InSCight

September 2009 | **Faculty of Science Alumni Magazine** Issue 03

Medicinal chemistry
Learning to listen
Creating new languages
Faculty developments

THE UNIVERSITY OF AUCKLAND
FACULTY OF SCIENCE

A word from the Dean

Welcome to the third issue of *InSCIght* magazine and my first as Dean of Science at The University of Auckland.

The news items and feature articles in this issue of *InSCIght* give a feel for some of the faculty's many activities and achievements over the past year, and ample evidence of why its staff and students are held in such high esteem.

You'll also find an update on exciting new developments, including construction at the Leigh Marine Centre and the Institute for Innovation in Biotechnology and the creation of a new 'clinics' entity at Tamaki Campus. I look forward to the many benefits that will accrue for teaching and research and for our relationships with the community and industry.

The faculty plays a pivotal role in science in this country and an increasingly significant role internationally, and I would like to acknowledge the contributions of former Dean Professor Dick Bellamy and Acting Dean Professor Alan Lee to its success.

It is my privilege to lead the faculty and to continue fostering the intellectual freedom and creative environment that the University is known for.

PROFESSOR GRANT GUILFORD
Dean of Science

The University of Auckland

Front cover: The Yock-Allen telescope launched in February this year. See the 'Around the Faculty' story on Page 1.

Around the Faculty

Fossil Bay Vineyard, the University's leased vineyard on Waiheke Island.

Record harvest at Fossil Bay vineyard

This year's harvest at the University's Fossil Bay Vineyard on Waiheke Island was one of its most successful yet. Staff, students, and friends of the vineyard, assisted by a few professional harvesters, picked more than five tonnes of Chardonnay grapes in a single day, transporting them to nearby Cable Bay Vineyard for pressing.

The decision was made to pick the grapes earlier than in previous years, which meant that the sugar content was lower, but the crop "cleaner" (less-diseased). The pressing produced 3,400 litres of juice, which became 15 barrels of wine. The barrels are currently undergoing the secondary malolactic fermentation, which will soften the wine, making it richer and more complex.

Postgraduate wine science students have been making wine under the University's *Ingenio* label since 2006, using grapes from the vineyard, which is the oldest planted in Chardonnay on Waiheke Island.

The 2009 harvest was of exceptional quality and, although it's too early to be sure, the wines are already showing great promise. Senior Tutor Randy Weaver suspects this could be one of the best vintages of the last decade. The final product will be bottled in November and released in February 2010 at the annual *Ingenio* release party.

Chiasma launch

Chiasma celebrated its fifth year of operation and launched its activities for 2009 with an event at the Fale Pasifika on 26 March. The 'Crossover – Chiasma Launch '09' attracted more than 150 students, staff and members of the biotechnology industry. The event was an opportunity to network and discuss opportunities and challenges in the biotechnology sector.

Chiasma is a student-led organisation that promotes innovation in biotechnology, and encourages links between the University and industry. Among other activities it holds an annual showcase introducing students to industry leaders, professional development courses and workshops for students, and industrial site visits. It was launched in 2004 and currently has around 500 student members.

Yock-Allen Telescope

The University of Auckland is part of an international collaboration that installed a new infrared telescope in the heart of the Marlborough wine region (see cover image). The $500,000 BOOTES-3 (Burst Observer and Optical Transient Exploring System) robotic telescope is located in the vineyard of amateur astronomer Bill Allen.

It is looking primarily for gamma ray bursts – huge explosions of electromagnetic radiation that signify the death of a massive star that formed and exploded soon after the big bang, leading to the formation of a black hole. Even before its official launch the telescope had detected such a burst, from an event that happened around 11.5 billion years ago.

The telescope is a joint Spanish and New Zealand project, and part of a network of similar observatories in Spain. It is the largest of its kind in the southern hemisphere and is expected to greatly increase the number of gamma ray bursts that can be detected.

Associate Professor Phil Yock, from the Department of Physics, is one of the key New Zealand researchers involved in the project. His contribution, and that of host Bill Allen, was acknowledged in the naming of the Yock-Allen telescope at its launch in February this year, the International Year of Astronomy.

Materials Accelerator

In April the Foundation for Research Science and Technology announced funding of $9.6 million over four years for a high-technology materials development programme led by The University of Auckland.

The Materials Accelerator aims to catalyse transformation of the New Zealand high tech manufacturing sector by creating partnerships between industry and researchers. It will focus on developing and prototyping high-value multi-material products for export – an undertaking that can be too expensive, time-consuming and risky for individual businesses to contemplate.

The Materials Accelerator is a new model for collaboration that will act as a "one-stop-shop" for industry. By helping New Zealand manufacturers to develop new products and enter new export markets, it is expected that the project will lead to economic growth and more skilled jobs across the manufacturing sector. In fact economic growth is a key outcome being measured, and required in the project.

Funding for the Materials Accelerator was awarded as part of the Government's new High Technology Transformational Research, Science & Technology initiative. The initiative aims to encourage accelerated development of high-technology projects from basic research through to commercial use. The successful proposal was developed by scientists and engineers from seven research organisations in partnership with major industry organisations and innovative businesses.

The Materials Accelerator will be led by Professor Ralph Cooney who will step down from his role as Pro Vice-Chancellor Tamaki to devote his time to the project.

Darwin Day

A free public symposium held at the University on 12 February 2009 celebrated the legacy of Charles Darwin and his theory of evolution. It was one of many events around the world held 200 years after the scientist's birth and almost 150 years after the publication of "On the Origin of Species", his seminal work in evolutionary biology.

The symposium was organised by Professor Allen Rodrigo from the Bioinformatics Institute and the School of Biological Sciences. "Darwin's writings on evolution were revolutionary, igniting a scientific and social powder keg whose reverberations can still be felt today," says Allen. "His legacy has extended beyond biology, beyond natural science and into the humanities and social sciences."

National and international speakers at the event reflected on the impact of Darwin on their research in biology, medicine, history and literature. As well as attracting a general audience, the popular event was attended by biology and science teachers and their students from Auckland secondary schools, and graduate students taking part in a poster competition that celebrated their innovative evolutionary research.

Photo courtesy of Iain MacDonald.

People news

Dick Bellamy

Professor Dick Bellamy, former Dean of Science and prominent virologist, retired in late 2008 after a 50-year association with the University.

Dick first enrolled as a student in 1958 and, after a postdoctoral fellowship in New York, returned to the University as a senior research fellow in 1968. "Virology and cellular and molecular Biology was booming in the United States, but I never really contemplated staying away," he says. "Like many people from this part of the world I returned for family reasons. I had a real empathy for Auckland and the West Coast beaches and wanted my children to grow up in New Zealand."

He began studying reoviruses, a group of animal and human viruses that was of biological interest but not linked with serious disease. In the 1970s he chose to transfer his attention to rotavirus when it was identified as the leading cause of severe infant gastroenteritis. Working with an Australian colleague, he managed to isolate and copy the first rotavirus genes, using the emerging technology of the 'recombinant revolution'. This opened up a multitude of research possibilities, and work on rotaviruses became the focus of the rest of his scientific career.

Dick became Director of the School of Biological Sciences (SBS) in 1990. One of his major tasks was implementing the Review of Biological Sciences that recommended reunifying the departments of Botany, Zoology, Cellular and Molecular Biology, and Biochemistry. "Around the world the fields were being brought back together, in recognition of the universal nature of biological principles and the advantages of inter-disciplinary work" he says. "I strongly believe that for a small country, a cohesive structure is more productive and economic, and it's also more sensible for teaching and research."

In 2001 Dick was appointed Dean of Science, and during his eight years in the role the faculty became the largest in the University. He says he feels satisfied that he managed to refine the faculty's structures to the point they become academically and financially stable. "It's not talked about much, but the real business of teaching, fostering research, and supporting internationally competitive science, can't be done without sound structures in place."

Reflecting on his 50 years with the University, Dick says that it has been a period of great change. "There have been some recent major developments, like construction of the Kate Edgar Information Commons, Computer Science and Business School buildings" he says. "But ultimately though, it's not the bricks and mortar that count, but excellent students and staff, and the University now has both of those."

