomechanics | McManus & Visitor |
| | Nonlinear Structural Mechanics | Mander |
| | Groundwater Flow | Hunt |
| | Water Chemistry | Wareham / Milke |
| | Environmental Fluid Dynamics | Nokes |
| | Enviro. Monitoring & Measurement Analysis | Milke |
| (B) | Accident Reduction & Prevention | Nicholson |
| (B) | Fire Engineering | Buchanan |
| (B) | Fire Dynamics I | Fleischmann |

### Second Semester

| | | |
|---|---|---|
| | Introduction to the Theory of Plasticity | Davis |
| | Finite Element Methods | Carr |
| (B) | Deep Foundation Design and Construction | McManus |
| | Geotechnical Earthquake Engineering | Berrill |
| | Environmental Impact | Thorpe / Peet / Visitors |
| | Biological Nutrient Waste Treatment | Wareham |
| | Wastewater Disposal | Davidson |
| | Traffic Management | Nicholson |
| (B) | Advanced Pavement Design | Saleh |
| | Unbound Pavements | Saleh / Dawson |
| (B) | Fire Safety Systems | Spearpoint / Fleischman |
| (B) | Fire Dynamics II | Fleischmann |
| | Structural Steel | Walpole |

# ROSE, the New European School of Earthquake Engineering

John Berrill is amongst the four New Zealanders invited to join the international faculty of the new international postgraduate school in earthquake engineering that has been established at the University of Pavia, Italy, under the name of The European School of Advanced Studies in Reduction of Seismic Risk (ROSE). The other New Zealanders are Michael Collins (University of Toronto), Geoff Martin (University of Southern California) and Nigel Priestley (somewhere on Banks Penninsula). Its aim is to form well-rounded earthquake engineers with a high degree of technical knowledge. It seeks to attract top-level graduate students from all over the world to a School taught by a highly qualified international faculty. The teaching system is based on a series of intensive short courses, taught one at a time and of about one month duration, offered by lecturers from Europe, the Americas, Japan and New Zealand. Masters and doctoral degrees are offered, with a masters degree requiring 10 courses and a two to three month research project.

The School is situated in the *Collegio Volta,* a new 120-bed residential college on the outskirts of Pavia. The city of Pavia itself, on the banks of the Ticino river about 50 km south of Milan, is very attractive, and dates from Roman times. It was the medieval capital of Lombardy. With a present population of 80,000, many of them students, it is managable and indeed very pleasant for a foreigner to live in.

John taught the second course, in earthquake geotechnical engineering, in February and March of this year and reports that it was a joy teaching the small, well-motivated and bright group of students, which included three Canterbury graduates, Simon Glaister, Damian Grant and Tim Sullivan. An excellent esprit de corps had already developed amongst the students and staff. In taking one of the early courses in a new school on the other side of the world, it was inevitable that there would be a few starting transients. More than one of these featured the new, super-fast PC reserved for the lecturer of the month. Its W2000 operating system was in Italian, and it kindly and automatically translated Help files and anything else it could get its hands on into Italian.

However, these and other minor teething problems were resolved gently and effectively, with Italian good humour. To use a French expression, "the balance-sheet was bien positive". ◆

*John Berrill*

# STOP: Best Exhibit Found

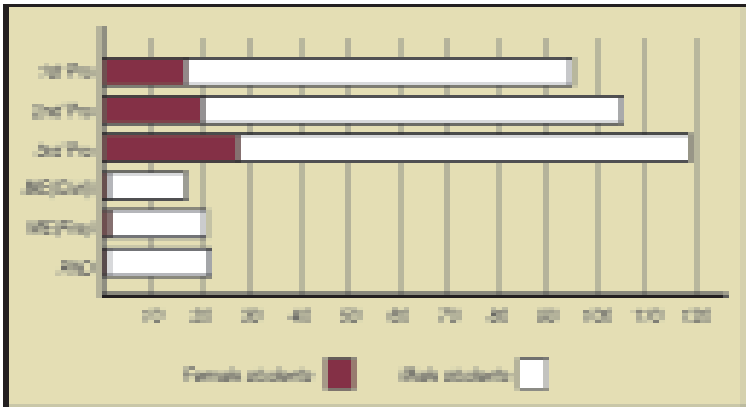
The Department has for several years sponsored a prize at the Canterbury Westland Science fair. The best exhibit relating to an aspect of civil engineering for the fair, held in August 2001, went to Samantha Berry, Marion College, for her study of behaviour at stop signs. Mark Milke said of her project:

