

MAURICE WILKINS CENTRE

New Zealand's Centre of Research Excellence
targeting human disease

Annual Report 2012

Maurice Wilkins Centre

The Maurice Wilkins Centre is New Zealand's Centre of Research Excellence targeting major human diseases. It focuses on cancer, diabetes and infectious disease.

New Zealand has an outstanding reputation for biomedical research. The Centre aims to harness this expertise to develop drugs and vaccines, tools for early diagnosis and prevention, and new models of disease. In addition to translational research that directly targets human disease, the Maurice Wilkins Centre encourages innovative fundamental science that has the potential for high impact on human health.

The Maurice Wilkins Centre is a multidisciplinary network that brings together leading biologists, chemists and computer scientists. By the end of 2012 it comprised 119 investigators throughout the country, and over 131 early-career affiliates, linking researchers from six Universities, three Crown Research Institutes and two private research institutes. These investigators represent most of New Zealand's expertise in discovering new drugs, vaccines and diagnostic tools that proceed to clinical trials.

As the national hub for molecular biodiscovery the Centre provides a point of contact for a broad range of local scientific expertise. It cultivates collaborations with international researchers and research institutions and also engages with industry and the medical profession. It is committed to building the economy, and building scale in the New Zealand biomedical sector.

For more information see www.mauricewilkinscentre.org

For more information on New Zealand Centres of Research Excellence see www.acore.ac.nz





MAURICE WILKINS CENTRE FOR MOLECULAR BIODISCOVERY

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Director's Report



Our Annual Report begins in brilliant fashion – celebrating the excellence of our people. The annual New Zealand Science Honours Dinner recognises outstanding achievements in science, and as described on page 7, we are delighted that this year Professor Margaret Brimble, Professor John Fraser, Professor David Williams, and Dr Richard Furneaux all received major awards from our national academy, the Royal Society of New Zealand. Professor Brimble won New Zealand's highest science

honour, the Rutherford Medal, joining three other principal investigators from the Centre in the panoply of Rutherford Medallists. A major part of the Maurice Wilkins Centre's mission is to bring together New Zealand's most talented scientists to fight human disease, and these awards underscore the great depth of our talent pool.

Other highlights in this report point to the maturity of the Centre, and its ability to tackle major challenges and opportunities on behalf of the nation. At a scientific level, the Maurice Wilkins Centre is co-ordinating new molecular approaches to understanding and preventing rheumatic fever, a disease that still plagues New Zealand, for reasons that are poorly understood (page 11). At a cultural level, the Centre has taken a lead in developing the scientific relationship between China and New Zealand (page 9). Such activities require long-term vision and commitment of resources, and the ability to work across New Zealand's institutions – attributes of Centres of Research Excellence that are of increasing value to the country.

As in previous years, we are proud to report many scientific achievements of major international importance. The progression into clinical trials of the cancer drug PR610 (page 15) and pre-clinical development of the TB drug TBA-354 (page 19) are further examples of the strength of New Zealand's drug discovery. These are the latest in a line of over 20 new drugs invented here that have entered clinical trials – a record that drew admiration from State Councillor Liu Yandong, now Vice Premier of the People's Republic of China, during her recent visit to New Zealand. Both of the drugs offer new approaches to disease therapy. PR610 is a "first-in-class" agent that uses a novel cancer targeting mechanism to selectively activate an anti-cancer drug within tumours. Being "first-in-class" means the inventors, Associate Professor Adam Patterson and Dr Jeff Smaill, can now develop a line of similar drugs, so the clinical trial of PR610 opens up a completely new front in the fight against cancer. TBA-354 has the potential to both improve the potency of TB treatment and also shorten the duration of therapy – crucial in reducing the emergence

of drug-resistant strains. The team behind the drug, led by Associate Professor Brian Palmer and Professor Bill Denny, is now at the epicentre of the global fight against TB. Progress of the New Zealand drugs in this battle can be tracked online at www.tballiance.org (see "Our Pipeline" for a snapshot) and we can all take great pride in the team's achievements, built on decades of investment in their drug discovery expertise by public agencies and charities.

