



IRANZ Connections.

Motu makes Climate Change film



Response to climate change is one of the most important long-term challenges facing New Zealand. Motu has recently released The New Zealand Farming Story: Tackling Agricultural Emissions - a film that focuses on what the agricultural sector is capable of doing to reduce emissions, and how it might be achieved. Agricultural emissions make up nearly half of New Zealand's gross emissions, and effective management of these will make a significant contribution to New Zealand's global climate change effort and commitments under Kyoto and other international agreements.

The film includes many insights from the work of the AgDialogue group, which was established by Motu as part of a four year research programme funded by Ministry of Primary Industries. This dialogue group focused on how agricultural emissions can be most efficiently controlled in the short to medium term. The group included participants from a wide range of disciplines and backgrounds and took a long-term view. It covered on-farm mitigation, emissions trading, policy options, technology change, non-regulatory options and complementary issues such as water regulation. This group has made a significant contribution to the future by identifying better policy options and clarifying trade-offs providing an informed foundation for future decisions.

The film can be viewed at agriculturalemissions.blogspot.co.nz

www.motu.org.nz

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Earthquake Hydrology: Seismic Pumps or Broken Pipes?



The recent major Canterbury and Fiordland earthquakes caused changes in groundwater hydrology throughout New Zealand that were recorded by hydrological and seismological monitoring networks with the highest spatial and temporal resolution ever detailed.

A Marsden Fund grant awarded to Dr Simon Cox (GNS Science) and Dr Helen Rutter (Aqualinc Research) will enable the first systematic investigation of earthquake hydrology in New Zealand to occur. The research aims to identify and explain the spatial distribution of earthquake-induced

dynamic stress on groundwater systems ('seismic pumping') versus static stress ('broken pipe' leakage).

Improved understanding of the mechanisms by which crust deformation affects groundwater dynamics is expected to improve estimation of liquefaction risk, enable more resilient water supply and waste-water removal systems to be engineered, and improve groundwater management.

www.aqualinc.co.nz

Stretching the knowledge of leather

Leather is known to be strong, and over 50 years has passed since its characteristic collagen fibrils were imaged; yet an understanding of the structure of these collagen fibrils and how they are affected by processing during the leather making process has remained largely elusive.

LASRA PhD student Melissa Basil-Jones' thesis has identified the fundamental aspects of the collagen network which contribute to the intrinsic strength of leather. By application of the SAXS beamline on the Australasian Synchrotron, a level of detail previously unknown has been revealed. The versatility of the instrument allowed a peek into the structure of many different species and leathers processed by different methods whilst simultaneously

stretching them in a purpose built rig.

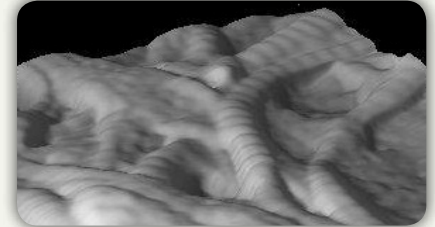
This work provided a glimpse into the bridge between the chemical properties of collagen fibrils and their structural make-up, such that theories of the effect of tanning and other chemical processes can begin to be understood by observing their effect on the physical response on the SAXS.

As Melissa finishes her pioneering studies in this field, the work is continuing with the more practical effects of various tanning systems being investigated by Ms Katie Sizeland under the guidance of Professor Havercamp of Massey University and Dr Edmonds of LASRA. These studies will reveal more of the fundamental properties of collagen and leather.

www.lasra.co.nz



STRETCHING APPARATUS INSTALLED ON THE SAXS BEAMLINE OF THE AUSTRALASIAN SYNCHROTRON



THE SURFACE OF LEATHER SHOWING CHARACTERISTIC D-BANDING OF COLLAGEN MICROFIBRILS

Mine Hazards

The Royal Commission's report into the Pike River Coal Mine tragedy has highlighted the need for a major overhaul of mining regulations. The report recommends that the regulator issue an approved code of practice describing the minimum specifications of principal hazard management plans, including those relating to gas management, methane drainage, ventilation, spontaneous combustion, outburst potential, strata control, and emergency response – with an aim to align the new regulations with Australia and work towards a joint examination and accreditation process with that country.

CRL Energy has commenced a work programme, with investment from TechNZ and the Coal Association of New Zealand, targeting technical and capability issues facing the New

Zealand mining industry. The immediate aim of the programme is to develop a technical service centre that will provide human capability and state-of-the-art equipment in New Zealand to address the identification, management, and mitigation of mine hazard issues in New Zealand. The issues are exactly those identified in the Royal Commission's recommendation: gas management, gas drainage, outburst potential, ventilation, spontaneous combustion – as well as hazards from friction ignition and rock reactivity. Related topics of investigation are hardened communication systems and the impact of extreme underground effects on geological structure.