"Samantha's effort showed a thoughtful approach to the study of traffic safety, a topic relevant to education and research in our Department. Her study examined the effect of the type of intersection, the amount of traffic, and the age and sex of the driver. She realised that it was too simplistic to say cars either stopped or did not stop, and she considered the degree to which cars stopped as well. Samantha discovered that the problem was much more complex than she had first imagined, which we hope indicates high potential for a career in science and engineering." ◆


# Our Student Body

The bar graph shows that we have about 100 students per professional year, and about 60 postgraduate students. The long term plan is to keep undergraduate numbers fairly constant, but significantly increase the number of postgraduate students, in both research degrees and taught masters degrees.

**We strongly encourage women students to enter our programme.**



# Master's Degree in Tra

## Degree Structure

You can study for the MET degree either full-time for 12-18 months, or part-time for up to 4 years. To obtain the MET degree you must generally complete several courses and a research project. The number of courses can vary from 0 to 6; as the number of courses increases, the amount of research decreases accordingly.

Most students will generally do either 4 courses plus a thesis or 6 courses plus a project report.

## Block Mode Teaching

Each Transportation Engineering course is taught in 'block mode' from time to time according to demand, to enable practising engineers to complete up to six courses and a research project within a four year period. A course taught in 'block mode' involves:

- attending two 3-day blocks at the start and middle of the course
- reading material and completing assignments distributed via the web
- sitting an examination at the end of the course

## Research

As part of the degree requirements, a research project must be carried out in a relevant area of transportation engineering, under the supervision of an academic staff member, with input from an industry mentor. Possible topics include all of the areas covered in the courses, and other areas of personal or industry interest.

## Collaboration with Auckland

This degree is offered in collaboration with the University of Auckland. You can credit one or more Transportation Engineering courses from the University of Auckland, provided at least half your courses are Transportation Engineering courses from the University of Canterbury.

## Background

In the previous CENews, we announce
in Transportation Engineering. At that t
of Canterbury, the Road Safety Trust a
had been arranged. We are pleased
agreed to provide substantial fundi
research fellowship), and the degree p
2002.

## Why a Master's in

There is a shortage of people wi
Engineering skills in New Zealand a
skills is expected to increase, as the
concern for the social and environme

The MET degree programme has bee
support from government, the tran
profession in New Zealand. The d
industry representatives along with st
and Auckland, to ensure the program
industry, and enhances employm
Applications are invited.

The degree programme focuses upo
of fundamental issues and methods
solve new problems that arise in the
constructing transportation systems.

For enquiries contact:
Department of Civil Engineering, Universit
Private Bag 4800, Christchurch, New Zea

General: Louise Fitzgibbon, Postgradu
Phone: +64 3 364-2380 Fa

Academic: Assoc. Prof. Alan Nicholson,
Phone: +64 3 364-2233 Fa

Email: pgradinfo@civil.canterbury.ac.nz

# nsportation Engineering

ed plans to establish a Master's degree
ime, some funding from the University
nd the Land Transport Safety Authority
to announce that Transfund NZ has
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rogramme will commence in February

## Transportation?

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future in all spheres of planning and

y of Canterbury
aland

uate Administrator
x: +64 3 364-2758

Director of Transportation Eng.
x: +64 3 364-2758

~ Website: www.civil.canterbury.ac.nz

## Courses Available

The University of Canterbury offers six Transportation Engineering courses, with two in each of the following areas:

- transportation planning
- pavement engineeirng
- traffic engineering

Given the flexibility in the number of courses, you can choose to cover one, two or all three of the areas. Outlines for the transportation engineering courses are shown below. Note that they may not all be available in any year. Additional Transportation Engineering courses will be available from time to time to cover special topics.

If you want to specialise, you may be permitted to take appropriate courses taught in Civil Engineering as well as in other Departments (eg. Geography, Geology, Management, Psychology, Mathematics and Statistics) in addition to the Transportation Engineering courses shown below.

