ONGOING MONITORING TO ENSURE NOW HOME LIVES UP TO EXPECTATIONS

The house at Olympic Place in New Lynn, Auckland, looks like any other. There is washing on the line, toys in the corner and music coming from the stereo, so it takes a much closer inspection to realise this house is quite different and very special.

The Beacon Now Home was officially opened by the Prime Minister, Helen Clark, in August 2005.

The home has been designed and built with four key principles in mind – affordability, aesthetics, performance and sustainability. Through ongoing research and monitoring of the home, the aim is to develop ways to create affordable, desirable homes that are environmentally responsible.

Since the opening, the home has been occupied by a young family and although every element of the house is monitored, the team is going to great lengths to ensure the research is an unobtrusive as possible for its tenants.

"The only way to truly determine whether the house is measuring up in terms of efficiency and sustainability is to continuously monitor different activities within the house, for example, energy and water consumption, and temperatures in different rooms and within walls," says Beacon General Manager Nick Collins.

"We're doing everything we can to ensure that life for our tenants goes on as normal. Because the Now Home is designed as a real-world home, the intrusion of visible monitoring systems or people is just unacceptable so we're doing everything remotely.

"In addition, we actually need non-invasive monitoring results in order to truly reflect the behaviour of the house in a normal environment," he says.

The monitoring system within the house provides remotely accessible data from a computer located under the hot water cylinder. The first set of data will be available shortly.

The Now Home has been developed by Beacon Pathway Ltd, a collaborative research consortium involving Scion, Building Research, Fletcher Building, New Zealand Steel and the Waitakere City Council.

For further information, check out www.nowhome.co.nz

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MICROBIAL ECOLOGY UNDER THE SPOTLIGHT

Creating value out of pulp and paper waste is one of the main aims of Gareth Lloyd-Jones, Group Leader Directed Biosynthesis in Scion's Eco-Smart Technologies group.

Gareth joined Scion in July 2005 following 11 years at Landcare Research.

Most of Gareth's work involves looking for novel properties in organisms that come from carbon rich waste environments.

Carbon rich waste systems contain diverse organisms that can perform a wide range of functions, resulting in the stabilisation of organic matter and/or the production of added-value products.

"Ultimately we are aiming to develop technologies and products that will deliver improved environmental performance and financial benefit from low value waste."

Gareth says the work involves using microbes for remediating waste, for generating useful byproducts from waste, and for isolating useful enzymes out of waste environments.

The aim is to develop products that have a high value proposition and commercial application.

Dr Gareth Lloyd-Jones (left) and Dr Quanfeng Liang.

PINE COULD REDUCE RELIANCE ON OIL

The humble pine tree could soon help reduce reliance on the world's dwindling oil supplies, thanks to work across the Scion group.

Scion researchers have spent the past five years working on extracting chemicals from pine bark and finding ways these natural chemicals could replace synthetic and petroleum-based compounds used in building products, packaging, plastics and cosmetics.

Dr Alan Fernyhough, leader of Scion's Biomaterials Engineering unit, says the team is now in the process of identifying partners to commercialise their work on wood adhesives for the building industry.

The product is a high-performance adhesive that uses tannin in phenolic-resorcinol formaldehyde adhesive systems (tannin-PRF). Tannin, a natural chemical obtained from pine trees, is used to replace part of the oil-based ingredients comprising such adhesives, which are used in structural beams, solid wood joints, and for other commercial building uses.

Dr Alan Fernyhough (left), leader of Scion's Biomaterials Engineering unit and Dr Jamie Hague, General Manager of the Ensis Wood Processing Unit.

"We ran our first trial a couple of years ago and proved the pine derivative is a viable alternative to synthetic chemicals. We are now working with an international company to assess the commercial opportunity for the wood adhesive technology. It is exciting to see our work getting to this stage and attracting industry interest."

Alan says although a great deal of international work has been done over the past 20 years, he believes this research has now reached commercialisation due to a number of new factors.