CRL Energy's Manager of Mining Services, Guy Boaz, will manage the programme. Mr

Boaz has a mix of underground production management and technical support experience in Huntly and the West Coast in New Zealand, Queensland and New South Wales in Australia, as well as South Africa. He brings a wealth of experience in underground coal mining methods along with knowledge and capability in gas drainage, mine ventilation, roof control, mine planning, and operational support.

www.crl.co.nz



CRL ENERGY'S MANAGER OF MINING SERVICES - GUY BOAZ

Transformational Research for Geothermal Energy and Waste Heat Plant

A co-operative research project between Heavy Engineering Research Association (HERA), metals engineering industry companies and research partners, University of Canterbury and University of Auckland has received funding from the Ministry for Business Innovation and Employment's High Value Manufacturing and Services investment round.

The project aims to generate the technology to enable the manufacture of Organic Rankine Cycle plant for the fast growing low

enthalpy, geothermal and waste heat export market. Geothermal Energy and waste heat present global export opportunities for New Zealand companies. HERA, with input from industry, academia and key stakeholders, has developed an Above Ground Geothermal and Allied Technology Research Roadmap which identifies key research themes, questions and aims. The research supported by this grant, dovetails with HERA's wider market-driven Industry Development Roadmap Process and reinforces New Zealand's international

geothermal capability offerings.

HERA Chairman, Mr Peter Hutton, says "Government working in partnership with Industry can bring about transformational change. I hope this is the beginning of a strong relationship between Industry, Government and research capability that will underpin the innovation required for companies to develop market leading technology products for export."

www.hera.org.nz

Rebuilding Canterbury

Nearly two years after the February 2011 earthquake, the rebuilding of Christchurch is starting to gain momentum. All of New Zealand is looking forward to seeing a "new Christchurch" develop over the coming months and years.



BRANZ's research has both benefitted from and is contributing to the rebuild process. Initially BRANZ's six structural engineers were on the ground the days after both earthquakes, helping the Earthquake Commission team make preliminary building assessments, and determining building safety. BRANZ staff carried out this vital work in

dangerous conditions.

In home failure research, BRANZ assessed over 600 damaged residential homes to examine what could be learned for the next reviews of the Building Code and related building Standards. Fortunately, all the homes in Canterbury did what they needed to do – they stayed structurally sound enough to prevent any fatalities. BRANZ has given scientific input into how foundations in Canterbury should be built going forward, balancing strength against cost. BRANZ's senior staff continue to act in an advisory capacity to the Building Code staff in the Ministry of Business, Innovation and Employment.

In an effort to transfer the knowledge to the building industry, BRANZ has already delivered a nationwide seminar series that covered the lessons learnt from the Canterbury earthquakes. Another seminar series covering this topic is planned for early 2013.

And finally, prior to the Canterbury earthquakes, one of BRANZ's consortium research programmes – Structural Timber

Innovation Company, or STIC, had been working on how New Zealand could build larger commercial buildings out of engineered timber. These would be stronger, more resilient and use one of New Zealand's abundant natural resources. Already, four buildings within the Christchurch CBD are to be built utilising STIC technologies.

The Canterbury earthquakes were a huge disaster, however, BRANZ's research and knowledge transfer work is helping to ensure that the lessons are learned and that Canterbury's re-build is strong and effective.

www.branz.co.nz



New Furnace Delivery

The team at TiDA are eagerly anticipating the delivery of their new furnace, which will be installed during December 2012. The furnace has been designed to further develop the Metal Injection Moulding capability in New Zealand. The new furnace will allow metal products to be made in a similar way as plastic products, with the same level of complexity, creating a highly efficient manufacturing process.

The actual furnace will occupy 18 square metres, and the main chamber is able to hold approximately 85 litres of parts, weighing up to 250kgs. It has a top temperature of 1650°C in either a vacuum, argon, nitrogen or air environment and up to 900°C in a hydrogen environment.

As well as providing both the metal injection moulding and sintering processes, the furnace will be used for heat treatment processes, particularly for titanium parts and parts made using selective laser melting processes.

www.tida.co.nz

New Leader for Precision Agriculture

Dr Armin Werner has recently joined Lincoln Ventures Ltd to lead its Precision Agriculture programmes. Precision Agriculture is a farming management concept based on observing and responding to intra-field variation. It relies on new technologies such as crop sensing, information technology, and geospatial tools, and is aided by a farmer's ability to locate their precise position in a field using satellite positioning system like GPS when applying farming inputs.