## Course Descriptions

### Transportation Planning

Traffic Management: Transport economics; travel demand and supply management; congestion pricing; transport policy formulation; policy instruments and effects; traffic management modelling.

Transport Planning and Modelling: Resource Management Act; land use planning models; travel demand modelling and prediction; economic appraisal; environmental impact assessment; public transport planning and operation.

### Traffic Engineering

Accident Reduction and Prevention: Impact on society; data analysis and interpretation; hazardous location identification; problem diagnosis; treatment options; treatment selection; economic appraisal; evaluation.

Advanced Traffic Engineering: Traffic flow modelling; queueing theory and its application; network analysis; network reliability analysis; advanced traffic information and control systems; designing for cyclists and pedestrians.

### Pavement Engineering

Advanced Pavement Design: Stresses, strains and deflections in flexible and rigid pavements; pavement materials characterization; mechanistic and mechanistic-empirical design methods; pavement performance and evaluation.

Pavement Management Systems: Pavement management concepts, levels and functions; data requirements; evaluation of functional and structural performance; intervention criteria; deterioration models; rehabilitation and maintenance strategies and priorities.

# People People People

Mark Davidson

Mark Davidson joined the Department in July 2001 to take up a senior lectureship in fluid mechanics. Since obtaining a PhD from the Department under the supervision of Ian Wood, he has held a post-doctoral position at the Cambridge University in the United Kingdom and a lectureship in Hong Kong at the University of Science Technology.

While at Cambridge he focused on atmospheric pollution problems and in particular the dispersion of pollutants within groups of buildings. Hong Kong presented a wide range of challenges because the initial task involved working with colleagues to create a new Civil Engineering department within a new University. With the establishment of appropriate facilities he was able to continue to pursue research interests in a range of pollutant mixing problems. However the context had changed to that of wastewater discharges, which represented a return to the area that had initially motivated his move into an academic career.

Returning to New Zealand provides a new set of challenges. The Department is in the process of making significant changes to its undergraduate curriculum and the hydraulics laboratory is undergoing an extensive re-development, particularly with regards to instrumentation where there is an increasing emphasis on optical instrumentation techniques. ◆

Jason Le Masurier

Jason Le Masurier has recently joined the Department, with responsibility for the construction management courses. Since graduating from the Portsmith Polytechnic in 1990, Jason's 11 years of experience has been divided equally between academia and practice. The first 5 years he worked as a geotechnical engineer with Acer (aka Freeman Fox, aka Hyder Consulting). After becoming chartered in 1995 Jason became a research assistant investigating soil / nail interaction mechanisms at Cardiff University. He then moved to Bristol University to work on a two-year research project in collaboration with 12 of the UK's largest construction companies developing collaborative approaches to construction projects. Following this research Jason spent a year on a technology transfer to Ove Arup, working for their London office in a team involved in a deep basement construction in the city.

Jason's research interests are in the area of systems engineering. His PhD thesis investigated the benefits of treating design as a continuous process of uncertainty management throughout a project life. Following from the PhD he was involved in collaborative research with Scottish Hydro Electric, developing a computer-based system for asset management decision support.

Most recently he worked as a regional co-ordinator for the Movement for Innovation, a UK Government sponsored organisation promoting innovation and best practice in the construction industry (see www.m4i.org.uk). Jason aims to continue an association with the M4I. He is keen to make contact with any clients and practitioners in the New Zealand industry who would like to form collaborative links with similar innovative organisations in the UK and is organising a meeting for the autumn to discuss the possible links, including a speaker from one of the M4I demonstration projects - the Tamar Bridge widening.

Jason is a keen sailor and outdoor enthusiast. Together with his partner Carol and three young children, he is looking forward to their new life in New Zealand. ◆

David Painter

David Painter has been appointed an Associate Professor in Natural Resources and Forestry Engineering in the School of Engineering, and will be based in the Department of Civil Engineering. His main administrative role is to support the BE(Hons)(Natural Resources) and BE(Hons)(Forestry) degree programmes of the School of Engineering. He will also be assisting the Natural Resources Engineering Group at Lincoln University with teaching for the BE(Hons)(Nat Res), on both the Lincoln and Ilam campuses.

