TE PŌKAI TARA
UNIVERSITIES
NEW ZEALAND

UCONZ
University Commercialisation
Offices of New Zealand

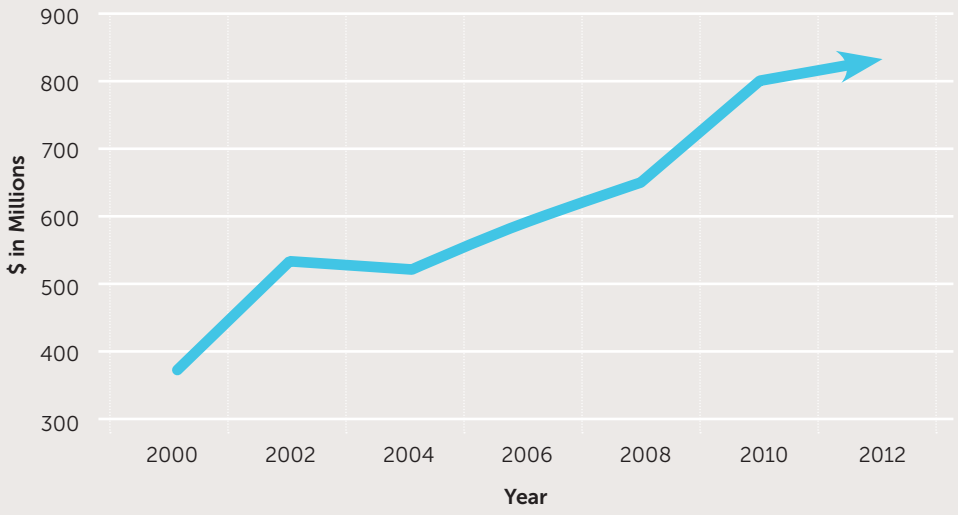
UNIVERSITY RESEARCH COMMERCIALISATION

Driving innovation and development

Universities at the centre of research and innovation

The biennial Research and Development survey* shows that the universities are responsible for one-third of New Zealand's expenditure on research and development.

The universities conduct the majority of the fundamental research that is integral to innovation and the development of new products and processes. The inventions in this publication highlight the value of this fundamental research to advance New Zealand's economic and social development. The universities' success in research commercialisation can also be attributed to strong partnerships and collaborations with industry.



University Research & Development expenditure

* *Research and Development in New Zealand: 2012,* joint publication of Statistics New Zealand and Ministry of Business, Innovation and Employment.

University research commercialisation in New Zealand:

DRIVING INNOVATION AND DEVELOPMENT

New Zealand's first university commercialisation company – the University of Auckland's UniServices – was established 25 years ago. Today the results of our eight universities' efforts to commercialise their research outputs amount to a business worth over $500 million a year.

«In 2005 the universities set up UCONZ – University Commercialisation Offices of New Zealand – to bring the commercialisation offices of all the country's universities together and to establish closer links with government and commercial research partners.

The commercialisation activities carried out by the universities are wide-ranging. This publication highlights just some of the opportunities and innovative projects being pursued by UCONZ members. Information about how the universities can help your business expand and capitalise on opportunities can be obtained from any of the universities, and contact details are listed at the end of this publication.

To commercialise their research activities the universities use means such as patents, licensing of manufacture, setting up subsidiary companies, and the outright sale of new technologies. In any year between 50 and 100 patents are issued to the commercialisation companies, about 10 companies are set up, and 50 to 70 new licensing arrangements are negotiated.

An earlier study showed that per dollar invested, New Zealand universities produced more than twice the number of new companies than the United States average, and over 50% more than Canada. In addition New Zealand universities produced patent applications on a par with US performance and 30% more efficiently than Canada. »

THE PATIENT CENTRIC HEALTHCARE REVOLUTION

Kumanu is the industry partnering programme of the University of Auckland's UniServices. It is dedicated to transferring the University's technology to the healthcare industry to improve the care of our seniors and people with chronic disease.