"I'm very grateful for the support I received as Director and Dean," he says. "It was very much a team effort to keep my laboratory going while I was Director of SBS. As Dean I had the support of many fine Heads of Department. Over my career I served under four Vice-Chancellors and three Registrars, without whose strong support I wouldn't have been able to make much progress."

"Like other academic staff at the University I've also enjoyed a marvellous level of freedom. I've been able to serve on a number of Councils and Company Boards, and work with many voluntary organisations. In the end I think that all parties benefit from academics developing a wide perspective on the relevance and impacts of their academic and other work."

Since his retirement Dick has been able to spend more time on the West Coast. One of his current goals is to make his cabin – built on his family's camping site without electricity – self sufficient with renewable energy.

Alan Lee

Professor Alan Lee completed his term as Acting Dean of Science in early August. He stepped into the role late last year following the retirement of Professor Dick Bellamy, and will continue as Deputy Dean to provide continuity. Friends, colleagues and senior University staff attended a function at Old Government House to thank him for his work.

"Being Acting Dean was an enjoyable experience, and the highlight was the excellent people I worked with. I also had the opportunity to meet many people around the University I hadn't dealt with before," he says.

Alan has had a long association with The University of Auckland. He studied for his Bachelor and Masters degree in the Department of Mathematics, and returned in 1974 as a staff member after gaining his PhD from the University of North Carolina. He has also held visiting academic appointments at Indiana University, the University of North Carolina, McGill University and Southampton University.

Alan was appointed Professor of Statistics in 2005 and was Head of Department from 1997 to 2002 and again from 2007. He also provided cover as Head of Sport and Exercise Science for a time, and says that it was interesting to be associated with a laboratory-based department and that the experience proved invaluable for his role as Acting Dean.

He is looking forward to his return to the Department of Statistics, where he will pick up his research into theoretical aspects of clinical trials and confidentiality problems in official statistics.

2009 Queens Birthday Honours

Two faculty members were recognised in the 2009 Queens Birthday Honours List.

Professor Michael Walker of the School of Biological Sciences became an Officer of the NZ Order of Merit (ONZM) for services to science. Michael is well known for his research into magnetic sense and its use in long-distance navigation by animals. He is also an advocate for Māori in science and is Joint Director of Ngā Pae o te Māramatanga, the National Institute of Research Excellence for Māori Development and Advancement. He serves on the boards of two Crown Research Intitutes and the Council of the Royal Society of New Zealand.

Emeritus Professor George Clark, of the Department of Chemistry, was made a Member of the NZ Order of Merit (MNZM) for services to biochemistry. George is an inorganic chemist whose research examines the physical structure of biological compounds, in particular the interactions between DNA-binding anti-cancer drugs and their targets. He was a member of the New Zealand Environmental Risk Management Authority from 2001 to 2008, where he served as deputy chair, and led high-level moves to manage and regulate chemical products, hazardous substances and new organisms.

Ted Baker

Professor Ted Baker, of the School of Biological Sciences and Maurice Wilkins Centre for Molecular Biodiscovery, was awarded the Health Research Council of New Zealand's Liley Medal at the Science Honours Dinner in Wellington last December. The medal was jointly awarded to Professor Philippa Howden-Chapman of the University of Otago.

Ted won the award for an outstanding contribution to the health and medical sciences in the field of molecular structure. The work focused on *Streptococcus pyogenes* - a bacterium that causes common infections such as sore throats and tonsillitis. Ted investigates the molecular structures of disease-related proteins with the aim of developing new drugs against infection by *S. pyogenes* and related bacteria. His award-winning paper, published in the journal *Science*, provided new insight into the structure of protein assemblies in the hair-like 'pili' on the surface of the bacteria. In receiving the award he acknowledged two of his co-authors Dr HaeJoo Kang of the School of Biological Sciences (see 'student news') and Dr Thomas Proft of the Faculty of Medical and Health Sciences.

Tertiary Teaching Excellence Awards

Lecturers from the Faculty of Science have been recognised in the national Tertiary Teaching Excellence Awards

Professor John Hosking, from the Department of Computer Science was an award recipient in 2008. John believes in action-based learning, and has created multi-disciplinary programmes to help students contextualise their learning in real-world situations. As director of the Centre for Software Innovation he has led development of student internships and a consultancy programme that give students industry experience.

Mr Paul Denny, a senior tutor in Computer Science, received an award in 2009. He was recognised for his popular and effective teaching approach, and for developing a suite of successful teaching resources. Among his achievements he created PeerWise, a web-based tool that allows students to develop, share, answer, and critique questions around their studies. PeerWise has been adopted by universities around the world and is used across a range of disciplines.

Dr Rachel Fewster, a senior lecturer in the Department of Statistics was also honoured in the 2009 awards. She received the prize in recognition of her innovative, enthusiastic, and highly successful teaching methods. She is widely respected by students and peers for her ability to make statistics accessible and understood by a wide range of people, using memorable real-world examples.

The Tertiary Teaching Excellence Awards recognise and encourage excellence in tertiary teaching, and reward teaching practices that are student-focused and committed to promoting effective learning. Just nine tertiary teachers nationwide receive an award each year.

Garth Cooper

Professor Garth Cooper has been conferred the title of Visiting Professor in Drug Discovery and Therapeutics at Oxford University for three years. Garth is a Professor in Biochemistry and Clinical Biochemistry with joint appointments in the School of Biological Sciences, and the Department of Medicine. He leads the Proteomics & Biomedicine Research group and is a Principal Investigator at the Maurice Wilkins Centre for Molecular Biodiscovery.

Garth has had a long association with Oxford University. He discovered the hormone amylin while completing his doctoral studies there, and went on to develop amylin-replacement therapy for diabetes. He has served on committees to recommend the award of the Oxford Nuffield Medical Fellowships, and has visited the University many times over the years to present guest lectures.

Kathy Campbell

Associate Professor Kathy Campbell of the School of Geography, Geology and Environmental Sciences has been named the Geological Society of New Zealand's (GSNZ) 2009 Hocstetter Lecturer

The annual award, named in honour of Austrian geologist Ferdinand von Hochstetter, goes to an outstanding New Zealand earth scientist undertaking world-class research. Recipients give lectures at GSNZ branches around the country on recently completed and largely unpublished findings.

Kathy's research addresses the interactions between ancient organisms and their environments. The Hocstetter Lectures she is giving this year are titled 'Extreme Life: Terrestrial hot-springs and the search for early life on Earth (and Mars?)', and 'The Paleoenvironmental and Evolutionary Significance of Hydrocarbon Seeps'.

Ross Ihaka

Associate Professor Ross Ihaka of the Department of Statistics was awarded the 2008 Pickering Medal by the Royal Society of New Zealand. The medal is awarded annually to a person who, while in New Zealand, has performed innovative work that has had significant influence and recognition nationally or internationally or has led to significant commercial success.

Ross received his award for his software package 'R', described by the Society as revolutionising the practice of statistics with its unique open-source, extensible model, and putting New Zealand on the map in the world of statistical computing. Ross developed R in collaboration with University colleague Robert Gentleman (now at the Fred Hutchinson Cancer Research Center in Seattle, Washington). The package is now being used and adapted by academics and industry around the world, with almost 2,000 versions online. See the research feature article on page 10.

Student news

Haruna Suzuki-Kerr

Haruna Suzuki-Kerr, a final-year PhD student in the Departments of Optometry & Vision Science and Physiology at The University of Auckland, won the Student Scientific Poster Competition at the NZBIO 2009 conference this March.

Haruna's doctoral research, supervised by the Head of Department of Optometry & Vision Science, Professor Paul Donaldson investigates how ionic balance is lost in the diabetic lens leading to cataract formation.

Her winning conference poster presented recent findings from her research. The competition was judged based on the ability of the poster to be understood by scientists and non-scientists and to explain the relevance of the work, as well as its scientific merit.

Daniel Pitman

First year student Daniel Pitman was awarded the Peter Spratt Memorial Scholarship, which provides full tuition to encourage Māori and Pacific students to study for a Bachelor of Science at the University. Daniel, who is of Ngāpuhi descent, came to the University from Whangarei Boy's High School, where he studied sciences, mathematics, and classical studies. He chose to focus on biology and ecology at university in order to pursue his passion for marine biology. His scholarship was funded through donations by friends and family of the late scientist Peter Spratt, the Royal Society of New Zealand and the wider science community.