David's association with the School of Engineering goes back to its early days on the Ilam site in the 1960s, as he completed a BE(Hons)(Mechanical) then, before moving across to Civil Engineeirng to do his PhD research in the Fluid Mechanics Laboratory, under the supervision of Frank Henderson, Peter Giddens, then a fresh young lecturer - Alex Sutherland. David worked for 13 years in an applied research and development group at the then Lincoln College before taking an academic position there in 1982.

Following his resignation as Head of the Department of Natural Resources Engineering at Lincoln University in 1996, David spent five years as an independent consulting engineer and contract researcher, mainly in his primary fields of interest: water resources engineering, hydraulic and hydrologic engineering and fluid mechanics. He says he is greatly looking forward to the opportunity to both support two programmes he believes are worthy parts of the School of Engineering's portfolio, and to contribute to the teaching and research of his Alma Mater. ◆

# People People People

Gamini Padmaperuma

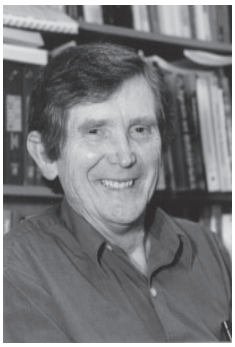
Gamini Padmaperuma was appointed as a lecturer on a fixed-term contract to fill the position vacated by Prof. Larry Bennett for the second semester of 2001. Gamini taught and coordinated the 3rd Pro Construction Management course during this period.

Gamini is originally a Mechanical Engineer who obtained his graduate qualifications from the former Soviet Union and UK. He has worked in Sri Lanka, Saudi Arabia and New Zealand and held various engineering management positions. Gamini has worked as a Visiting Lecturer for many academic and professional institutions and as a full-time Senior Lecturer at the Open University of Sri Lanka (OUSL).

Gamini writes, " I enjoyed my relatively short stay on the fourth floor (Civil Engineering Dept.) and found everyone to be very friendly and helpful. I am really grateful to everyone in the department for making my short stay enjoyable and memorable. I enjoyed teaching and working with students".

Gamini has returned to Sri Lanka for a year to continue his Ph.D. studies at OUSL and intends to return in 2003 to his home department in Canterbury, Mechanical Engineering, to continue his studies.◆

## Distinction for Prof. Elms



Emeritus Professor Elms was made a Distinguished Fellow of the Institution of Professional Engineers (DistFIPENZ) of New Zealand at the national congress in Auckland in March 2001. The bestowal of distinguished fellowship is a highly significant accolade, as there are only a handful of them in the country.

Professor Elm's distinction was for his 'eminent contribution to engineering education and practice, and his leadership in national policy issues'. Congratulations!

## Farewell

Some of our staff are leaving us, having accepted the University's offer of voluntary severance. We'd like to extend our best wishes for the future to Ray Allen, Nigel Cook, Yvonne Dench and Barbara Liddicoat. We thank you for your service and dedication over the years. You will all be greatly missed in the department.

## Prof. Bob Park Awarded Doctor of Engineering

Emeritus Prof Bob Park (seen here to the right of Alex Sutherland) was awarded Doctor of Engineering for his significant original contributions to engineering. Through his leadership role as head of the Department of Civil Engineering, his service to the engineering profession, and from his teaching and research in the area of structural design of earthquake resistant structures.

Prof. Park was Head of Department of Civil Engineering for for 15 years from 1978 to 1992 and served as the deputy vice-chancellor for the University of Canterbury for 6 years.

Retirement for Professor Park is a euphemism because he is still very active with his research and writing and we often enjoy his company in the School of Engineering.

## Retired?

Emeritus Professor Tom Paulay likes to describe himself as a virtual person; however, as this spring 2001 photo shows, that is not true. Tom is still very real, working four days a week on new approaches to seismic design and enjoying life as ever. Shown here with Jacqueline Berrill and Mrs Paulay.

## Lectures and Laos

Professor Wood was invited as one of the six guest lecturers by the Croucher Foundation to an Advanced Study Institute on *Recent Developments in Coastal Eutrophication Research: Prediction, Decision Support Systems, and Management,* in February 2001. After this workshop he gave a lecture at the Asian Institute of Technology in Bangkok on 'Sewage Plumes' and had a holiday backpacking with his wife Pat, in Laos.