«Patients with serious chronic disease, cardio-vascular problems and diabetes are the unfortunate 'frequent flyers' of the health service. They are in and out of hospital the most often, and their care is the biggest driver of healthcare costs in New Zealand.

Kumanu's focus is on 'patient centric' healthcare; providing tools to help these patients manage their own care at home as much as possible, thus reducing their need to visit hospital. This is better for the patient, and far less costly for our health system. It is an area that offers global opportunities for innovation by New Zealand.

First-line care in the future will be integrated and delivered through devices such as smartphones, iPads, laptops, smart TVs, and robotic devices on various scales. Research at the University of Auckland is opening up numerous opportunities for partnership with New Zealand businesses, and the University is keen to work with technology partners who can help realise this potential.

Advanced robotics is the flagship for showcasing the technology that will drive the healthcare of the future; simpler integrated care models will spin off, and indeed this is already in operation.

'Health bots' is a multidisciplinary project involving departments of the University and the Electronic and Telecommunications Research Institute in Korea. This collaboration has seen health bots operating in Auckland's Selwyn Village.

The robots – there are now 30 in use at the village – provide companionship for residents, allow communication such as Skype calls, play brain games, remind residents to take their medication, monitor their vital signs and communicate directly with the medical staff on site and elsewhere, minimising the need for face-to-face consultation.

Health developments are not limited to robotics. UniServices' ASSET programme involves the Schools of Medicine, Nursing, and Business and Economics at the University, along with District Health Boards and the Ministry of Health.

Patients' vital signs are monitored automatically at home, and relayed via a home hub to storage in the cloud. If their readings fall outside agreed parameters, an automated response is sent to the patient's GP or nurse specialist, prompting a call or visit. The GP, specialists, and hospital can all share the patient's information electronically and liaise remotely.

Kumanu partners include Panacea Healthcare Chiptech, Pulsecor, Selwyn Foundation Lifetime Health Diary, Zephyr Technology, Stickmen Studios, Nexus6, and Atlantis Healthcare. »

Instructing a rest home patient in using a health bot to take a blood pressure reading.

EXCITING LUNG SIMULATOR TECHNOLOGY

A lung simulator is one of the exciting technologies to emerge from the Auckland University of Technology's Institute of Biomedical Technologies (IBTec).

«The institute was established in 2007 to employ engineering research tools to study biological systems. Applying various sciences and mathematical models, researchers at the IBTec have improved existing therapies, diagnostics tools and medical devices. The institute conducts research mainly in three centres; the Centre for Biomedical Materials, the Centre for Cardiovascular Diagnostics and the Centre for Respiratory Therapies. It has R&D collaborations with more than 25 companies around the world.