Kar Mun Chooi

Kar Mun Chooi of the School of Biological Sciences was one of seven PhD students at The University of Auckland who received a Top Achiever Doctoral Scholarship from the Tertiary Education Commission this March. The scholarship provides an annual stipend of $25,000 for up to three years plus course fees and conference funding. A total of 41 scholarships were awarded in the latest round.

Kar Mun's research focuses on Grapevine leafroll-associated virus-3 (GLRaV-3), a serious disease affecting New Zealand vineyards that is estimated to cost millions of dollars due to reduced grape quality and yield. She is investigating the variability of the virus, and the implications for diagnosis of the disease and how infectious it is. Her research is supervised by Associate Professor Mike Pearson, and is co-funded by Corbans Viticulture.

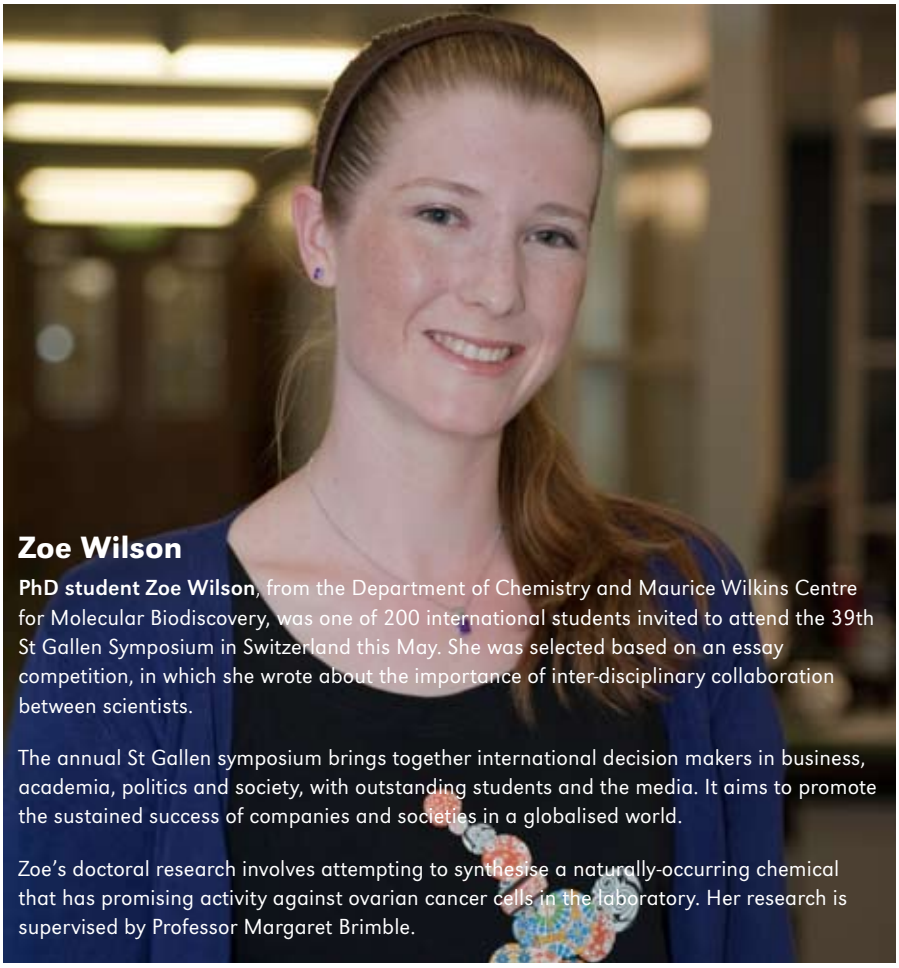
HaeJoo Kang

Dr HaeJoo Kang, of the School of Biological Sciences and Maurice Wilkins Centre for Molecular Biodiscovery, was one of only five students to receive the Vice-Chancellors prize for best doctoral thesis at The University of Auckland in 2008.

Her doctoral research looked at proteins that are involved in the assembly of hair-like structures called pili on the surface of *Streptococcus pyogenes*, a bacterium that causes common infections such as tonsillitis and also severe illnesses in humans. Her major work was to determine the three-dimensional structure of the protein that forms pili, find out how the proteins link to each other to form pili and discover a previously unknown 'molecular glue' that stabilises the protein giving pili their strength.

HaeJoo's thesis, 'Characterisation of *Streptococcus pyogenes* pili: structure, stability and assembly', was supervised by Professor Ted Baker.

The Vice-Chancellors prizes are awarded based on the demonstrable significance of a thesis in its field, the originality and excellence of the research, exceptional academic and intellectual achievement, and timely completion.



Zoe Wilson

PhD student Zoe Wilson, from the Department of Chemistry and Maurice Wilkins Centre for Molecular Biodiscovery, was one of 200 international students invited to attend the 39th St Gallen Symposium in Switzerland this May. She was selected based on an essay competition, in which she wrote about the importance of inter-disciplinary collaboration between scientists.

The annual St Gallen symposium brings together international decision makers in business, academia, politics and society, with outstanding students and the media. It aims to promote the sustained success of companies and societies in a globalised world.

Zoe's doctoral research involves attempting to synthesise a naturally-occurring chemical that has promising activity against ovarian cancer cells in the laboratory. Her research is supervised by Professor Margaret Brimble.

Medicinal chemistry

Most drugs on the market are based on natural compounds. The active chemical in aspirin was originally found in willow bark, and penicillin was created by a fungus. Now, science is going back to basics and looking to the natural world for new drugs.

Chemicals extracted from the natural world provide valuable compounds for the development of new drugs in the pharmaceutical industry. These compounds have highly complex structures that are difficult to synthesise in a laboratory, but because they are only available naturally in minute quantities, there is a need to develop synthetic ways to prepare larger quantities. Medicinal and organic chemists are building expertise in synthesising the chemical structures seen in nature, and can also look at ways of changing the structure to enhance desirable properties.

Over 60% of existing pharmaceuticals are based on natural products. In recent years, the development of high throughput screening and drug design technologies have allowed pharmaceutical companies to move away from natural product searches, dismissing them as too complex and difficult to reproduce. However, they are beginning to resume their search for new drug leads in nature as the number of successful drugs from these technologies is lower than anticipated.

Where to look

Many of these complex compounds are secondary metabolites, produced by organisms living in extreme conditions or as a defence mechanism. Natural compounds of potential interest as pharmaceuticals have been found in fish, fungi, bacteria and plants.

The Medicinal Chemistry team, headed by Professor Margaret Brimble, are looking at a number of these complex natural compounds and how to synthesise them for use in drug development. One compound they are working to reproduce synthetically is berkelic acid, a chemical that exhibits anticancer properties. Berkelic acid is a secondary metabolite, produced by microorganisms living in Berkeley Pit Lake in Montana, USA, the site of an abandoned copper mine with highly acidic water.

Algal blooms in New Zealand's coastal waters are another source of potentially useful compounds. Algae, when ingested by shellfish, produce a toxin that is potentially harmful to humans and wildlife when consumed, resulting in symptoms ranging from diarrhoea to extreme cardiovascular and neurotoxic effects. However, some of these effects are due to the movement of calcium and other ions in cells, and these properties can be manipulated to reverse similar events that take place in certain clinical conditions, such as pain, epilepsy, hypertension, cancer and stroke.

Another family of shellfish toxins (the pectenotoxins) have been shown to exhibit the ability to target and kill cancer cells when studied in the laboratory. Through investigation, manipulation and optimisation of these properties, Professor Brimble's group hopes to develop new drugs that can be used against ovarian, renal, lung, colon, melanoma and breast cancers.

Other research being undertaken by the group includes the synthesis of a toxin from the plant *Delphinium brownie*, which shows activity against Alzheimer's and other neurodegenerative diseases. The research group have also synthesised a family of compounds isolated from fungi that are active against *Helicobacter pylori*, a bacterium that causes peptic ulcers and gastritis.