*Temple painting in Loas, one of many photos taken on Ian's trip*

# Fire Engineering

## Distance learning

The new distance-learning programme in fire engineering has completed its first full year of operation. Among the activities were the two 3-day block sessions for the ENFE 603 Fire Safety Systems class. The class included students who travelled from Auckland, Nelson and Dunedin plus the full-time on-campus students.

The sessions were organised by the course instructor, Mike Spearpoint, the Fire Laboratory technician, Grant Dunlop and the Fluid Mechanics Laboratory technician Ian Sheppard.

In the first block session the students examined the performance of different types of heat and smoke detectors to a range of fires and potential false alarms. The students also conducted sprinkler spray discharge measurements and hydraulic calculations in the Fluids Mechanics Lab. A range of sprinklers were examined at realistic design pressures and flows in order to assess the uniformity of water delivery to the floor. Raincoats were necessary as some people appeared to be very keen to get as wet as possible.

The second block session included a full-scale wooden pallet fire with automatic sprinkler operation and a comparison test without a sprinkler. Students estimated the expected time of sprinkler operation and the student that came closest got their evening dinner paid for by the rest of the class. Finally, Charley Fleischmann demonstrated some of the principles of smoke control systems by filling the fire engineering laboratory with hot artificial smoke and using its fans as an extraction system.

## Industry liaison

The department keeps close contact with the fire protection industry both locally and internationally. Mike Spearpoint spent a week with Arup Fire in Perth, WA and met up with three ex-graduates from our programme. Mike Spearpoint and Andy Buchanan attended the FPANZ Contractors Group meeting in Christchurch. We keep in regular contact with both the local and national chapters of the SFPE and Mike Spearpoint gave a presentation on mains-powered smoke alarms to the local chapter.

The degree programme is also supported by visitors and assistance from a range of organisations. The students gain much from their interaction with these people.

## NZ Fire Service Commission visit

The New Zealand Fire Service Commission visited the department in association with its regional visit held in Christchurch. The Commission has been a major sponsor of the programme since its inception through the provision of the New Zealand Fire Service Commission Lecturer position currently held by Mike Spearpoint and the scholarships awarded each year to up to five of the Masters students. The Commission, chaired by Dame Margaret Bazley, discussed a range of topics with the department to examine how the research and teaching fits in with the Commission's objectives. The Commission was then invited to meet with the current students and to watch a fire test under the furniture calorimeter.

*Andy Buchanan and the MEFE students having discussions with Dame Margaret Bazley*

## Conferences and visits

Linus has recently returned from a trip to Europe, attending the Interflam international fire engineering conference in Scotland and performing collaborative research in Belgium. The conference was held between 17th – 19th October 2001 in Edinburgh.

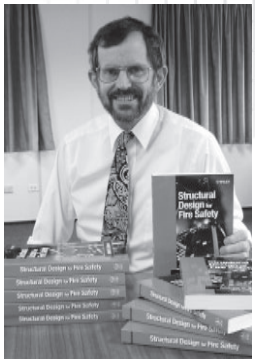
Andy Buchanan was invited to give a talk to the FPANZ AGM in Auckland in which he described the research work currently being undertaken at the University.

Charley Fleischmann spent 2 weeks in Chongqing University in China, as a guest lecturer. He gave several lectures on Compartment Fire Dynamics, Performance Based Fire Engineering Design, and Fire Engineering Education, and spent several hours in informal discussions with students about their research and university life at Canterbury. Chongqing University has a small graduate program in Fire Engineering, under the direction in Prof. Fu. Their primary research focus is in the area of atrium fire protection and smoke management. Seeing the limited resources in China makes one appreciate the facilities available at Canterbury.

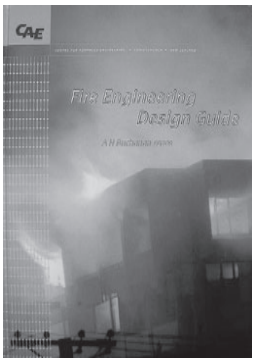
Andy Buchanan and Mike Spearpoint attended the 5th Asia-Oceania Symposium on Fire & Technology, Newcastle, Australia in December. Andy gave a plenary presentation on the fallacies and facts surrounding the design for fire resistance. Mike gave a paper on the use of web-related mark-up languages for the exchange of fire data.