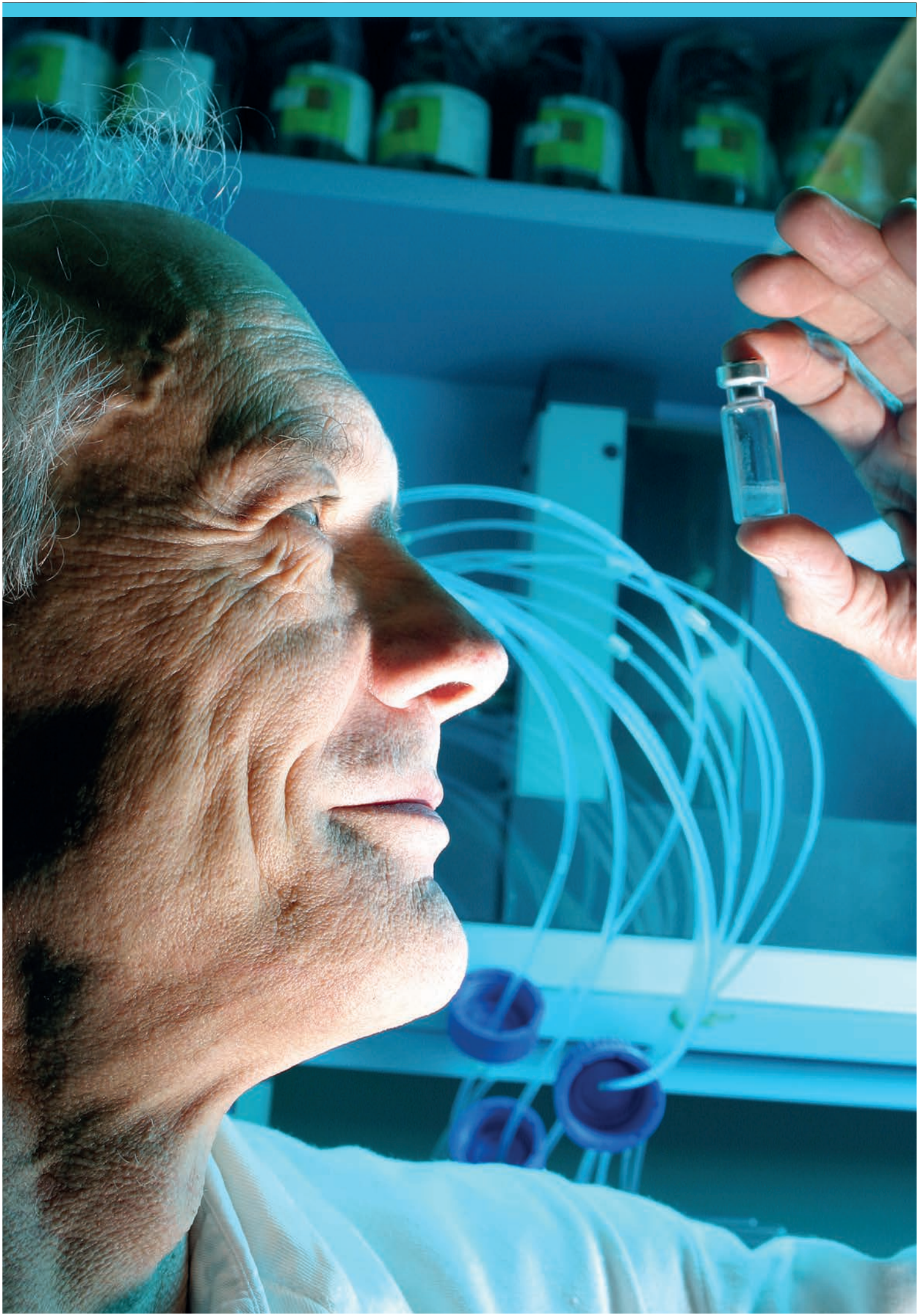
Scientists at the IBTec have developed a unique lung simulator. The device's novel design replicates the behaviour of the human lung and particularly the bronchial structure, allowing more accurate on-line monitoring of a richer set of respiratory parameters than other lung simulators. Its operation can be varied to test different parameters simultaneously.

The simulator is routinely used by the researchers at IBTec for R&D purposes, and its unique capabilities have also attracted the attention of medical devices companies, who have used it to develop and test technologies. The lung simulator has many different applications. Using it prior to in-vivo research can significantly reduce the cost of testing biomedical devices, replacing a large proportion of animal studies and clinical trials.

The simulator can be used for non-clinical testing of existing respiratory devices, for purposes such as certification, monitoring, and quality assurance. The device may also find application in the regular calibration and testing of respiratory devices in hospitals and other care facilities.

The lung simulator is just one of the promising technologies in the pipeline from the IBTec. Other interesting technologies emerge regularly, reflecting the dedication of the researchers at the IBTec and their enthusiasm to contribute to New Zealand's growth knowledge economy. »

IBTEC's lung simulator.



A NEW ZEALAND BIOTECH SUCCESS STORY

The ZyGEM Corporation is a rapidly growing biotechnology company, which produces and markets innovative products for the extraction and analysis of DNA and RNA for the research, forensic and clinical diagnostics markets.