Our investigators' ability to generate therapies suitable for clinical trials is also evident in the Centre's work to develop immune therapy for cancer. The immune system is now recognised as able to exert very powerful effects against cancer, and new approaches to stimulate immune attack on tumours are now being incorporated into regimes to treat many different cancers. Clinical trials are crucial to understanding how to combine immune therapy with more conventional cancer therapy, and the commissioning of a new manufacturing facility in Auckland (page 13) enables a wide range of clinical trials to be conducted in New Zealand. At the end of 2012, this facility was granted a licence to manufacture medicines by the medicines regulator Medsafe, so the New Zealand research community can now design, manufacture and test these new medicines here, in answer to unmet medical need. This facility exemplifies the Maurice Wilkins Centre's commitment to translating its knowledge into practical outcomes, and places New Zealand in an exciting leadership position in this field of research. This commitment to manufacturing new medicines is backed by world-class skills in vaccine and drug delivery. As described on page 21, Professor Sarah Hook's team has expertise in vaccine delivery that is not only helping New Zealand researchers develop new cancer therapy, but has also attracted invitations to work at the two leading immunology institutes in Japan. This type of collaboration between Maurice Wilkins Centre researchers and leading international institutions helps ensure our programmes stay at the cutting edge of world research. Sustained scientific relationships with these institutions also builds the prestige of New Zealand science, and opens access to international resources and funding streams.

Looking back over the Centre's development since its inception, we see a steady march in its ambitions. From an initial focus on building capability in key technologies supporting development of new therapy, we moved to a phase of building inter-disciplinary and inter-institutional collaborations at a scale only possible with a vibrant network of leading investigators. This report shows the new types of impacts the Centre is achieving on behalf of the nation, leading approaches to the scientific challenges we face, and acting as a major conduit for developing the scientific relationship with key international trading partners. The next phase of the Centre's development will see further growth in such large scale activities, built as always on the quality of our people, and their well-earned reputation as leaders in their fields.

Rod Dunbar
Director



Contribution to National Goals

The Centres of Research Excellence are collectively charged with making a contribution to national goals including fostering innovation and social and economic development. It is anticipated that the CoREs will each contribute to these goals in different ways and in different proportions, depending on their particular research focus. The Maurice Wilkins Centre has its own unique place in this spectrum. Our focus on human disease is based on a multidisciplinary platform that extends across chemistry, biology and medicine and combines key approaches and technologies from physics, engineering and mathematics.

Innovation

The Maurice Wilkins Centre conducts highly innovative research and enables innovation in the wider research and business sector. Its goal is to become New Zealand's engine for the discovery of new therapies and diagnostic tests. Innovation in research is often to be found at the interface between disciplines, through cross fertilisation of ideas and technology. The Maurice Wilkins Centre brings together researchers from a range of disciplines to tackle complex questions that no one field alone could address. It also encourages a more collegial approach within the biomedical research sector in New Zealand. The Centre's work leads to the establishment of new spin-out companies and contributes directly to innovation within established companies through contract research, consultancy, and sharing of facilities and expertise. Fundamental scientific discoveries, novel technologies and management developed within the Centre enable new lines of research that advance understanding of human health and disease and also enable innovation in other sectors including New Zealand's primary industries

Social development

One of the Maurice Wilkins Centre's contributions to social development in New Zealand is through improvements to human health. Our major focus is to improve the diagnosis and treatment of diseases such as cancer, diabetes, and infectious disease – all increasing challenges for New Zealand society. At the same time, science is an important aspect of our culture, and the Maurice Wilkins Centre plays a role in increasing the impact of science within New Zealand, as well as connecting us strongly to the international scientific community. The multi-disciplinary and collaborative ethos of the Maurice Wilkins Centre ensures an excellent training environment for graduate students and younger scientists, including exposure to the ethical, managerial and entrepreneurial aspects of translational science. It is particularly important for students at all levels of education to see that scientific research of the highest international quality can be done in New Zealand, and that it can make major contributions to the social and economic well-being of their country. The example set by Maurice Wilkins Centre leaders in choosing to return from research posts overseas, committed to carrying out world-class research in New Zealand, provides a powerful incentive for our top students to do likewise in future.

Economic development

The Maurice Wilkins Centre's focus on new approaches to human disease has dual importance for the New Zealand economy, in both improving health and providing direct economic gains. Centre investigators have to date been responsible for bringing a large portfolio of drugs to clinical trial, with a deep pipeline of new projects in pre-clinical development. This strong portfolio means that New Zealand maintains its exciting potential in the biopharmaceutical sector, one of the few economic sectors capable of driving explosive economic growth. The intimate links between the Maurice Wilkins Centre research programme and recent start-up companies demonstrates that research findings can and will be developed for the national good. Direct economic gains also come from international research contracts, and milestone and licensing revenue from overseas partnerships – effectively a “weightless” export industry. Less direct economic gains come from Maurice Wilkins Centre investigators' significant impact on the international rankings of our educational institutions, which affect their ability to attract international students. The Centre also plays an important role in promoting and validating our national scientific capabilities abroad, increasing the reputation of New Zealand as a source of high-value research.





