IRANZ Connections.
www.iranz.org.nz

TiTeNZ Wins at KiwNet Awards

The collaborative research work being carried out by the TiTeNZ Science Leadership Teams is further strengthening New Zealand's lead in high value development processes.

The six advanced research technologies include Additive Manufacturing, Ion Beam technologies and Forging and Extrusion.

Commercial outcome results have already been documented and exporting opportunities are imminent, with TiTeNZ being selected as a finalist and announced a Winner in the KiwNet Awards, in the AJ Park Commercialisation Collaboration Award.

The TiTeNZ team is a collaboration between the Callaghan Innovation, GNS, TiDA, University of Auckland, University of Waikato

Hon Ruth Richardson the Chairman of KiwiNet says, "When we look at the at the finalists and winners at the KiwiNet Awards, we see the sort of success we need to advance New Zealand's ambition to become a globally recognised leader in research commercialisation. It really shows that now is the time in the connectivity revolution to commercialise ideas."

www.tida.co.nz

Issue 12: September 2014

Celebrating Lincoln Agritech's 50th Jubilee

We are proud to announce the 50th anniversary of our organisation. In 1964, the New Zealand Agricultural Engineering Institute (NZAEI) was formed to undertake applied research and development to support agritech innovation by New Zealand's primary sector.

The NZ Cabinet approved the formation of the Institute at Lincoln College (now Lincoln University) in October 1963 and the first staff member joined in October 1964. Financed primarily from Ministry of Agriculture grants, early research concentrated on tractor safety frame testing, fencing, carcass disposal, farm water supply and agricultural aviation. In 1994, Lincoln Ventures Ltd was created through merging the NZAEI with the Kellogg Farm Management Unit and the Centre for Resource Management. In 2012, the company changed its name to Lincoln Agritech Ltd to better reflect its position as an agritech-focused science and engineering research company owned by New Zealand's only specialist land based university, Lincoln University.

The company continues to perform strongly 50 years after its inception and employs over 40 staff, including scientists, research engineers and software developers. It conducts applied research and consultancy for the agricultural, industrial and environmental sectors with current research focused on sensor and measurement technologies, groundwater research, precision agriculture, including agricultural spray drift, and irrigation software design (Irricad). Lincoln Agritech looks forward to continuing to support and enable New Zealand's primary sector.

The 50th anniversary celebration will be held on 2nd of October and we invite current and past staff and directors, stakeholders and clients to share the occasion with us. If you are interested in attending, please email Melissa Wong at melissa.wong@lincolnagritech.co.nz to join our mailing list.

www.lincolnagritech.co.nz

Lincoln Agritech Raspberry Harvester 1972

Opus New, Purpose-Built Wind Tunnel is Now Operational

Opus Research has over 40 years' experience in carrying out wind and industrial aerodynamic analysis to support a wide range of projects in Wellington and around New Zealand. An exciting new era has just begun for us in this field, with our recent decision to invest in a brand new, state-of-the-art 30m wind tunnel which has been purpose-built to meet our clients' current and future needs and to fit comfortably in our new premises in Petone. The new tunnel is now operational and replaces the large 1970s-era wind tunnel at Gracefield, which had reached the end of its useful life.

Our new wind tunnel facility is a smaller and more efficient recirculating tunnel configuration, and has been designed for reduced noise and power consumption. The new tunnel is supported by our extensive specialist in-house reference library, computer-controlled data acquisition systems, and a comprehensive range of instrumentation, all of which contribute to high experimental efficiency.

At Opus Research, our aerodynamics engineers specialise in the analysis of wind effects on buildings, structures and the environment. We undertake wind engineering and industrial aerodynamics analysis and research to find practical solutions to wind and aerodynamic problems in the built environment and in the construction and transport industries.

Many of our past commissions have related to the environmental effects of buildings, and wind-induced loading and motion. Significant projects have included Te Papa, Westpac Stadium, Waitomo Caves Visitor Centre, Scott Base in Antarctica and two of New Zealand's tallest commercial buildings – the Majestic Centre in Wellington and the Coopers & Lybrand Tower in Auckland.

Our wind engineering team has also completed a wide variety of wind engineering research projects, with the results of some having been published internationally and in some cases incorporated into the Australasian Loadings Code. In addition, Opus Research staff have pioneered the use of advanced aerodynamics techniques in structural and vehicle design.

www.opus.co.nz/services/research/

Motu Partners in a new Centre of Research Excellence ("CoRE") called Te Pūnaha Matatini – The Centre for Complex Systems

Motu is pleased that it will partner with the University of Auckland and other New Zealand and international researchers in a new Centre of Research Excellence ("CoRE") called Te Pūnaha Matatini – The Centre for Complex Systems.