"This research is very relevant in today's society. There is a growing interest in bio-based materials and this research has particular appeal as it uses a waste material."

Alan says there are many advantages of using pine tree extracts over current chemicals. Firstly, pine trees are a sustainable resource that grows well in New Zealand. Added to that, the formaldehyde emissions from the new adhesive are lower than standard adhesives.

"The whole point of this work is to find an environmentally-friendly alternative to the oil-based chemicals that are currently used in so many products. The big advantage with our product is that it is better for the environment and uses existing factory equipment to make it," he says.

Dr Jamie Hague, General Manager of the Ensis Wood Processing Unit, says the collaboration has enabled the technology to be fast tracked towards commercialisation.

"This work is of international significance and it would have been much harder to get to this stage without working together," he says.

"I see this as just a first step towards revolutionizing the wood processing industry. With respect to adhesives, the long term goal is to develop systems that are based entirely on renewable materials, with a particular focus on eliminating formaldehyde as a component," Jamie says.

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NEWSLETTER

Biomaterial Futures

SCION joins group effort to clean up lakes

Scion has joined forces with Environment Bay of Plenty and Waikato University in an effort to help solve one of the Rotorua region's biggest environmental problems – dirty lakes.

High nutrient concentrates have been affecting the quality of New Zealand lakes for many years, particularly in the Rotorua and Taupo regions which receive large volume runoffs from farmland.

Researchers from Scion's Eco-Smart Technologies group and Waikato University are currently undertaking field trials at Lake Okaro, one of the worst affected lakes in the region. The work is being funded by Environment Bay of Plenty.

Fifteen polythene cylinders have been installed in the lake, each dropping to the lake floor thereby creating an artificial ecosystem that includes the sediment on the bottom of the lake.

A variety of different commercial and experimental methods are being used to treat the ecosystem contained within the cylinders.

Eco-Smart Technologies unit leader, Trevor Stuthridge, says the treatments soak up the pollution-causing phosphorous from the water and the aim of the project is to determine which treatments do the best job.

"In particular, we are trialing a new modified zeolite product which has been developed at Scion.

"The zeolite found in this area is unique as it is only a hundred thousand years old, compared with most others around the world which are millions of years old. As a result, Rotorua's zeolite is very porous and active and, once modified, it seems to be soaking up phosphorous better than most other treatments.

"So far this treatment is working extremely well which is positive for both the environment and the local economy."

The pilot-scale trials are due to finish shortly.

Eco-Smart Technologies focus on treating or enhancing waste streams for economic benefit, while providing economic gains.

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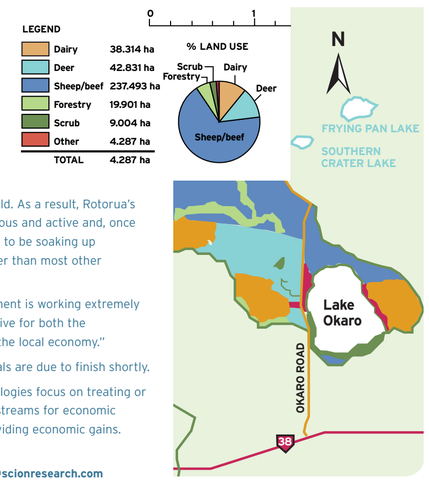

Map courtesy of Environment Bay of Plenty.

Inside this issue

Takes a closer inspection to realise this house is quite different and very special.

Find out on Page 5.

From the CEO

There is no doubt that the past 12 months have been extremely busy for Scion – both in terms of developing our future-facing work in biomaterials, as well as our forest-based joint venture, Ensis, with our CSIRO partners.

As you are probably aware, our organisation has a long history in providing research-led solutions for the forest industry. You can review the highlights of this work in our quarterly Ensis Link publication (see http://www.ensisjv.com/publications.aspx if you are not already receiving this).

At Scion we're taking those strengths and capabilities into a new space with our Biomaterials Futures vision, which is built on future sustainability and developing plant-based biomaterials substitutes for products currently derived from non-renewable resources.