How to create a natural compound

It can take several years to plan and execute the correct 20+ chemical reactions needed to create a natural compound, but once the strategy is found the chemical can be synthesised in large amounts for further research. In addition, the compound's chemical structure can be manipulated to produce numerous related compounds, which may be more suitable as a drug, for example with increased potency or reduced side effects.

Identification of compounds of interest comes from constant scanning of the scientific literature and attendance at international scientific conferences. Once a compound has been identified as having potential use as a drug, the Medicinal Chemistry team will take the structure and design a method for its synthetic construction. The complexity of the reactions required are normally ideal for postgraduate teaching purposes, with the secondary benefit of potentially having use as a treatment for disease.

The chemistry involved in synthesising the molecule is the first step in developing the drug. By working with biologists, the compound can be tested for its suitability as a drug. The chemists can then selectively manipulate the synthesis process, creating analogues and other related molecules, until testing identifies the compound with maximised desirable, and minimal undesirable, properties for a drug.

Family (Department):
Chemistry

Genus (Group):
Medicinal Chemistry

Species (Principal Investigator):
Professor Margaret Brimble

By Emma Timewell

Learning to listen

In classrooms across Auckland, students are wearing hearing devices while their teachers speak into microphones, as part of research to help children with brains that don't process sound properly.

About 5% of children have an auditory processing disorder (APD), where sound is not processed in the usual way by the brain. The disorder can be associated with a family history of learning, reading or listening problems or brought about early in life through ear infections or differences in brain development. Children with APD typically have normal levels of intelligence and normal hearing sensitivity, but the inability of their brain to process speech in noise can lead to children falling behind in class or, in extreme cases, severe behavioural problems.

Classrooms, in particular prefabricated classrooms, are not good acoustic environments for children with APD. Speech can echo off hard surfaces, and classrooms with poor noise attenuation admit high levels of external noise. Children with APD may have to rely on their classmates to help them understand their lessons, and in some cases may give up listening completely if they cannot follow the teacher, which for some children ultimately leads to behaviour issues.

The Speech Science team, based at the University's Tamaki Campus and led by Associate Professor Suzanne Purdy, is looking at a variety of different ways to help children with APD overcome their problems in the classroom, such as intensive homework and clinical programmes and the use of FM technology.

Using FM technology

One of the key methods the speech scientists are investigating is the use of personal hearing devices in the classroom. This simple technique involves the teacher wearing a microphone that transmits their voice via an FM radio signal to small receivers on the student's ears. The device decreases the level of external noise relative to the teacher's voice, and transmits their voice clearly.

The Speech Science team has completed several trials showing that the FM technology is of benefit in the classroom. One study at a low decile school showed that using the device for just six weeks could increase children's attention in class and improve their listening ability in difficult situations. The research involved 46 children aged six to 11 years with a reading delay of at least two years. Children who wore the FM device showed improved classroom performance whereas no change was seen in children who did not use the device. A questionnaire revealed that the children and most teachers were very positive about the device, and following completion of the study the school decided to raise money to introduce sound-field systems in all of its classrooms.

Another study of 29 children with APD showed that use of the device for six months resulted in significant changes in evoked brain potentials (small electrical signals generated by the brain when sound is processed) and other improvements in the children's "listening brain". Again, after the study was completed many of the participating families chose to purchase the FM devices.

Results of another trial suggest that children who use the FM technology in combination with other methods to overcome APD can achieve even greater benefit. This study of more than 90 children revealed that many had language and reading disorders as well as APD. Children were asked to use the FM device in combination with either auditory training (practising to discriminate between sounds and recognising different speech sounds) or language therapy (tasks to improve the ability to understand and construct spoken and written language).

Children who used either combination of approaches showed significantimprovements in terms of language processing, auditory pattern recognition, and evoked brain potentials.

Looking to the future

Children with APD typically do not receive treatment from Ministry of Education Special Education Services unless they also exhibit severe learning and behavioural problems in the classroom.

"There is a strong link between auditory, reading and language difficulties, but by the time most children are diagnosed (usually after the age of seven) it may be impossible to fully reverse the impact," says Associate Professor Purdy. "A screening programme, such as that trialled in Victoria, could identify children with APD at school entry age (or perhaps earlier) and allow interventions to be put in place. Such early intervention could enhance school progress, self esteem, and classroom behaviour."

Research into the neurological causes of APD may allow scientists to develop ways to overcome the disorder. By measuring the brain's response to specific sounds and background noise, the parts of the brain affected by APD are being isolated. One goal of this research is to develop treatments that boost brain function in these areas, and improve auditory and language processing ability, starting from a young age.

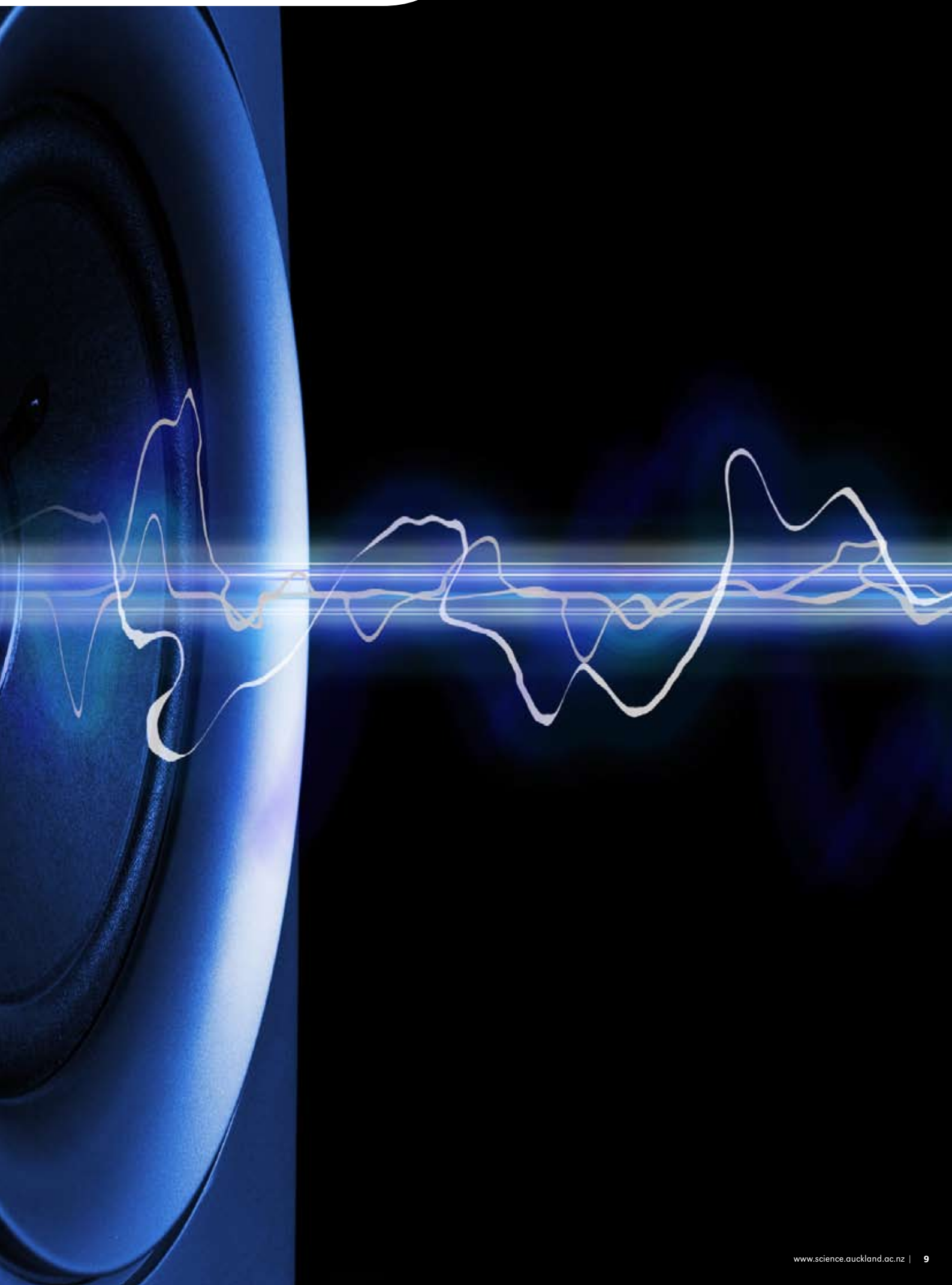
More studies into the best interventions for APD, including the research currently underway in the Speech Science group, will eventually identify the best way to help children and adults with APD to reach their full potential. Studies conducted by the Speech Science group have shown significant improvements in children's auditory function with treatment. More research is needed to ensure these interventions have an impact that will last throughout the child's life.