Distinguished Professor Margaret Brimble speaks at the Royal Society of New Zealand's Research Honours Celebration on receiving the Society's top award, the Rutherford Medal, presented by the Hon Steven Joyce, Minister of Science and Innovation

Photograph courtesy of the Royal Society of New Zealand

Highlights

The following stories describe 2012 highlights for the Maurice Wilkins Centre in the areas of research, training and science education.

A core of celebrated scientists

Maurice Wilkins Centre investigators continued to win acclaim in 2012, ending the year with seven medals at the Royal Society of New Zealand research honours event, including the top award.

“The awards are very well deserved and we feel enormously privileged to have these talented individuals as part of our network,” says Director Professor Rod Dunbar.

Four of the Centre’s principal investigators have now won the Rutherford Medal, the Society’s highest honour. The 2012 awards for health science, chemical science and research with the potential for human benefit also went to members of this core group, underscoring its strength.

Distinguished Professor Margaret Brimble from The University of Auckland won the Rutherford Medal, which recognises an exceptional contribution to New Zealand society in science and technology. She joins fellow principal investigators and Rutherford Medallists, Distinguished Professors Ted Baker, Bill Denny and Peter Hunter.

An expert in medicinal and natural products chemistry, Margaret synthesises compounds from nature that show promise for medical applications such as the treatment of cancer or diabetes, and for agricultural use. The medal honours her world-leading contributions in the field. Margaret also won the MacDiarmid Medal, which recognises potential for human benefit, for her work on a new drug candidate that may reduce the impact of traumatic brain injury, and the Hector Medal for an outstanding contribution to the advancement of chemical sciences.

Maurice Wilkins Centre Deputy Director Professor John Fraser, Dean of Medical and Health Sciences at The University of Auckland, received the Sir Charles Hercus Medal, for excellence in health science. John is an expert in immunology and infectious disease. He is particularly interested in superantigens produced by the body in response to infection, and virulence factors that help infectious agents to thrive and overcome the body’s immune defences. The medal honours his pioneering studies on bacterial superantigens, which have major implications for understanding and treating a variety of human infectious diseases.

The Centre is delighted that two members of its wider network were also honoured at the celebration. Dr Richard Furneaux, a Distinguished Scientist at Callaghan Innovation, won the Thompson Medal for outstanding and inspirational leadership of carbohydrate chemistry research and its commercial application to biotechnology in New Zealand. Professor David Williams from The University of Auckland received the Pickering Medal, the Society’s top technology award, for his contribution to the development of biomedical and gas sensors, which have been commercialised.





State Councillor Liu Yandong meets with Maurice Wilkins Centre investigators at
The University of Auckland

Photo courtesy of Godfrey Boehnke

Creating connections with China

An official visit by State Councillor Liu Yandong, now a Vice-Premier of the People's Republic of China, was the culmination of the Maurice Wilkins Centre's work during 2012 to build strategic links between New Zealand and China in biomedical science.

State Councillor Liu visited New Zealand to discuss cooperation between our two countries in science, innovation and education. On a flying trip she met with the Prime Minister, Mayor of Auckland and other dignitaries and also made time to visit The University of Auckland and hear a Maurice Wilkins Centre presentation. She was accompanied by other senior members of the Chinese government and diplomats.

"The Chinese Embassy was aware of the reciprocal visits of Maurice Wilkins Centre scientists to China in April and of [Chinese] scientists to the Centre in August, [and their] in-depth discussions with respect to new drug developments," explains Mr Xie Chengsuo, the Embassy's First Secretary of Affairs of Science and Technology. "[We] proposed the visit to the Centre, since it is a good example of personnel exchanges and the exploration of possible cooperation with China. [The] scientists in the Centre have been farsighted in promoting cooperation with their Chinese counterparts for mutual benefit."