Examples of potential biomaterials products include biopolymer-based formulating agents for cosmetics and adhesives, replacements for synthetic plastics and natural fibres and composites developed from wood, flax, hemp and other crops.

This, the first issue of our Biomaterials Futures Newsletter, aims to bring you a quarterly update on some of the news and events associated with our people, our research and our business.

A biomaterials future is a realistic and necessary vision for New Zealand and we're proud to be involved in developing that future. We look forward to highlighting some of the results in this quarterly newsletter and we welcome your thoughts.

Tom Richardson
Chief Executive Officer

BUILDING BLOCKS
THE SUBJECT OF PHD RESEARCH

Scion's Stefan Hill has joined forces with a group of top scientists from around New Zealand and the world to gain a better understanding of the molecular architecture of trees, with the aim of ultimately developing better biocomposite products.

Stefan, a scientist in Scion's Biomaterials Engineering group, is undertaking the research for his PhD at Victoria University. He says the project is specifically aimed at determining whether water is an integral part of trees and plants.

"We all know that life cannot exist without water, but what we need to know is what role water plays in natural biocomposites like trees. For example, is water the glue that holds it all together?

"This is important because when it comes to creating new biocomposite products, we need to know how the different elements are made up and how they might behave. You wouldn't construct a 20-storey building without laying the foundations, similarly, we can't develop new biocomposite products without understanding the building blocks," says Stefan.

"We know everything there is to know about glass fibres and how they behave when they are used in products like fibreglass. We need to have that same level of knowledge about plant fibres so that we can create viable replacements for fibreglass and other unsustainable products.

"Basically, this work will form the basis of a future bio-based society," he says.

Stefan's advisory group includes Rotorua's Robert Franich, Jonathan Harrington and Roger Newman, Peter Francell, the director of biocomposites at the Max Plank Institute in Germany, and one of New Zealand's top scientists, Paul Callaghan from Victoria University.

Stefan's work links advanced magnetic resonance techniques with biomaterials science of real importance to New Zealand, says Dr Callaghan.

"He is especially well-qualified for this research because he has a sound understanding of sophisticated NMR methods, and yet is immersed in an applications environment."

Stefan will undertake most of the research from his nuclear magnetic resonance spectometra laboratory in Rotorua, while he will also spend three months at the Max Plank Institute in Germany. It is expected the work will take between three and five years to complete.

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GROWING THE GAINS

Since ancient farmers first began growing crops for food, mankind has looked to enhance the productive value of plants. The process of improving tree crops for wood supply has begun only recently and progressed more slowly, because forests take longer to grow and breed. Scientific breakthroughs made by Scion's Cellwall Biotechnology Centre (CBC) will accelerate the improvement of tree crops in order to achieve quantum leaps in value gain.

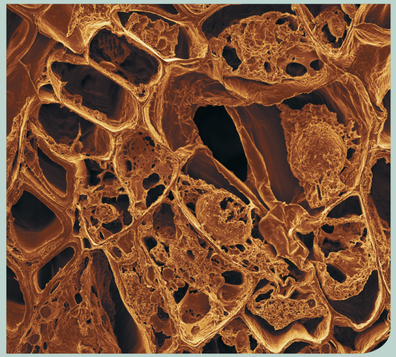
Scion has developed a method of synthesising cell wall formation in the laboratory that mimics wood production inside a tree. This breakthrough enables scientists to rapidly test genes and examine the effects on cell wall formation in a way that will speed up the application of advanced biotechnologies in tree breeding.

CBC Unit Leader, Dr Tim Strabala says that applications arising from discoveries in cell wall formation and other aspects of tree biotechnology will fundamentally change the face of plantation forestry practice.

"The purpose of our biotechnology research is to tailor tree crops that will better meet specific manufacturing and product requirements in the future. Knowledge gained from our research on cell wall genetics, molecular biology and biochemistry could result in forests with crop rotation times ranging from five to 25 years, depending on what they are designed to produce."