«The ZyGEM family of products is derived from an exclusive collection of microorganisms from extreme environments, including Antarctica. The products allow the extraction of nucleic acid from diverse sample types for simple, accurate, rapid human and animal DNA testing for life sciences customers performing basic research.

The company's first base was in Hamilton, where world-class science research was undertaken at the University of Waikato. WaikatoLink, the commercial arm of the University of Waikato, recognised and commercialised potential applications for the technology to form the spin-out. ZyGEM now has headquarters in the United States and New Zealand, and a global network of distributors and partners.

ZyGEM's latest development, the Microlab Platform, replaces the standard DNA identification process, which takes intensive training, sophisticated equipment and days or weeks to complete, into an affordable, onsite process that takes less than an hour. Advanced microfluidic research is combined with ZyGEM's unique technology to build a laboratory on a single small chip, which dramatically shortens processing and analysis time.

Another recent success, in partnership with global security heavyweight Lockheed Martin, is the release of a platform for simplifying and speeding up DNA analysis for human identity testing. The systems have the potential to transform the way law enforcement, forensic, security and intelligence communities use DNA identification. The forensic and government sectors represent target markets estimated to exceed $3 billion per annum in the United States alone.

ZyGEM's New Zealand laboratories continue to contribute to its success as it develops new applications for its 2,000 extremophile organisms, which produce rare and unique enzymes.

ZyGEM is a great example of successful commercialisation of research from the lab to international markets. Early commercialisation and R&D projects were supported by government investment from the former Foundation for Research, Science and Technology. »

Advances in hyperthyroidism treatment:

HYPER-T EARSPOT™

Hyperthyroidism is the most common endocrine problem in cats over eight years old. The number of affected animals is small but growing, with a 20-fold increase in New Zealand in the last 30 years.

«Treatment aims to bring the thyroid hormone concentration back within the normal range. This can be achieved by surgery, radioiodine therapy, or antithyroid drugs such as methimazole. Radioactive iodine has the fewest adverse effects and is the most efficacious of the treatments but has drawbacks, including high costs and radiation therapy might not appeal to clients and cannot be used on cats with concurrent renal disease. Surgery is difficult, expensive and can have significant disadvantages. This makes medical management attractive, but some cats are notoriously hard to medicate with oral drugs, and medical management of hyperthyroidism typically requires long term twice-daily oral tablets, which must be taken with water.

Researchers at Massey University have developed a revolutionary way to deliver thyroid medication to cats. Hyper-T EarSpot is a world-wide first for once-a-day transdermal application of hyperthyroidism drugs. This means the drug is rubbed into the inside of the cat's ear once a day and allows the drug to be absorbed effectively by the animal without being disturbed by scratching. It is safe and easy to administer, and reduces stress in the animal, benefiting the cat, its owner and the veterinary practice.

Projected revenue for this product is based on the age profile of the cat population. If 10% of the target population uses the treatment, at approximately $150 per annum, this represents a potential annual turnover of $750,000. A launch in Australia under the same assumptions would produce potential revenue of $2.25 million per annum. The product has been patented, and the name "EarSpot" trademarked.

The commercialisation of Hyper-T EarSpot has benefited researchers at Massey University, providing valuable experience in developing research programmes that can be quickly adapted to commercial application. The patenting of the intellectual property associated with this drug delivery system has opened up the potential for other similar applications. The veterinary industry has been very quick to take up this product during its limited release, as a solution to a common problem. Ultimately the licensing of this technology in the global veterinary market will benefit the New Zealand economy, and will potentially facilitate more applied research at Massey University.

This technology has been patented worldwide and licensed to Bayer for commercialisation, ensuring benefits flow back to New Zealand. »

Pepsi the tabby gets her daily dose of EarSpot.