Family (Department):
Psychology

Genus (Group):
Speech Science

Species (Principal Investigator):
Associate Professor Suzanne Purdy

The Speech Science group has received funding and support from the Deafness Research Foundation of New Zealand and Phonak Group.



Creating new languages

More than a decade after its birth at the Department of Statistics, the computer language 'R' has truly come of age. The free software, designed to analyse numerical data and present it in graphical form, is now being used by researchers and industry on a global scale.

Early this year the *New York Times** reported that data analysts from some of the world's best-known companies, such as Google, Shell and Pfizer, are using R and adapting it for their own purposes. "R is really important to the point that it's hard to overvalue" said a Google research scientist. "It allows statisticians to do very intricate and complicated analyses without knowing the blood and guts of computing systems."

This ease of use for people who don't have a programming background is one of the major attractions of R. Another is the ability to modify the language for specific uses. Over the years, hundreds of people have contributed to extending the software, creating add-on packages for specific purposes – such as forestry, seismology, and bioinformatics – and there are now almost 2,000 such packages online.

R was initially created by Ross Ihaka and Robert Gentleman at The University of Auckland in the early 1990s, as an experimental platform to explore their ideas. Later in the decade, they began using it as part of their undergraduate teaching, to test the system in practice. Word of R spread quickly in academic circles and colleagues from around the world expressed their interest. As a result the researchers released R under a free software licence, initiating an international collaboration that now includes many of the top researchers in the field.

Ross, who has since become an Associate Professor and won the Royal Society of New Zealand's Pickering Medal for his work, is now starting the creative process again and is building on the lessons learned with R. Working with PhD student Brendan McArdle and collaborator Associate Professor Duncan Temple Lang at the University of California, Davis, he aims to create a new language capable of handling larger and more complex datasets.

When R was created in the early 1990s, computers were much more limited than today. A typical computer had around 128 kilobytes of RAM (working memory) – many thousands of times smaller than a low-end machine today – and could handle datasets in the tens of kilobytes. The subsequent increase in computing power means it's now possible for a standard computer to handle datasets of a gigabyte (one million kilobytes).

The problem though, is that the amount of data collected by researchers has grown even faster than the power of their computers, so the analytical techniques that worked well in the past no longer do today. Scientists now deal with datasets of a petabyte (one million gigabytes), such as those generated by the Large Hadron Collider or the Human Genome Project. Commercial organisations also routinely collect massive amounts of data.

For their new language the researchers' goal – to start with at least – is to target more moderate datasets around a thousand times larger than those managed by R, with computational performance hundreds of times faster. An example might be the genomic dataset for New Zealand livestock improvement, rather than the massive dataset generated by the Human Genome Project. "It's quite possible, though, that some of the very largest datasets may be collapsed and analysed using the language," says Ross. If the history of R is anything to go by, extending a language beyond its initial target is readily achieved.

According to Ross, creating a new language is, to a certain extent, an exercise in crystal ball-gazing. Assuming that it follows a life cycle similar to R, the new language will need to cope with computer systems and analytical requirements ten years from now.

A central part of the process is considering the strengths and limitations of existing languages and how their best features may be combined. "There's no such thing as a truly novel computer language," he says, "Each one builds on what has gone before." R, for example, used ideas from the 'S' language developed at Bell Laboratories and popular in the statistical computing community at the time, and 'Scheme' from the Massachusetts Institute of Technology, a language that became familiar to Ross in his time as a research associate there.

For their new language the researchers want to combine the flexibility of R with the performance and longevity of 'Common Lisp'. Common Lisp, like Scheme, is a dialect of 'Lisp', a family of languages first developed in 1958 and a proven survivor. It is also the principal language of artificial intelligence (AI), raising the intriguing possibility of cross-fertilisation with the AI community and even, perhaps, the development of intelligent analytical software.

How the language may be delivered is a question for the future, but R illustrated the benefits of a free software approach. "In the initial stages of developing R, we considered using a commercial model but felt that this was likely inhibit rather than promote development," says Ross. "We saw the establishment of the world-wide-web and rise of the free-software movement as providing a much more interesting and productive direction to proceed in."

"Releasing the code in this way provides access to a larger group of collaborators than would otherwise be possible, tapping into the wide range of expertise required to create a fully featured language."

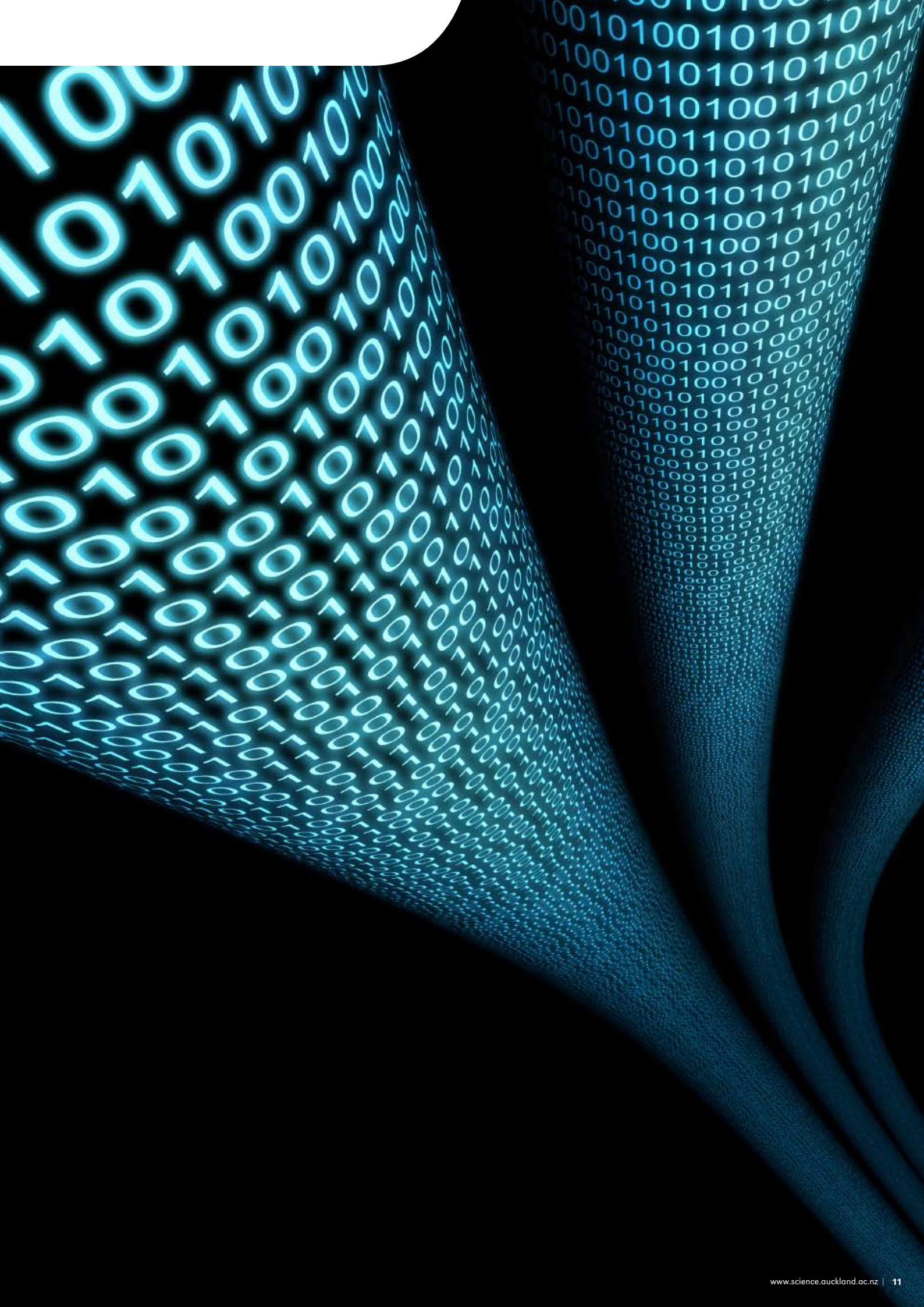
The researchers' academic focus means they're primarily interested in the ideas and possibilities of language creation, rather than a specific product. But based on the global success of R, and its adaptation by others into diverse products, there will undoubtedly be a huge amount of interest in their work.