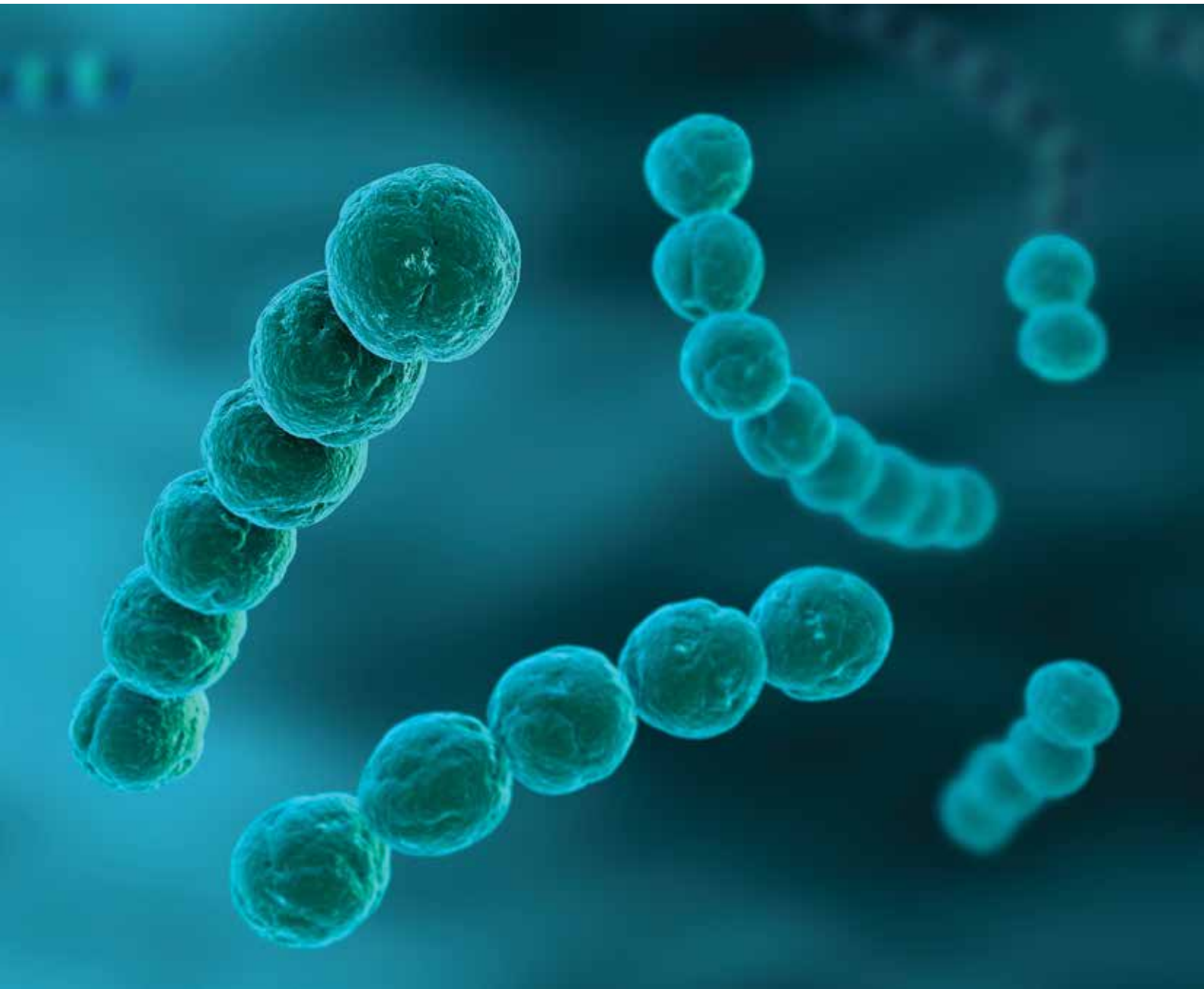
"International institutions have expressed enthusiasm for engaging with the Maurice Wilkins Centre as a conduit for New Zealand biomedical science," says Director Professor Rod Dunbar. "New Zealand's biomedical research and clinical translation capabilities are highly respected by our Asian colleagues. Our aim is to develop long-term, mutually beneficial relationships that will allow the expansion of their research programmes and our own, with benefits for health and the economy."

With the second largest economy in the world, and a strategic approach to scientific and industrial development, China is making massive investments in science. Its Five Year Plan prioritises drug discovery, a high-technology area in which New Zealand, and the Maurice Wilkins Centre in particular, excels. The Centre also draws together much of New Zealand's expertise in developing new treatments for non-communicable disease, one of the three priority areas in the China-New Zealand Five Year Roadmap for scientific cooperation.

"[The Centre] includes many prominent scientists in the life science sector. It is representative of the top research capabilities in New Zealand and we are delighted to forge such a close relationship," says Professor Ming-Wei Wang, who leads the National Centre for Drug Screening at the Shanghai Institute of Materia Medica (Chinese Academy of Sciences) and the Chinese National Compound Library – institutions that together can support aspects of drug discovery complementary to those available at the Centre.