Tim explains that trees grown to produce extra tannin, for example, could be harvested at a significantly lower age than those grown for structural timber. It's simply a matter of growing plants that are designed to yield a particular product.

"Similarly, trees grown for pulp will benefit from genetic enhancement for specific characteristics, such as decreased



lignin content. These enhancements can be achieved either through genetically modified organisms (GMO) or non-GMO methods."

Just as most of the fruit and vegetable crops grown today bear little resemblance to their wild forebears, so it is likely that future production forest will contain trees with quite different characteristics from what we see today.

"Our team has recently discovered a gene that influences wood density. This information can yield immediate benefits to growers through tree breeding programmes."

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LOOKING INTO WOOD

Scion microscopy specialists have compiled an instructive tool for wood anatomists, wood technologists and plant biomaterial researchers.

"Fluorescence Microscopy of Wood" is a multimedia CD that contains methods for conventional and confocal fluorescence imaging of wood cell walls.

"The contents of this CD represent an enormous amount of careful work, distilling the many years of experience the authors have had using these techniques. The images and information are excellent and will be helpful to researchers who are researching wood structure using confocal microscopy or who are about to begin." Professor Philip Harris, The University of Auckland.

For more information see www.scionresearch.com and type "Wood CD" in the search box.

Natural fibre world not too far away

Imagine a world where the panels on your car, the chair you sit on and the keys and casing of your pocket computer are all made from natural, renewable fibres such as wood, flax or hemp. That world may not be too far away according to researchers in Scion's Biomaterials Engineering team.

Scion's biomaterials vision is to transform renewable biological resources into new industrial products.

The aim is to develop materials that help reduce society's reliance on petroleum-based plastics and fibres and other non renewable materials such as glass or steel. At the same time, the goal is to develop products that biodegrade naturally at the end of their life, without contributing to landfill or waste accumulation.

Scion principal scientist, Roger Newman, says his team's research looks at the whole life cycle of a product.

"The world is seeking biological replacements for steel, fibreglass and oil-based products. We want to develop a sustainable natural alternative that comes from the land and goes back to the land when it's finished. There is no point developing a new product that doesn't biodegrade, we would simply be adding to the world's landfill problem."

Roger's team is working with Biopolymer Network partners Canesis and Crop & Food Research to develop a series of natural fibre industrial reinforcement materials that could potentially replace fibreglass in a number of applications.

"Glass fibres are used on a large scale worldwide. Each year more than two million tons of reinforcement glass fibre is produced for use in products like insulation and car parts, while it is increasingly used in composite materials to replace metal components in a diverse range of products such as computer casings and furniture parts.

"One of the main issues with fibreglass is that it uses a lot of energy to produce and it has an indefinite life.

"Our vision is to develop a range of sustainable bio-based products that are cost-effective and deliver the same functionality or performance, as well as environmentally acceptable 'end of life' options. The intention is that it can either be recycled in another product, burnt as a fuel or broken down without environmental impacts."

Roger says the group has made great progress over the past 12 months.

"We're constantly thinking of new ways to use biofibres. It's going to be an exciting new world and we're delighted to be part of it."

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HARAKEKE INDUSTRY TAKES A STEP FORWARD AT ROTORUA HUI

Almost 100 scientists, businesspeople, Government agency representatives and landowners gathered at Scion's Rotorua site late last year to attend a hui focussing on potential opportunities for the emerging Harakeke (New Zealand flax) industry in New Zealand.

Scion's Group Manager Maori Strategy, Tupara Morrison, says the hui provided the opportunity to bring different groups together who have an interest and a stake in the Harakeke industry.

"At the moment many different organisations are working on potential applications for fibre that is derived from the Harakeke. But we must look at the entire value chain to ensure that we have a resource to start with, otherwise research like this will never become reality.

"At the same time, we must also take into account the cultural and spiritual elements involved in Harakeke, its harvesting and its uses, and seek to understand and recognise the indigenous knowledge associated with the plant," says Tupara.

Representatives from the Sustainable Farming Fund (SFF), administered by MAF, were also involved in the hui.

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