Family (Department):
Statistics

Genus (Group):
Statistical Computing

Species (Principal Investigator):
Associate Professor Ross Ihaka

**Ashlee Vance, 'Data Analysts Captivated by R's Power', New York Times, 6 January 2009, available at www.nytimes.com/2009/01/07/technology/business-computing/07program.html?_r=2*



Faculty developments

Three major projects are underway at the faculty that are designed to improve teaching and research, as well as strengthening connections with the community and industry. They include the creation of the new University of Auckland Clinics at Tamaki entity, an upgrade of facilities at the Leigh Marine Centre, and construction of a new research annex to house the Institute for Innovation in Biotechnology.

Tamaki Clinics

The University offers a range of clinical services to staff, students, and the wider community, such as a hearing and tinnitus clinic, cardiac rehabilitation clinic, optometry clinic and speech language therapy clinic. As well as providing necessary clinical teaching for our students, the clinics offer services based on the latest research and techniques, and are an important link with the local community.

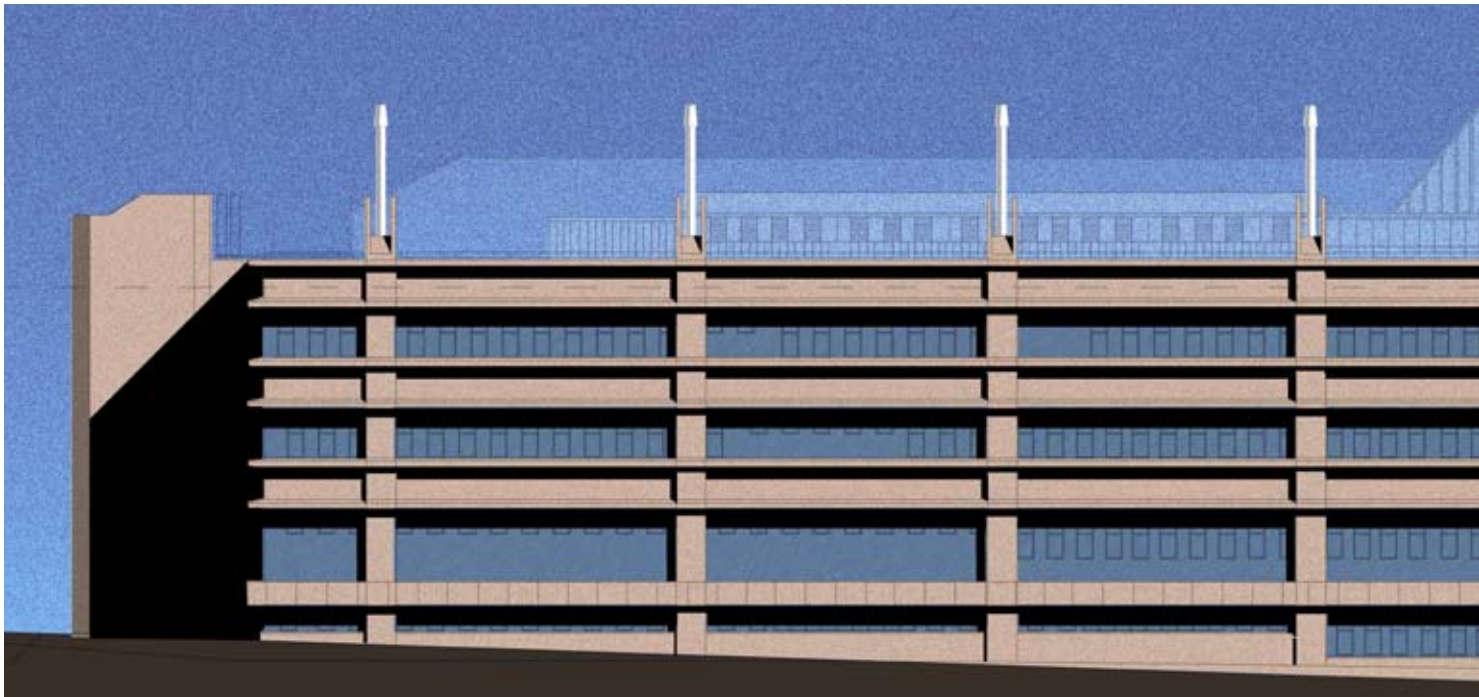
The clinics in the Departments of Audiology, Optometry, Psychology, and Sport and Exercise Science have, until now, operated as separate entities within the Faculties of Science and Medical and Health Sciences.

Vice-Chancellor Professor Stuart McCutcheon has now approved the creation of The University of Auckland Clinics at Tamaki. The new arrangement will see the clinics operating under a shared services model, whereby they are managed and function as a single unit.

The goal is to establish a high-quality clinical environment that will best support University teaching and research. Clinic staff will work closely with the departments involved to ensure that students have a professional, sustainable training environment.

It is anticipated that as a single entity the clinics will be well placed to foster research and build collaborations with Government and industry. A further aim is to develop and broaden the services offered to the community, and to build awareness of the University as a valued clinical provider.

The decision to create The University of Auckland Clinics was made after an extensive consultation and review process. A Governance Board has been established and Business Operations Manager Tracey Reason has been in place since July.



Architect's sketch of the new extension (right) to the School of Biological Sciences' Thomas Building (left) that will house the Institute for Innovation in Biotechnology. Image courtesy of Stephenson & Turner.

Leigh Marine Laboratory Upgrade

An upgrade of the University's Leigh Marine Centre is well underway and due for completion late next year. It will improve teaching and research facilities and, for the first time, allow the wider public to access the Centre's expertise.

Work began in early April with construction of a student accommodation block and workshop for the Centre's field staff, replacing old facilities that were in need of refurbishment.

The next phase will see construction of a new research building, with specialised laboratories and offices that will provide a modern, purpose built research space.

A new Interpretive Centre will then be built, giving the 350,000 people who visit the Goat Island Marine Reserve each year the opportunity to learn more about the marine environment. The Interpretive Centre will have dedicated staff and feature electronic and static displays. It will allow the Leigh Marine Centre to share its knowledge with the public, and promote growing awareness of the importance of our oceans.

The upgrade will also help with intensification of planting in the mainland 'island' established in 2006 with funding provided by Auckland Regional Council and Rodney District Council.

Goat Island Marine Reserve

Institute for Innovation in Biotechnology

In late July, construction began on an extension to the School of Biological Sciences that will house the Institute for Innovation in Biotechnology (IIB).

The IIB - the first biotechnology incubator in New Zealand - is already up and running in existing University facilities. It currently houses five biotechnology companies and has seven industry partners.