NEW TECHNOLOGY TO ADDRESS POLLUTION PROBLEM

A new technology developed by Victoria University of Wellington researchers has the potential to address one of today's biggest pollution problems – sludge disposal. A by-product of the wastewater treatment process, sludge accounts for a third of the total waste volume going to landfills: about half a million tonnes per year just for New Zealand's lower North Island.

«The innovative researchers at Victoria University saw the problem – where do we put it all? – and came up with a scientific solution called Wetox. This new technology not only eliminates the sludge but produces clean water and useful chemical products from the waste, and recovers valuable mineral resources.

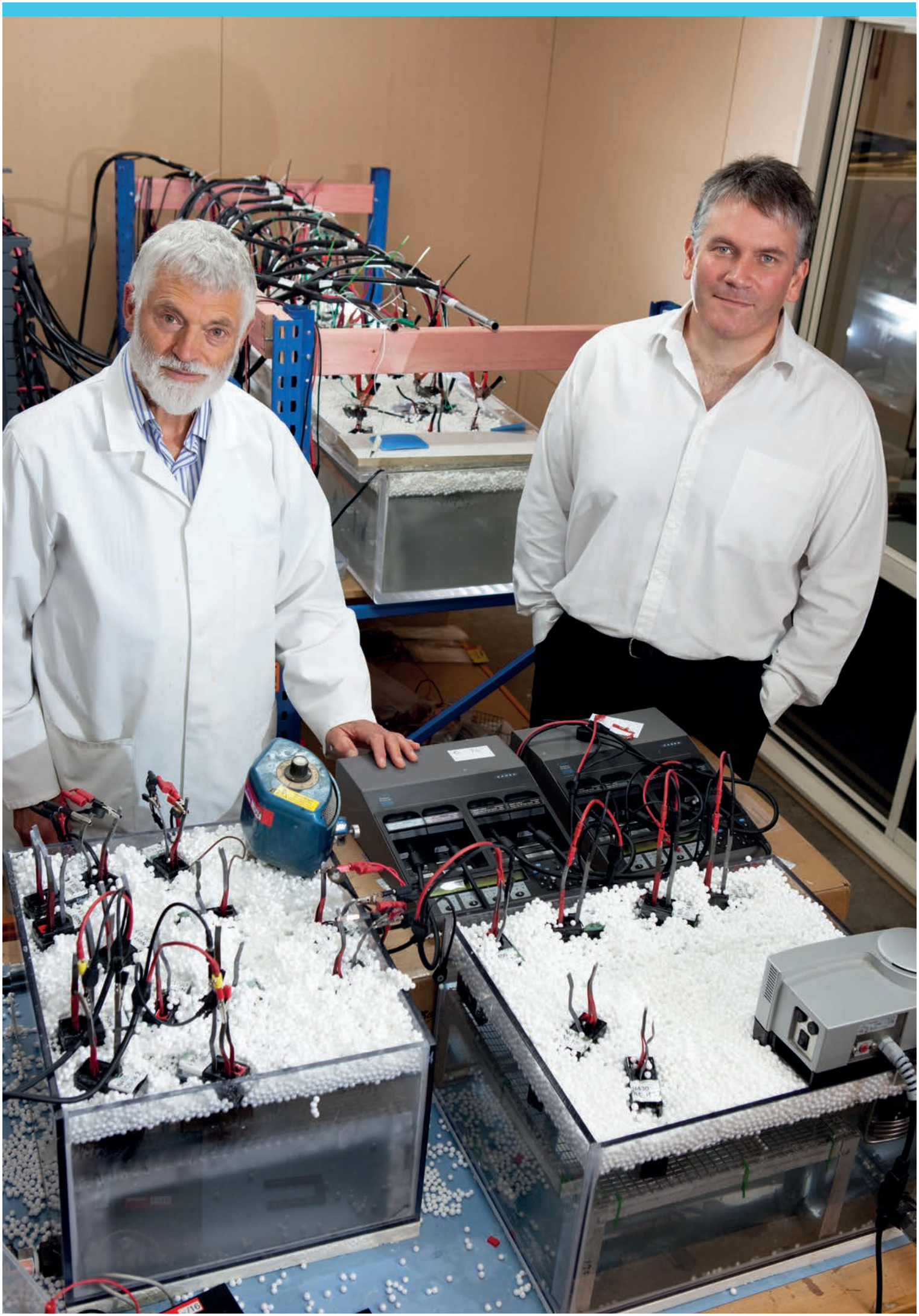
The Wetox sludge deconstruction process is more efficient, cost-effective and environmentally-friendly than traditional catalysed wet-air oxidation methods. Using high pressure and extreme temperatures to turn waste into water, Wetox reduces sludge volumes by over 90%, virtually eliminating the need for industry waste to be disposed of in landfills.