# Publications

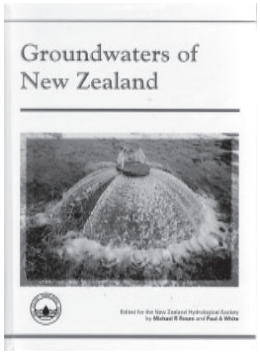
We have had many publications in the department this year, including research reports, papers in international journals and conference proceedings as always, but also three books.



Andy Buchanan published his book "Structural Design for Fire Safety" this year through John Wiley & Sons. The book presents a comprehensive overview of the fire resistance of building structures. More information is available on the John Wiley website at http://www.wiley.com




Also, this year the second edition of the Fire Engineering Design guide was published. A number of experts from New Zealand and Australia contributed to the book. The edition includes some new chapters and also expands on current practices and regulations in Australia. The book was launched in New Zealand during June in Christchurch, Wellington, Auckland and Rotorua. The Australian launch was in November in Melbourne, Brisband and Sydney. For more information or to order the book look at the Centre for Advanced Engineering (CAE) website at http://www.cae.canterbury.ac.nz/order.htm.




A new book on groundwater in New Zealand was published by the New Zealand Hydrological Society this year. The book was edited by Michael Rosen and Paul White from Geological and Nuclear Sciences and had contributions from some of the watery people in the Department (Hugh Thorpe, Bente Clausen, Bruce Hunt, and Julien Weir who graduated from the Department with a M.E. Degree).

## Fire Engineering Research Reports

| | | |
|---|---|---|
| 2001/1 | Flammability of Upholstered Furniture Using the Cone Calorimeter | A Coles |
| 2001/2 | Radiant Ignition of New Zealand Upholstered Furniture Composites | F Chen |
| 2001/3 | Statistical Analysis of Hospitality Industry Fire Experience | T Y A Chen |
| 2001/4 | Perf. of Gypsum Plasterboard Assemblies Exposed to Real Building Fires | B H Jones |
| 2001/5 | Ignition Properties of New Zealand Timber | C K Ngu |
| 2001/6 | Effect of Support Conditions on Steel Beams Exposed to Fire | J Septuro |
| 2001/7 | Validation of an Evacuation Model Currently Under Development | A Teo |
| 2001/8 | 2-D Analysis of Composite Steel - Concrete Beams in Fire | R Welsh |
| 2001/9 | Contribution of Upholstered Furniture to Residential Fire Fatalities in NZ | C R Wong |
| 2001/10 | The Fire Safety Design of Apartment Buildings | S Wu |

## Departmental Research Reports

| | |
|---|---|
| 2001-2 | **Safety and Risk Management Using Indicator Methods**<br>Adam Milligan and D G Elms |
| 2001-3 | **Seismic Performance of Retrofitted Reinforced Concrete Bridge Piers**<br>R Presland, J I Restrepo, R Park |
| 2001-4 | **A Comparison of the Seismic Performance of Precast Wall Construction: Emulation and Hybrid Approaches**<br>Tony Holden, J I Restrepo, J B Mander |

Many of the above Fire Engineering reports are available for download as PDF files from our website at http://www.civil.canterbury.ac.nz under Fire Engineering Research. If you wish to purchase hard copies, please contact Catherine Price at c.price@civil.canterbury.ac.nz, for pricing and availability..

# Students

## Civil Engineering Prizes

The department wishes to congratulate the following students who were awarded prizes for their excellent results in 2001. These prizes are made available by the generous support of the industry sponsors.