In late 2012 the Centre also hosted a visit by Zhejiang Province leaders. The province hosted the 3rd China-New Zealand Joint Commission on Science and Technology and the signing of the Five Year Roadmap, and is seen as central to scientific links between the two countries. See page 26 for more on how the Centre is building international links for New Zealand biomedical science.





Streptococcus, the bacterium responsible for rheumatic fever
© Sebastian Kaulitzki | Dreamstime.com

Rheumatic fever - Research strengths confront national need

The Maurice Wilkins Centre prioritises rheumatic fever research, and its work built momentum in 2012 with the appointment of a specialist researcher, funding of two research projects, and organisation of an international workshop to investigate vaccine strategies.

In late 2010, the Maurice Wilkins Centre convened a national symposium to identify the “superbugs” that pose the greatest threats to the country’s health, and define how the Centre’s expertise could be used to help neutralise those threats. At that meeting, medical specialists in infectious disease identified rheumatic fever as one of their top concerns.

Rheumatic fever, which can lead to life-threatening heart disease, is now rare in most wealthy countries but remains a major concern in New Zealand. Maori and Pasifika communities in particular have amongst the highest rates of rheumatic heart disease in the world. By learning more about the biology of the disease, and potential vaccine strategies, the Centre aims to complement ongoing public health programs aimed at reducing this dreadful disease burden.

“The Centre provides the composite skills to deliver a long-term strategy to tackle what remains a major health issue in New Zealand,” says Deputy Director Professor John Fraser, an expert in the biology of group A streptococcus, the bacterium responsible for the disease. “This is an excellent example of a national need being matched by national scientific strengths.”

In 2012, with the backing of the Centre, New Zealand molecular biologist Dr Nikki Moreland returned from Singapore to begin a new rheumatic fever study. The Centre drew together a new team of scientists with complementary expertise to support her application to the Heart Foundation for a fellowship to undertake the research. Nikki is now working with Waikato clinicians to collect blood from children with rheumatic fever. She is studying the immune “fingerprint” of the disease, searching for antibodies involved in the autoimmune reaction that causes rheumatic fever following a streptococcal infection.

Nikki is also organising a meeting of the world’s foremost experts on group A streptococcal biology and disease, initiated and funded by the Maurice Wilkins Centre. A focus of the workshop, to be held in Auckland in early 2013, will be discussion of how to develop an effective vaccine strategy for the Australasian region. In late 2012 the Centre funded two new studies, led by clinical microbiologist Dr Deborah Williamson and streptococcus researcher Associate Professor Thomas Proft, to determine the strains of group A streptococcus found in New Zealand – information that will be critical for future vaccine development.

The Centre is delighted that in early 2013 the Prime Ministers of New Zealand and Australia committed NZ\$3 million over two years for a trans-Tasman project to identify vaccines that could be taken into clinical development, an announcement that aligns well with its upcoming workshop.





Lead chemist Dr Geoff Williams working in the new laboratory at The University of Auckland that has been granted a Medsafe licence to manufacture medicines

Photo courtesy of Godfrey Boehnke

A licence to manufacture medicines

A licence to manufacture medicines has been granted to a University of Auckland facility that will produce the active ingredients of cancer vaccines to be tested in humans. The facility will contribute to vaccine programmes that involve Maurice Wilkins Centre investigators around the country.

Two years of work, completed in 2012, has transformed a standard chemical laboratory into a state of the art facility that will produce the active ingredients destined for human clinical trials. The new laboratory, which meets stringent international good manufacturing practice (GMP) standards, reflects the Maurice Wilkins Centre's commitment to taking its technology into manufacturing platforms. The first clinical trial it will service is an experimental treatment for melanoma, but the facility will be used for a range of clinical trials in the future.

GMP manager Sarah Carley worked alongside lead chemist Dr Geoff Williams to develop the manufacturing systems that were inspected by Medsafe, New Zealand's regulatory body controlling new medicines, before the licence was granted. Every component and procedure was painstakingly tested, documented, and approved, from the raw materials used by the chemists to the air they work in.

The new laboratory complements a GMP facility at Callaghan Innovation's Gracefield campus, where an "adjuvant" or booster for the vaccines will be produced, and a GMP cell therapy facility at the Malaghan Institute of Medical Research. In the first clinical trial, vaccine components from Auckland and Gracefield will be soaked into patients' own immune cells at the Malaghan Institute before being administered. "This is a real 'New Zealand Inc.' story," says Maurice Wilkins Centre principal investigator Professor Margaret Brimble, who led the establishment of the laboratory, along with Centre Director, Professor Rod Dunbar.