The Wetox process is less expensive than previous techniques, and also produces valuable chemical by-products such as carboxylic acids, and recovers valuable nutrients, metals and minerals, such as phosphate, which is an important fertiliser.

From its beginnings as a university thesis, Wetox has developed into a business with huge promise in a global market potentially worth billions of dollars. This potential has recently been recognised by the New Zealand Government in the form of a $1 million investment at Palmerston North's wastewater treatment facility, where Wetox is being installed as a pilot plant.

Wetox is a leading example of Viclink's commercialisation of Victoria University's research to solve real problems and create revenue for New Zealand from the export of ground-breaking technology. »

Sludge before and after Wetox.



POWERING UP FOR NICHE CAR MARKET

A Christchurch company that had its beginnings at the University of Canterbury has high hopes of a massive market for its new battery technology, which targets the green car market.

«ArcActive recently won an award for excellence in the field of environmental technology research at the CleanEquity 2012 conference in Monaco, a magnet for the world's investors.

ArcActive has built on technology first developed by Dr John Abrahamson at the University of Canterbury, and taken it much further. It is aimed at "stop-start" and micro hybrid vehicles, which are increasingly numerous in Europe and the United States.

Hybrid cars' engines reduce output or turn off and battery power kicks in when the car is idling or coasting to a stop. This saves fuel but places huge demand on traditional batteries, which last only weeks in these vehicles.

Compulsory vehicle emissions controls in the United States and Europe are driving take-up of the vehicles. ArcActive is in a good position to develop competitive new battery technology for these cars. The crucial component in the new battery is the negative electrodes, and ArcActive plans to make them here and supply them to battery makers.

The market for stop-start batteries is forecast to grow from $5 million last year to nearly $100 million a year by 2020; some estimates put it much higher. The New Zealand technology has world-beating performance at a very low cost, so should be able to compete more than favourably.

In 2012 University of Canterbury sold its equity stake in ArcActive, which allowed ArcActive to take control and drive the company forward, consistent with the University's philosophy of early transfer of ideas to the commercial world.

Considerable work is needed, however, before the battery can be put on the market but the company's goal is to achieve this by 2015.

One big technical challenge remains: scaling up production to make the batteries in volume. Selling the battery to one car maker would make it a very big business, and if the performance gap is sufficient it has the potential to ultimately become the dominant technology and replace the traditional battery. »

Optimisation of stop-start electrodes.

STOPPING THE KIWI SLAUGHTER IN OUR FORESTS

Stoats are estimated to kill up to 40 North Island brown kiwi chicks every day, or around 15,000 each year – approximately half of the annual North Island kiwi birth rate.

«Researchers from Lincoln University's Centre for Wildlife Management and Conservation, led by Professor Charles Eason, in partnership with teams from the Department of Conservation and Connovation Ltd, have produced PredaStop, a product designed to prevent the demise of our national icon.

Registered by Connovation Ltd for the control of stoats and feral cats in 2011, PredaStop contains para aminopropiophenone (PAPP), the first new mammalian toxin to be registered anywhere in the world for over 20 years, and the only one aimed primarily at animal welfare. The development of PAPP, a red blood cell toxin similar in effect to carbon monoxide poisoning, took 10 years from concept to New Zealand registration.