Motu is the only economic research organisation to play a major role in any of the six successful CoRE proposals, which cover the gamut of physical, biological and social sciences. The TEC will fund the six successful CoREs for a six-year period beginning in 2015.

Te Pūnaha Matatini will develop new methods and tools for analyzing complex systems, and apply those tools to important problems facing New Zealand. It combines three major Research Themes: Analytic Methods; Ecological Systems; and Economic Systems. Motu Director Adam Jaffe will be the Theme Leader for the Economic Systems Research Theme. Motu Researchers Dave Maré, Isabelle Sin, and Suzi Kerr will form the core of the economics research team.

The research will examine how economic activities in New Zealand – particularly activities related to innovation and economic growth – function within networks that span different technologies and geographic regions, and how these networks compare to and interact with ecological systems. The results of the research will have important implications for New Zealand firms and New Zealand government agencies responsible for innovation and economic growth. The research will be a major part of Motu's Innovation and Productivity research programme.

www.motu.org.nz

MALDI Imaging

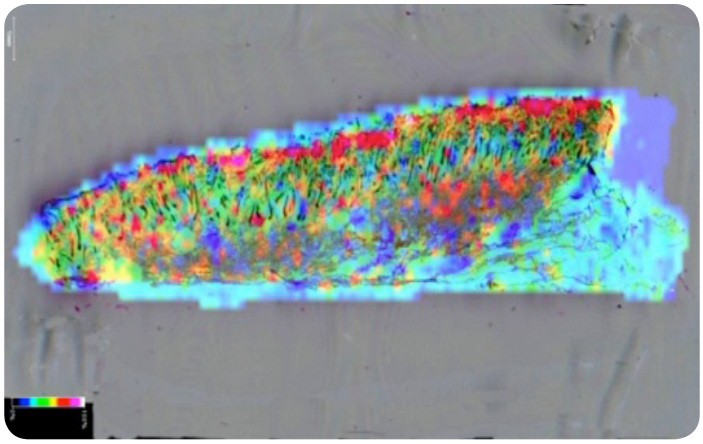
One of the most exciting aspects of collaboration is gaining access to equipment which we could not afford to purchase, and which was never specifically intended to be used for our purpose. This often leads to leaps in capability and understanding in our more fundamental research.

A recent collaboration with Dr Deb-Choudhury at AgResearch Lincoln allowed access to a Bruker Ultraflex III MALDI TOF-TOF instrument to conduct some joint research on the protein composition of sheepskin in its native, raw state and after part-processing, to show how conventional processing affected the quantities and locations of individual collagen types.

The identified proteins from MALDI imaging were combined with information from nano-LC-MS/MS from Agilent through our collaboration with Dr Gill Norris at the Institute of Fundamental Science, Massey University in Palmerston North.

This pioneering study has allowed us for the first time to visualise the placement, composition and interactions of individual collagen proteins in the cross-section of lambskin and the effect chemical processing has on this during the conversion process to leather.

www.lasra.co.nz



Collagen VI identified in an image of the cross-section of lambskin. Higher concentrations are highlighted in red, lower concentrations in blue

New CB3 Mine Services Ltd Spontaneous Combustion test

Coal self-heating is a naturally occurring process caused by oxidation. When uncontrolled it can lead to spontaneous combustion (SponCom) and the production of noxious gases. Unless managed, the results can be catastrophic, when mining, transporting, storing and using coal. Even non-catastrophic self-heating of coal will lead to loss of coal quality (e.g. calorific value, coking properties). An informed understanding of coal self-heating behaviour can be used to develop an appropriate Principal Hazard Management Plan, including Trigger Action Response Plans (TARPs)

CRL Energy in collaboration with Dr Basil Beamish, formerly of Auckland and Queensland Universities, has established CB3 Mines Services Ltd with SponCom laboratories in Brisbane and Lower Hutt. The service was set up to assist Australian and New Zealand coal producers and users to safely mine, transport and store coal. It applies world leading practice in SponCom assessment for customers in Australasia, Africa, Europe, America and Asia, and has been set up as part of a Mine Hazards programme funded by the New Zealand Coal Association and Government.