Margaret is a renowned chemist (see page 7) who specialises in producing synthetic copies of compounds found in nature. Her team's role in the first clinical trial is to synthesise peptides (short sections of protein) that mimic those on cancer cells. The peptides – the vaccine's active ingredients – are designed to help the immune system learn to recognise and eliminate cancer.

Unlike traditional vaccines, cancer vaccines are given after the disease has developed. Their relative lack of side effects allows them to be added to standard cancer therapies. The first vaccine to be tested will use patients' immune cells as carriers but in future they are likely to be administered directly, for example by injection into the skin.

The first clinical trial has been funded by a \$4.5 million programme grant from the Health Research Council, linking immunologists, chemists and cancer specialists. The initial focus is on melanoma but project leader Dr Ian Hermans from the Malaghan Institute says the techniques being developed also have the potential to be used in other cancers: "Many cancers respond to immune activation, so an effective vaccine-based strategy with a good safety profile could alleviate suffering on a large scale."





Initial development of New Zealand-designed “stealth drug” PR610 is focusing on patients with non-small cell lung cancer – the most common form of lung cancer

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New Zealand patients trial local cancer drug

Cancer patients in Auckland, Waikato and the United States are participating in the first clinical trial of an exciting new drug invented in New Zealand.

PR610 is the first in a new class of cancer “stealth drugs”, invented by Dr Jeff Smail and Associate Professor Adam Patterson from the Auckland Cancer Society Research Centre (ACSRC) and Maurice Wilkins Centre.

“We’ve designed a remarkable molecule with substantial anti-tumour activity,” says Jeff. “The rapid pace with which this novel treatment has reached the clinic is a tribute to the efforts of a talented drug development team.” The scientists have cleverly exploited an abnormality of tumours to make a drug that can discriminate between cancer and healthy tissue, potentially minimising the side effects of treatment.

Administered in inactive “prodrug” form, PR610 transforms into a powerful cancer drug only in the abnormally low-oxygen (hypoxic) conditions found in most solid tumours. Once active it permanently inhibits key receptors (kinases) in cancer cells. It is designed to achieve high, active doses in tumours while remaining dormant in healthy tissues, avoiding the collateral damage associated with standard chemotherapies. This is an entirely new treatment approach.

The first clinical trial of PR610 began in late 2012 at Auckland City Hospital, Waikato Hospital and sites in the United States. “It’s especially pleasing to see clinical trials of new drugs being held in New Zealand,” says Mr John Loof, CEO of the Cancer Society Auckland Division. “Local patients can be some of the first involved in furthering our understanding of how these targeted medicines can make such a difference.”

The phase I/II study will investigate suitable doses in patients with a range of solid tumours, and then move on to monitor side-effects, blood levels and anti-tumour activity in patients with non-small cell lung cancer (NSCLC) that has become resistant to standard treatment.

Lung cancer is the leading cause of cancer death and NSCLC is the most common form. Currently there is no effective treatment for NSCLC that has become resistant to standard chemotherapy. Initial development of PR610 will focus on patients with this disease, and subsequent studies will evaluate the drug in other cancers, such as gastric and breast cancer.

“PR610 had striking activity against cancer in the laboratory,” says co-inventor Adam Patterson. “When tested alongside other clinical candidates, it was the only agent capable of shrinking drug-resistant lung cancer. With Proacta’s expert support, the US Food and Drug Administration approved an Investigational New Drug Application for PR610, allowing the drug to progress to human trials.”

PR610 is part of a pipeline of hypoxia-activated kinase inhibitors from Adam and Jeff’s groups licensed to biotechnology company Proacta Incorporated (a New Zealand-founded company now based in San Diego). Proacta has an agreement with Yakult Honsha Co., Ltd, for research, development and commercialisation of PR610 in Japan.





Delegates at the inaugural NCEA Level 3 Content Day, held at The University of Auckland's Faculty of Medical and Health Sciences

Photo courtesy of Godfrey Boehnke

Scientists and teachers in unique partnership

Science teachers from Auckland and Northland leapt at the opportunity for an intensive update on the latest in biomedical science, at a unique Maurice Wilkins Centre event in 2012.

"I was so inspired that I want to go back to university, it was that good," says Julie Harrison, Senior Biology Teacher at Kerikeri High School, explaining how important, and challenging, it is for science teachers to keep pace with rapid advances in their field. She says the event was "fantastic, brilliantly organised, and very innovative," as well as a rare networking opportunity for rural teachers like her.