PAPP represents the first of a new class of active pest control ingredients that are relatively humane and have a low risk of bio-accumulation within the environment. It is fast-acting, killing stoats and feral cats in about 60 minutes, compared to hours for most alternatives. PAPP also carries a lower risk of secondary poisoning of non-target species, and has an antidote. Connovation is developing the export market for PredaStop, which is already being exported to Australia where it is in pre-registration trials for controlling foxes and feral cats.

The research partnership is now focussed on developing a re-settable, long-life delivery system, called the Spitfire. The aim is long-term suppression of pest populations with control devices that do not need regular servicing. Spitfire, which applies PAPP to the animal's fur so it is ingested during grooming, is being tested in pen- and field-based trials.

PAPP is just one of the leading-edge wildlife management technologies being produced at the centre. A team led by Dr Helen Blackie, which includes researchers from DoC, Lincoln Ventures Ltd and the Auckland University of Technology, has developed a specially designed electronic surface which detects and recognises various animal characteristics, allowing differentiation between species and subspecies. This has created global interest, as a means of monitoring pest populations and incursions. For example, trials are being conducted by the US Air Force of a device to monitor missile silos, where 90% of false alarms are triggered by rodents.

Manufacturing and distribution partners for international sales are being sought in 2013. »

Hero

Villain

Trans-Tasman marriage of technologies could give rise to

A NEW HIV DRUG

Almost 30 years ago Warren Tate first discovered a previously unknown mechanism in a bacterial gene. This "frame-shifting" mechanism is a curious aberration in gene expression, which occurs during protein synthesis; as Tate discovered, it is crucial to the success of some bacteria and several viruses, including the HIV virus.

«Professor Tate is now at the University of Otago and has spent much of his life investigating exactly how frame-shifting works. More recently, he has sought to develop a compound that can stop it from working, and thus stop the HIV virus from multiplying. His eye is on a new class of drug for HIV, potentially of benefit to millions.

Contrary to popular perception, modern medicine has not solved the problem of HIV – even in the West, where people have access to medication. While a combination of drugs has allowed people to live with HIV, and prevent the disease from developing into AIDs, they must take these drugs for the rest of their lives. The longer people take them, the more likely they are to suffer side effects. There is also some evidence that the HIV virus is developing resistance to some medications. In short, we cannot rely on the available therapies to treat HIV forever.

Together with co-inventor and former PhD student Tony Cardno, Tate developed a "frame-shift assay," a screening tool to test how the frame-shifting mechanism will respond to different compounds. Dr Cardno moved to Melbourne to adapt the assay to the High-Throughput Screening facility at the Walter and Eliza Hall Institute (WEHI). This large-scale testing facility allows researchers to conduct millions of tests to rapidly determine which compounds might modulate a particular biomolecular pathway.

The collaboration between the University of Otago and WEHI was forged by the commercialisation staff of Otago Innovation Ltd. As a result of the partnership, Professor Tate and colleagues have now tested 113,000 compounds on the frame-shift mechanism. Initially, 125 hits were recorded, from which five compounds were pursued further. This is the stage in drug development known as "hit-to-lead optimisation" – finding a compound with significant pharmacological potential, which will need to be modified to improve its efficacy and limit side effects.

Otago Innovation is sourcing finance for this next stage of the process in developing a frame-shifting lead compound that biotech and pharmaceutical companies will be interested in. Only a small percentage of leads make it through clinical trials to market. However, if a frame-shift modulating drug were to succeed, the commercial potential is enormous. For example, Merck and Co introduced Isentress, a new class of therapy for HIV, in 2007. The drug has generated more than $1 billion worth of sales for the company in four years. »

HIV frame-shift.

These are just some examples of the way UCONZ helps to transform the research from the eight New Zealand universities into commercial reality. While many are at the development stage, they all have the potential to make a major contribution to New Zealand's economic transformation.

Find out how the universities' commercialisation entities can assist by contacting your nearest UCONZ office.

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