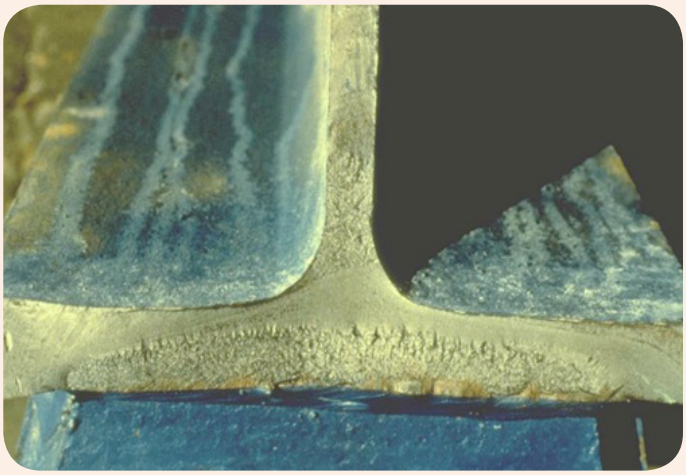
A new test (SponComSIM™) is designed to simulate coal self-heating behaviour starting from site-specific in-mine temperature conditions and measures the moderating influences of moisture as well as any accelerated self-heating such as from the presence of reactive pyrite. It identifies whether the coal can achieve thermal runaway under ideal conditions and in what timeframe this is likely to take place. This test has been benchmarked against known coal performance for many mining operations and coal stockpile situations. The same test procedure has been used to quantify the effectiveness of applying anti-oxidants to manage and delay self-heating of reactive coals.

Gas monitoring in coal mines is used in most coal producing countries to provide early detection of a self-heating event, allowing for timely intervention to limit the disruption to production and ensuring the safety of those on site. The SponComGAS™ test records the gas evolution pattern in relation to temperature increase and can be used for the early detection of a self-heating event. These unique gas evolution trends can be used for identifying characteristic trends and defining appropriate indicator gases for setting TARP limits

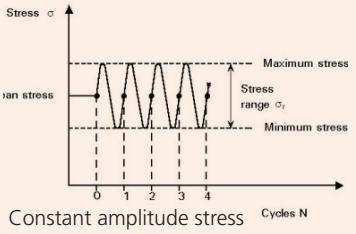
All CB3 test results are analysed, interpreted and compiled into a comprehensive report by Chartered Professionals who are members of the Australasian Institute of Mining and Metallurgy.

www.crl.co.nz

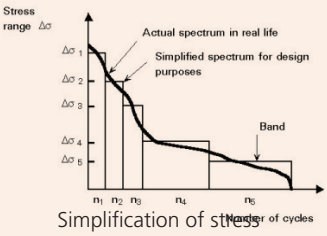
Adaption of international fatigue provisions for new Australasian bridge design standard



Fatigue is the mechanism whereby cracks grow in a structure. Growth only occurs under fluctuating stress. Final failure generally occurs in regions of tensile stress when the reduced cross-section becomes insufficient to carry the peak load without rupture. The fatigue strength of a welded component is defined as the stress range Δσ which, fluctuating at constant amplitude, causes failure of the component after a specified number of cycles N. The stress range is the difference between the maximum and minimum points in the cycle. The number of cycles to failure is known as the endurance or fatigue life.



Constant amplitude stress history



Simplification of stress spectrum

In practice, most stress histories in real structures are of the variable amplitude type as opposed to the constant amplitude shown above. Such histories pose a problem in defining the number and amplitude of the cycles. Under variable amplitude loading the life is estimated by calculation of the total damage done by each cycle in the stress spectrum.

HERA's is actively involved in the revision of the fatigue section of the bridge design standard AS 5100.6. The intention is that the next revision of the Standard will be adopted as a joint New Zealand and Australian standard AS/NZS 5100.6. Rather than modify the existing fatigue resistance verification approach, the decision has been made to adopt the most advanced fatigue design provisions given by the International Institute of Welding (IIW) and Eurocode 3 (EN 1993-1-9).

The transition from the existing verification procedures of AS 5100.6 to that given by these international provisions eliminates the tedious calculation procedure of damage accumulation by the use of damage equivalent factors _, which relate the stresses from real traffic to the idealised code-defined fatigue load model. As the _-factors given internationally have been developed based on fatigue load models used in Europe, HERA have developed Australasian _-factors by calibrating the existing loading standard AS 5100.2 with the proposed AS/NZS 5100.6.

In addition, reliability differentiation is introduced within AS/NZS 5100.6, where different safety factors are used in design depending on whether the structure is regularly inspected or not (known as the 'damage tolerant method' and 'safe life method', respectively). Further calibration studies have been undertaken using typical worked examples that have been extended through parametric analyses by considering differing bridge spans. As well as greatly simplifying fatigue design, it is hoped that the new rules in AS/NZS 5100.6 will result in more economic and safer structures. The work has been undertaken in close cooperation with the world authority on fatigue design Prof. Adolf Hobbacher, Germany together with Dr. Fidelis Mashiri in Australia.

www.hera.org.nz

CRL ENERGY SCOOPS NATIONAL ENVIRONMENTAL AWARD

A CRL Energy-led research programme successfully took out the big prize at the 2014 Minerals West Coast Environment Awards, announced at the Minerals West Coast's annual conference in Greymouth in late July.

CRL Energy edged out OceanaGold's Reefton gold mine restoration project to take the award with their on-going long-running programme to prevent, minimise, or mitigate mining-related impacts on water quality and aquatic ecosystems downstream of mines. Research underpinning the decade-long programme involves geologists, geochemists, biologists, and environmental scientists at CRL Energy Ltd, Landcare Research, Canterbury University, and Otago University.