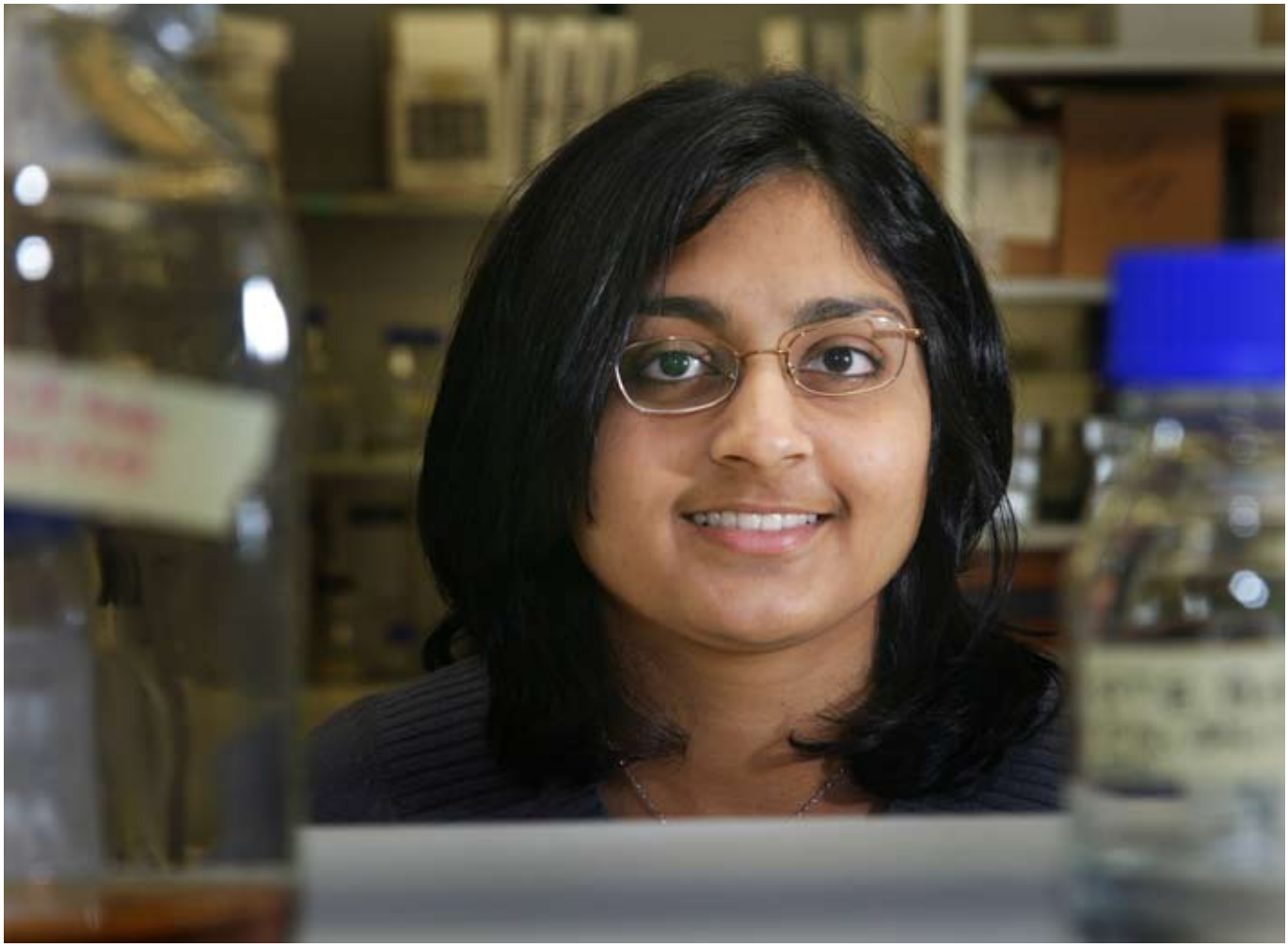
Established through the Government's Partnerships for Excellence programme, and with the assistance of $10 in Government funding, the IIB is intended to develop the biotechnology industry in New Zealand. It brings together academics and industry in the same space in order to share knowledge and facilities.

The Auckland City Council has recognised the bio-incubator as an important component in its strategy to grow bio-industry, and His Worship the Mayor, the Honourable John Banks, was on hand to turn the first sod on the construction site.

The new, purpose-built annex, designed by Stephenson & Turner, will expand the space available to the IIB and provide it with a permanent home. Due to be completed in early 2011, it will accommodate up to 500 researchers and graduate students, and around a dozen biotechnology companies.

Increasing its research space means that the IIB can provide more companies with the facilities and infrastructure they need to advance their research, and by sharing these costs, lower the entry barriers to the industry. Growing the IIB will also encourage the development of New Zealand's biotechnology workforce, by giving staff and students learning and employment opportunities, and allowing small companies to build their expertise.

Alumni news



Jessica Rodrigues

Jessica Rodrigues

Bachelor of Technology Honours graduate Jessica Rodrigues was one of only 40 recipients of the 2009 International Fulbright Science and Technology Award. The awards are the United States Government's most prestigious and valuable education scholarships, awarded to promising graduates in science, technology or engineering.

Jessica's honours research at the School of Biological Sciences, supervised by Dr Matthew Goddard, examined the variability of wild and commercial yeasts and their ability to grow under different environmental conditions. She demonstrated huge variability both within and between species – which came from diverse sources ranging from pathogenic isolates to commercial wine strains – and found that some were capable of growth on unusual carbon substrates.

Her scholarship, worth NZ$350,000, allows her to study at PhD level at a university in the United States. She will leave New Zealand in August this year to begin a five-year PhD programme in plant genetics at the University of California, Berkeley.

Dr John Buchanan

Alumnus Dr John Buchanan was named a World Class New Zealander at a ceremony in Auckland in April. John was one of seven people identified by Kea New Zealand and New Zealand Trade and Enterprise as "tall poppies" for helping New Zealand companies and industries to succeed on the international stage. He won the "Finance, Investment and Business Services" category of the awards.

John, who is now based in Britain, graduated with a PhD in Chemistry from The University of Auckland. He later studied at Oxford University, Wolfson College and Harvard Business School. He had a 33-year career with BP, retiring from the role of Group Chief Financial Officer in 2002.

He is currently Chairman of the medical devices group Smith & Nephew and the UK International Chamber of Commerce, Deputy Chair of the global board of Vodafone, and Non-Executive Director of the global boards of AstraZeneca and BHPBilliton. He also chairs the UK Friends of The University of Auckland.

Rachel Shaw

Rachel Shaw, a graduate of the School of Biological Sciences, was one of two University of Auckland students named inaugural winners of the Rutherford Scholarship at a celebration at the New Zealand High Commission in London late last year.

The scholarships to study at doctoral level at the University of Cambridge were awarded on the basis of exceptional academic ability.

Rachel completed her Bachelor of Science Honours in 2008 after graduating with conjoint Bachelor of Science and Arts degrees. Her PhD research at Cambridge will examine the psychology of 'mental time travel' in the Western Scrub Jay, as well as studying consciousness and memory.

The Rutherford Foundation is administered by the Royal Society of New Zealand, with additional support for the doctoral scholarships from Cambridge Commonwealth Trust.

Matthew Buchanan and Karl von Randow of Cactuslab.

Alumni profile

Name: **Karl von Randow**

Job: **Director, Cactuslab**

Class of: **2000 (Conjoint BSc, BComm)**
2001 (BSc Hons)

Studied: **Computer Science and Commerce**

Lives: **Auckland**

I co-founded the web development company Cactuslab in 2001, shortly after graduating with my BSc Honours. I had already been working for several years and gained valuable experience at WebMedia, a New Zealand company that was part of the dotcom boom.

When WebMedia closed it was a logical decision to set up my own business with colleague and fellow computer science graduate Matthew Buchanan. We already knew that we worked well together and had complementary skills covering the full range of web design and development roles. My main focus is on the technical side of things, while Matt is the expert in design, and combining these skills has been a key factor in our success. We now have three people working for us, two of whom are also graduates of the University.

Studying computer science at University was like a dream come true for me. I had been programming since I was about ten years old and I was excited to discover that I could turn this into formal study. My high school careers advisor suggested that I take commerce papers as well, which turned out to be good advice for a future entrepreneur.

Taking a conjoint degree meant that I had to be really focused in my choice of science papers and I filled most of my allocation with computer science subjects. I also studied mathematics which offered a huge amount of cross-over. I moulded my commerce degree to complement what I was learning in computer science, for instance choosing information systems papers.

Everything that I do uses the knowledge I gained at university. While I could have taught myself computer programming skills, formal study at university gave me a lot more insight into what I'm doing as well as providing knowledge and skills I may not have thought to seek out.

My most important memories from university are of my friends from computer science and maths. The departments are small and closely connected, and the students get to know each other well. People I went through university with remain friends and are now working in high profile companies around the world.