The inaugural NCEA Level 3 Content Day, at The University of Auckland's Faculty of Medical and Health Sciences, was initiated and organised by Rachel Heeney, Head of Biology at Epsom Girls Grammar School, and Maurice Wilkins Centre principal investigator Professor Peter Shepherd.

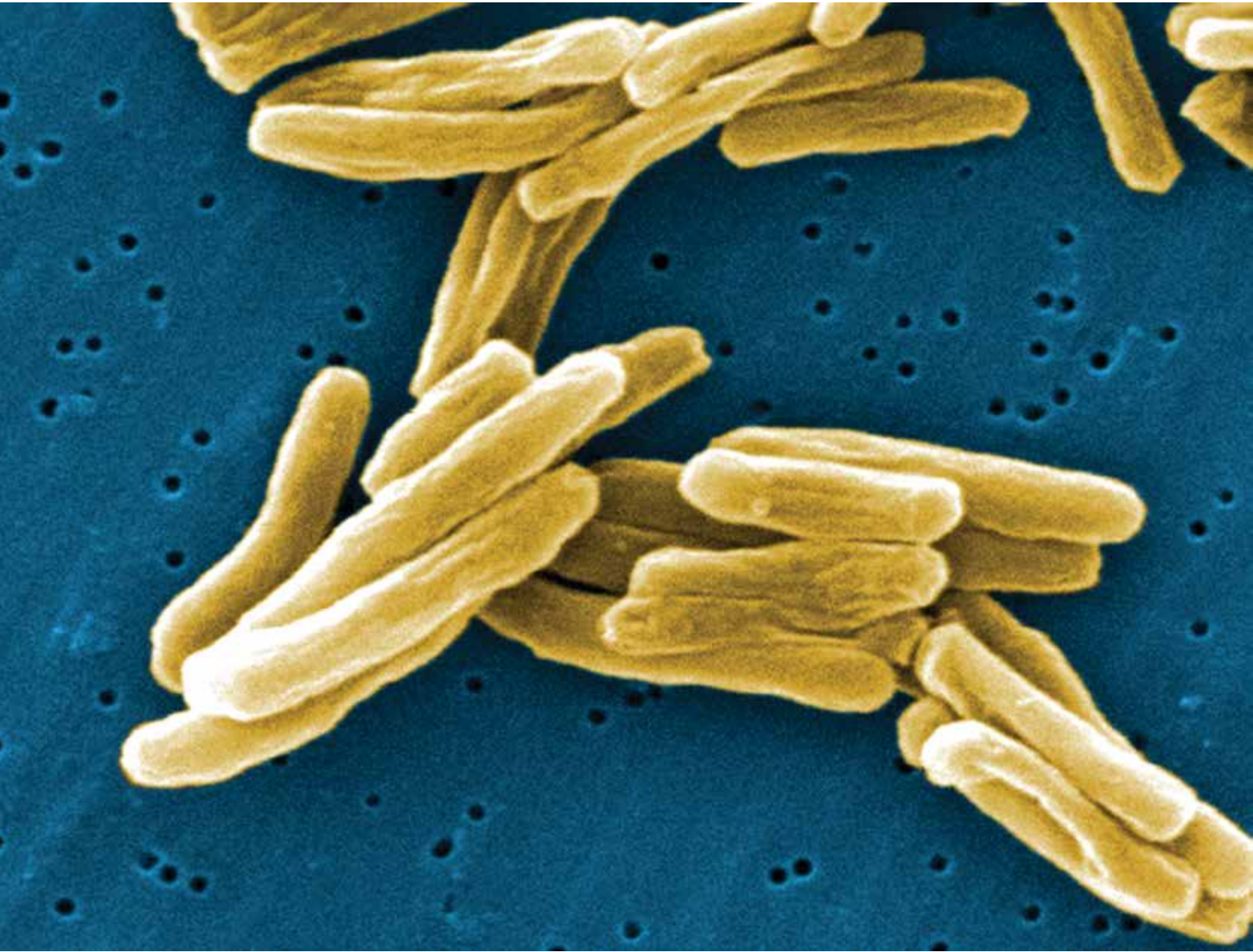
Rachel says that whereas a lot of teacher professional development focuses on pedagogy, or how to teach, the Content Day offered an update on the science itself from some of the country's best researchers. Cindy Wynn, a science teacher development expert from Team Solutions, says: "This was a massive opportunity for teachers to up-skill, which they're screaming out for. It was unique and very valuable because it provided teachers with up to date, cutting edge information."