Research carried out in the programme includes answering what can be predicted about acid mine drainage (AMD) and how this can be used to improve mine planning; what the environmental impacts of mine drainages are on ecology; and, what management treatment and rehabilitation options are available, and how the best options are selected.

The research consortium has or has had research sites to investigate best-practice methods to control AMD at several mines including Stockton, Globe, Bellevue, Roa, Echo, and Sullivan Mines – trialling both active and passive forms of AMD treatments. The team now run several passive treatment projects which focus on the use of waste products, such as mussel shells and wood waste, for mine drainage treatment in a novel and sometimes world-leading manner.

"Our work on the use of precipitates from neutralised mine drainages to adsorb arsenic and antimony is attracting international attention."

Several international research groups have visited the sites to examine the best-practice or novel methods. In addition to these treatment sites the team has also sampled other sites widely distributed throughout the New Zealand to add to the geochemical and water quality databases.

At the awards ceremony, Minerals West Coast manager Peter O'Sullivan said CRL Energy had showcased the advances being made in predicting and managing the environmental effects of mining. "Mining today has to be environmentally responsible, both during mining operations and long after mining is finished. That is what New Zealanders expect, and that is what is being increasingly delivered."

The research programme is funded by the Ministry of Business, Innovation and Employment and in 2011 and 2012 was rated in the top 3% of some 180 MBIE-funded research projects for achievement and delivery of applied science to end users.

The Mine Drainage Framework, to assist mining operations with planning of future New Zealand mine developments, can be found on the CRL Energy website at http://www.crl.co.nz/services/research/mine_drainage_framework.htm

www.crl.co.nz

Dr James Pope, CRL Energy's South Island General Manager and lead researcher of the prize-winning project (left), and Hugh Grey of the Minerals West Coast Trust]

Developing a natural pesticide solution

Biological control company Biotelliga is working with a number of partners, including Cawthron Institute, to develop biological, sustainable, non-synthetic chemical pesticides.

"There's a disconnect right now between a public who wants food that has been grown safely and without harmful synthetic pesticides, and growers who are under pressure to grow more to meet our global food needs," says Stephen Ford, Biotelliga founder and technical director.

"What there hasn't been is a transitional technology that can serve to bridge those two demands. Our work suggests that bio-control products could be the answer."

Now known as SF7489, the development of this bio-control solution could revolutionise how harmful fungi are managed. For example, SF7489 has tested successfully as a possible way to fight kauri dieback and a number of fungi that affect our horticulture industry.

Cawthron Institute Technical Manager, Paul McNabb, says it's been a partnership with Biotelliga since the beginning.

"Stephen wanted to replicate what he was seeing in field trials, in the laboratory, and then isolate and measure the active compounds. Our analytical and natural products chemistry services allow him to further investigate and refine his 'recipes' for bio-control products."

Biotelliga is finalising its first multinational agreement for SF7489. Here in New Zealand, SF7489 is currently before the regulator for review.

Paul McNabb says products like SF7489 extend New Zealand Inc's reach. "It's fantastic to be involved with a client like Biotelliga where we're able to help them turn a great idea into a commercial reality."

www.cawthron.org.nz

Aqualinc Adds A New Tool To New Zealand's Water Quality Limit Setting Toolbox

Government's proposed changes to the National Policy Statement for Freshwater Management will set numeric objectives for freshwater attributes such as the abundance of periphyton in a river. Managing periphyton abundance in rivers requires that nutrients are kept within limits. However, determining what these limits should be is complex because periphyton abundance is also determined by light, temperature and river flows. Floods scour periphyton from rivers thereby reducing the frequency and duration of periods of high of abundance. In addition, low river flows may produce the slow water velocities and warmer temperatures that promote growth. Because the frequency of floods and duration of low flows are affected by water use (abstraction, diversion and damming) periphyton is also relevant to setting limits to water use.

Aqualinc has recently teamed with NIWA in the development of a national model that predicts periphyton abundance based on variables that are relevant to limit setting; nutrient concentrations and flow, while accounting for other factors such as light andtemperature. The periphyton model has been included in the limit simulator that has been developed by Aqualinc as part of the Wheel of Water research programme. The limit simulator concurrently evaluates a range of environmental and resource use indicators. The limit simulator shows how the frequency and duration of periods of high periphyton abundance would respond to changes in resource use, for example the increase in nutrient concentrations and reduction in river flows that may occur under irrigated agricultural land use. The results are summarised on water wheel diagrams that communicate the simulated outcomes for alternative sets of limits and show the trade-off between environmental indicators (e.g. periphyton abundance) and resource use indicators (e.g., agricultural production).

www.aqualinc.com