Lincoln Ventures CEO Peter Barrowclough says that New Zealand has a precision agriculture opportunity currently. "We have the convergence of the roll-out of rural broadband, IT systems and world demand for agricultural products. And we need to grow more with a smaller environmental footprint. Lincoln Ventures is ideally placed to develop this area of agriculture and we are very pleased to have Dr Werner joining the team to assist with this."

Dr Werner comes from Germany where he previously headed up the Institute of Land Use Systems at the Leibniz Centre for Agricultural Landscape Research in Müncheberg. Dr Werner has worked in research on Precision Agriculture for

almost two decades. He headed several collaborative research and development projects in Germany and in the European Union that had noticeable impact in the field of Precision Agriculture.

Dr Werner is excited about being in New Zealand to further his research and to apply his experience and his connections. Dr Werner aims to combine research with teaching and training, to drive precision agriculture uptake and impact. He will collaborate with Massey University's Professor Ian Yule who has been at the forefront of Precision Agriculture research in New Zealand for some years. Lincoln Ventures Ltd and Massey University are also interested in working with farmers, private sector companies and other research providers in helping promote and implement Precision Agriculture in NZ.

www.lv.co.nz



**DR ARMIN
WERNER JOINS
LINCOLN
VENTURES LTD**

DNA INNOVATIONS TO PROVIDE BOON TO AQUACULTURE MONITORING

A DNA-based technique originally developed for the biomedical industry is being adapted by Cawthron scientists to help sustainable management of finfish aquaculture. A team of molecular and marine biologists at Cawthron have been awarded \$800,000 from the Ministry of Business, Innovation and Employment to develop a new method of monitoring environmental impacts for the aquaculture industry. The technique known as 'Next Generation Sequencing' can be used to identify multiple organisms in an environmental sample. The tool will be developed using tiny and abundant marine organisms called *Foraminifera*. The tool has the potential to be faster and more cost-effective than the current microscope-based method

used to monitor aquaculture impacts.

Research scientist Susie Wood says Cawthron is the first in New Zealand to use such a technique for monitoring aquatic environments and one of the first in the world to use *Foraminifera*. "They are extremely sensitive to environmental changes and very common in marine systems so we hope they will be ideal organisms for this project." Joining Susie and marine biologist Nigel Keeley for the project is Swiss molecular biologist Xavier Pochon. He brings expertise in DNA-based methods and previous experience with *Foraminifera* to his new role at Cawthron. The first sampling took place in the Marlborough Sounds in November.

www.cawthron.org.nz



XAVIER POCHON JOINED THE AQUACULTURE & BIOTECHNOLOGY GROUP IN JANUARY

The Value of Prevention

An important part of preventing deaths on the road is being able to understand and model crashes to find out why they happened and whether the road design can be improved to help prevent future similar crashes. Of course, due to safety issues, it's often not practical to do full-scale testing to determine this. PC Crash fills this gap.

Opus Central Laboratories has been using this internationally recognised 3-dimensional (3D) vehicle crash and trajectory simulation package as a research tool since 2010. In PC Crash, 3-D road models can be imported as CAD files or created from scratch and then road geometry, road conditions, vehicle models, their paths and speeds and much more can be defined. The simulations can then be run to produce a variety of 3-D animations, 2-D plans, tables or plots, or detailed reports, and repeated with different model conditions.

In particular, Central Laboratories has used PC Crash to research the effect of changing crossfall - or the gradient across a road - on vehicle stability, vehicle loss of control during

cornering as a function of speed, and the effect of raised profile marking on motorcycle stability.

Central Laboratories' successful use of PC Crash in these three applications proves the software has a role to play in evaluating the design and crash potential of new and existing road construction, especially where topographic constraints can force significant design compromises.

www.opus.co.nz



Who we are:

IRANZ is an association of independent research organisations. Its members undertake scientific research, development or technology transfer. Members include Aqualinc Research Ltd, BRANZ, Cawthron Institute, CRL Energy Ltd, Heavy Engineering Research Association (HERA), Leather & Shoe Research Association (LASRA), Lincoln Ventures Ltd, Motu Economic and Public Policy Research, Opus Central Laboratories, Titanium Industry Development Association (TiDA) and Transport Engineering Research NZ Ltd (TERNZ).

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