**Civil Engineering Prize** - Sarah Dye

**NZ Concrete Society Prize** - Bruce Galloway

**RW Morris Prizes in Hydrology or Hydraulic Engineering**
Sarah Dye and Manu Ward

**NZ Pavement & Bitumen Contractors Assoc. Prize in Pavement Engineering**
Rachel Thompson and Andrew Jackson

**NZ Automobile Assoc. Prize in Traffic Eng.** - Sarah Dye

**Traffic Design Group Prize**
**2nd Pro** - Anna Wilkins
**3rd Pro** - Hamish Wilde

**Works Infrastructure Ltd Prize in Civil and Roading Construction Mgmt**
**2nd Pro** - Melanie Henry
**3rd Pro** - Craig Byers

**Structural Engineered Timber Manufacturer's Association (SETMA) Award** - Lucy Coe

**Tonkin & Taylor Prize in Geomechanics**
Daniel Forster and Andrew Ball

**Montgomery Watson/Jim McFarlane Memorial Prize** - Gerogina Waibl

**Holmes Consulting Group Structural Engineering Prize (2000)** -Justine Geddes and Sean Gardiner

**Montgomery Watson Geotechnical Eng Prize (2000)** - Sarah Dye

# A Border Dyke Infiltrometer

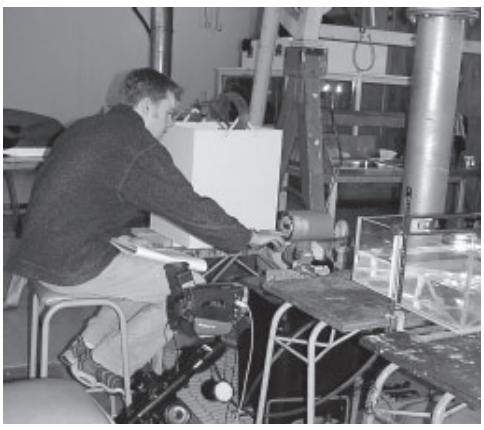
Take a drive in any direction into the Canterbury Plains and it won't be long before you find long thin mounds laid across the paddocks. These are the border dykes of border dyke irrigation, the oldest and most common form of surface irrigation in Canterbury.

Border dyke irrigation involves delivering water to the paddocks by water races, and then flooding the strips bounded by the dykes, one at a time. It guarantees a good green paddock for the cows, but is it really an efficient method of irrigating?

Lincoln Environmental, a division of Lincoln Ventures Ltd, have pondered this question but previously had no reliable method of measuring efficiency on a regional scale. That's why it came up with the idea of a border dyke infiltrometer: a portable, quick, easy-to-use method of measuring the amount of water that actually infiltrates into the ground during border dyke irrigation.

As his 3rd Pro Civil Engineering project, Manu Ward tested a model of the border dyke infiltrometer in the fluids laboratory here at the Engineering School, under the supervision of Dr Bente Clausen. With the assistance of Ian Sheppard, the fluids lab technician, Manu used a constant head tank (left on photo), a bucket, and a modified fish tank (right on photo) to simulate the flows of field measurements. Hours of trials and flow measurements through an electromagnetic flow meter enabled an assessment of the accuracy of the infiltrometer. His final result: an average error of 7%. Lincoln Environmental say this is an order of magnitude better that current methods and good enough for the hundreds of measurements needed on a regional scale. It is now ready for field testing. ◆

*Manu Ward*



*Manu Ward reading measurement of flow-meter*

# Hydrodynamic Effects of Aquaculture

*Rope of mussels in the lab for tests*

Mussel farming is one of the fastest growing industries in New Zealand, with more than 600 mussel farms in operation, employing over 2000 people, and exporting mussels to 64 countries. The lifting of a moratorium on marine farming in July 1999 resulted in many resource applications to construct mussel farms both in small embayments (such as within the Marlborough Sounds and Banks Peninsula) and offshore (such as in Golden Bay and Clifford Bay). Some of these applications are for large farms over a hundred hectares. Among questions asked at hearings for these applications are: what is the carrying capacity of the area; is the proposed farm sustainable; what effects will the farm have; and how big an area will be affected? In order to improve the consent

process and to allow scientists time to properly assess likely impacts, a further 2 year moratorium on granting consents for new farms has been imposed.

Much of the research into the effects of mussel farms is currently carried out by the National Institute of Water and Atmospheric Research (NIWA). However a student from the Civil Engineering department, David Plew, is working in conjunction with NIWA on a Ph.D project studying the hydrodynamic impacts of mussel farms. The goals of this project are to assess how mussel farm structures influence water currents by drag on the submerged longlines, and how the water column is mixed as it passes through the farm. The intention is to determine an appropriate method of incorporating these effects into a hydrodynamic computer model to allow a prediction of the impacts of a proposed farm. This project involves a mixture of numerical, field, and laboratory work, with one field trip in Pigeon Bay recently completed. Other sites that may be studied include Golden Bay and Pelorus Sound.