Community links

Incredible Science goes live

In the build up to this year's Incredible Science Day on Monday 6 July, the faculty launched the new website www.incrediblescience.co.nz

Incredible Science Day is a free annual festival hosted by the faculty that introduces primary and intermediate-aged children and their families to the fun and excitement of science. The new website makes highlights from the event available throughout the year, and for people outside the Auckland region.

The website was launched with a series of fun and informative videos on subjects such as light metals, the human body, being a real-life crime scene investigator, making green cheese, and the theory behind origami. It also gives instructions for simple experiments that can be done at home, such as growing crystals and investigating the difference between solid and liquid.

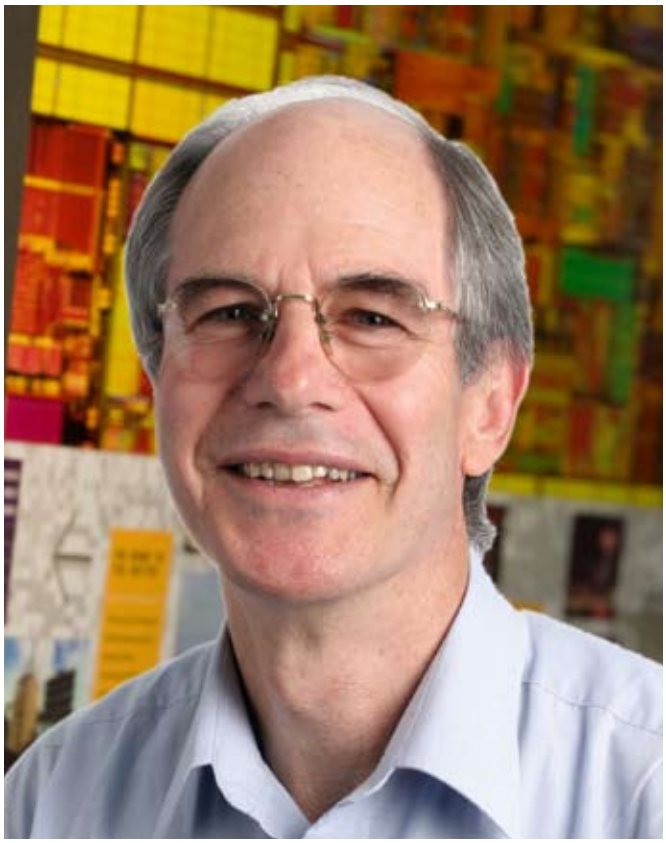
Coming soon are more videos from this year's event, with Matt Gibb from TVNZ's popular children's programme Studio 2 presenting clips on glassblowing, 3D face scanning, animal skeletons, creating miniature tornados, and how to make DNA and slime.

Incredible Science Day was a huge success again this year. Thousands of people attended, filling venues around the University and making the most of the shows and demonstrations by scientists, interactive activities, and the chance to earn Mini Degree.

Winners of the Year 5 and 6 category of SciQuiz, Arahoe Primary School

The annual Science Quiz was a popular part of the day, with teams of primary and intermediate students racing against their peers and the clock to test their science skills. The competition went down to the wire, with teams having to choose whether to risk their score by passing a question, or run down their time trying to solve a problem.

After a series of heats, teams from Belmont Intermediate School and Arahoe School won the final event and students from ACG Parnell College, Warkworth Primary School, and Kaurilands School took out the second and third places in each age group.



Peter Gibbons

The inaugural Peter Gibbons Memorial Lecture Series, sharing developments in computer science research with the wider public, was held at the Department of Computer Science from May-June this year. Each of the lectures was given to a full house and recordings have been made available online.

The lecture series will be held annually in memory of Associate Professor Peter Gibbons, a long-standing member of the faculty. "The lecture series seems a fitting long-term memorial for Peter who was a pioneer of computer science in this country," says Head of Department Robert Amor. "Peter was a founding member of our Department. He inspired many others into research, often drawn from the thousands of students he taught."

Peter came to the University in 1980 as a senior lecturer in computer science and the first external appointment in the newly-formed department. He had studied in New Zealand and Canada, receiving the first computer science degree in the country – an MSc with distinction awarded by Massey University in 1972. He became an Associate Professor in 1993 and remained with the Department of Computer Science until his retirement in 2004, continuing as an honorary appointment after this time. His main research area was combinatorics, at the boundary between mathematics and computer science.

"The theme of the inaugural lecture series - Computing: From Theory to Practice –epitomises Peter's approach to research," says Robert. The lectures addressed the translation of computer science theory into practice in a variety of fields: combinatorics, software engineering, bioinformatics and education. The topics were chosen to reflect the areas in which Peter made contributions and to highlight cooperation across academic disciplines, a particular feature of his research.

The 2010 lecture series – called 'Facing the Data Mountain' – will look at how we can make sense of the large quantities of information that are now available online.

A fund has been established to ensure the permanence of the series. For more information visit www.cs.auckland.ac.nz/research/GibbonsLectures/

Annual Appeal

This month science alumni will receive their annual alumni appeal requesting tax-deductible donations for the Science Student Support Fund. With over 7,000 students from diverse backgrounds, the faculty is educating an important group of tomorrow's scientists and leaders.

The tradition of giving back to one's alma mater may be relatively young in New Zealand, but is becoming increasingly important. Changes in government funding, enrolment levels and tuition fees in recent years have made alumni support even more imperative to help talented students with limited financial means further their education.

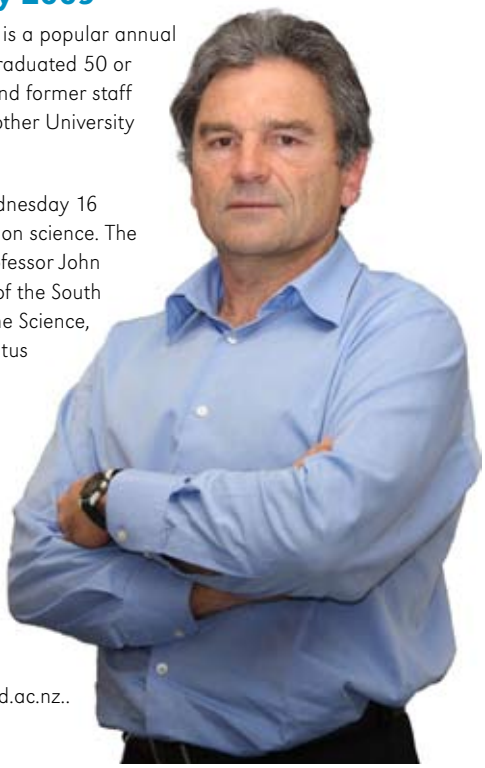
For more information on how you can help science students, contact Anita McKegg on 09 373 7599 ext 81848 or a.mckegg@auckland.ac.nz.

The University of Auckland Golden Graduates Day 2009

Golden Graduates Day is a popular annual event for alumni who graduated 50 or more years ago, staff and former staff born before 1940 and other University supporters.

This year's even on Wednesday 16 September had a focus on science. The alumni speaker was Professor John Montgomery, Director of the South Pacific Centre for Marine Science, and former Dean Emeritus Professor Dick Bellamy shared reminiscences.

If you would like to receive information about the 2010 Golden Graduates Day or other alumni events contact Melanie Middleditch on 09 373 7599 ext 83566 or alumni-events@auckland.ac.nz..



Professor John Montgomery

Contact us!

If you are a Faculty of Science graduate and have a story to tell about your experiences or achievements, or would simply like to re-establish contact, please get in touch.

We also welcome feedback and suggestions about this publication. If there's something you would like to see in the next issue, don't hesitate to contact us.

InSCIght is available electronically – please email us if you would prefer to receive the magazine in this format.

Contact:
Pauline Curtis:
p.curtis@auckland.ac.nz

or Rebekah Hotchin:
r.hotchin@auckland.ac.nz

Contact
Faculty of Science
The University of Auckland
Private Bag 92019
Auckland 1142
New Zealand

0800 61 62 63
Phone: +64 9 373 7599 ext 87020
Txt: 5533
Fax: +64 9 373 7431
Email: scifac@auckland.ac.nz
Web: www.science.auckland.ac.nz