David is superivised by Roger Nokes (Canterbury University) and Bob Spigel (formerly of Canterbury University, now at NIWA). ◆

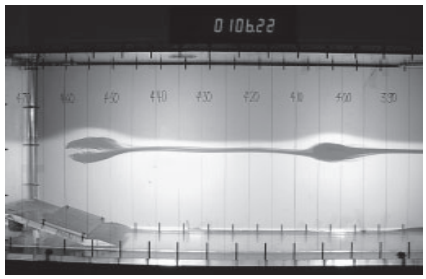
*David Plew*

# Investigation into Stratified Fluid Phenomena

Karin Lutz, a German student studying for a Master's in Civil Engineering at Karlsruhr University, had a whirlwind visit in the department in May and June when she undertook a two month experimental fluid dynamics project under the supervision of Dr Roger Nokes.

Nearly all naturally occurring fluid bodies, the atmosphere, the oceans, and lakes, exhibit some degree of density stratification. The dynamics of these bodies are strongly affected by these density variations, and any mixing that occurs can lead to interesting and important fluid phenomena. A striking example is the "Morning Glory" phenomena that can be witnessed near the southern coast of the Gulf of Carpentaria in north-eastern Australia. The Morning Glory is an impressive roll cloud that occurs due to the interaction of sea breezes and the nocturnal inversion in the atmosphere.

Karin's project focussed on the related problem of how a fluid of intermediate density collapses into a fluid system comprising two fluid layers of differing density. It has been observed that the initial internal gravity current – something like a sea breeze that moves along the interface between the two fluids instead of along a bottom boundary – eventually transforms into one or more solitary waves on the interface. These waves are like blobs of fluid moving along the interface, and their existence can be clearly seen in the photograph. It is hoped that Karin's data will give us further insights into the parameters that govern the transition from current to wave.◆



*Roger Nokes*

# Fire Engineering PhD Students

*Fabien sampling material prior to test burn.*

**Fabien Dangeron** is investigating relationship between wildfire behaviour and structure sur-vivability, using gorse scrub fuel as a case study. This study is supported by New Zealand Forest Research with the help of Grant Pearce.

**Linus Lim** is investigating the effect of restraint on the behaviour of fire-exposed concrete floor systems. The purpose of these tests is to investigate the effect of tensile membrane action on the fire resistance of floor slabs, is supported by the Heavy Engineering Research Association (HERA), BHP NZ Steel, Dimond Industries, Forgan Jones, Speedfloor and Firth Industries. Cartage and storage has been donated by Tim Smith of Smith Crane & Construction Ltd. For more information please see http:/www.civil.canterbury.ac.nz/postgrads/linus/.

**Tony Parkes** is continuing his research into compartment fires and is developing a plate thermocouple apparatus to measure the radiant heat flux in compartment experiments. The plate radiometers consist of a stainless steel sheet with a thermocouple welded to one side. Experimental tests will be carried out in a half-scale compartment with six separate fuel sources and a fire-rated observation window. This project is funded by the Foundation for Science, Research and Technology (FoRST).

*Ee Yii standing beside his test furnace*

**Ee Yii** is working on modelling post-flashover compartment fires with realistic fuel types and ventilation scenarios. A computer model using single-zone modelling concepts has been developed and a set of fire experiments has been carried out with different combinations of roof and door vent sizes.This project is also funded by FoRST. ◆

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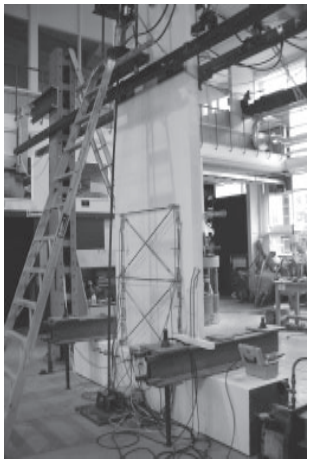

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