Peter selected Maurice Wilkins Centre scientists whose expertise matched key topics at NCEA Level 3, from the impact of new technologies in genetic profiling and stem cell research, to understanding how our bodies maintain equilibrium (a new topic for the coming year). Working with Rachel, he helped them present the material in a way that teachers could take straight into the classroom.

There were 130 registrations for the event, more than triple the number anticipated, and teachers' feedback was overwhelmingly positive: 99 per cent said events like these were essential or very valuable and all planned to use the material. Sam Siliassau, Senior Biology Teacher at Wesley College, says that it also bridged the gap from school to university, helping him prepare his students for higher study. He has since invited two of the presenters to speak at his school and motivate students interested in scientific careers.

The Centre sponsored the event, allowing teachers to attend free of charge, and Rachel says administrator Peter Lai's assistance was critical to its success. Similar events are now being planned around the country.

Outreach to schools helps Centres of Research Excellence fulfil their role in the promotion of science, and Peter Shepherd says the Maurice Wilkins Centre has sought to identify areas where its resources can really make a difference. Peter and Rachel have a suite of initiatives underway partnering teachers with scientists and have also written an award-winning biology textbook. For more details of how the Centre supports science education see page 31.



Micrograph of *Mycobacterium tuberculosis*, the bacterium that causes tuberculosis
Image courtesy of Dr Ray Butler and Janice Carr (Centres for Disease Control)

New Zealand TB drug candidate selected

In late 2012 a promising New Zealand compound targeting treatment-resistant tuberculosis (TB) was selected as a drug candidate by international non-profit drug developer the Global Alliance for TB Drug Development (TB Alliance).

New drug candidate TBA-354 was designed by scientists from the Auckland Cancer Society Research Centre (ACSRC) and Maurice Wilkins Centre in partnership with the TB Alliance and University of Illinois at Chicago. The TB Alliance expects to complete preclinical studies by early 2013, and then seek permission from the US Food and Drug Administration to begin human trials.

TB is second only to HIV/AIDS as the greatest infectious killer worldwide. While most cases and deaths occur in low and middle-income countries, it is a major health concern in the Asia-Pacific region. Treatment regimens are complex, lengthy and challenging to follow and the disease is developing resistance to current antibiotics. If a new drug proves more effective than current treatments it may reduce the duration, cost and side-effects of treatment.

Laboratory studies to date have been very promising, with TBA-354 proving much more potent and broad-spectrum than PA-824, the first-generation compound it was designed to improve upon. TBA-354 and PA-824 are members of the first new class of drugs developed for TB in nearly fifty years and the first designed to attack the persistent form.

PA-824 is already showing promise in clinical trials and – in a parallel line of attack – the TB Alliance contracted the New Zealand scientists to develop second-generation compounds to overcome some of its known limitations. The New Zealanders optimised each part of the drug, and in the process developed a new method of synthesis that will simplify and reduce the cost of producing drugs of this class.

“TBA-354 is an improved, second-generation version of PA-824,” says Professor Bill Denny, ACSRC Co-Director and a Maurice Wilkins Centre principal investigator. “It is much more potent than PA-824, longer lasting, and has greater activity against resistant strains. Recent trials show that PA-824 can dramatically shorten the treatment period for TB, and it’s encouraging that in TBA-354 we have a compound that is clearly superior to it.”

“This has been an excellent and productive international collaboration, across groups with different skills, where we have learned much that we can apply in future,” says Associate Professor Brian Palmer of the ACSRC and Maurice Wilkins Centre, who led the project’s chemistry team of Drs Adrian Blaser, Iveta Kmentova, Hamish Sutherland and Andrew Thompson.

“New Zealand has an outstanding reputation in drug discovery and it’s exciting to see the ACSRC’s expertise in cancer drug development being applied to the fight against one of the most devastating infectious diseases in the world,” says Centre Director Professor Rod Dunbar.





The future of vaccines

Maurice Wilkins Centre investigator Professor Sarah Hook from the University of Otago is developing new vaccine formulations – including needle-free vaccines and vaccines for cancer – and national and international collaborations are a crucial part of her work.

Vaccines are a new frontier in the treatment of cancer. Copies of molecules from cancer cells are used to stimulate an immune response that helps the body to recognise and attack the cells.

“Many people are studying cancer vaccines,” says Sarah, who was promoted to Otago’s Chair in Pharmaceutical Sciences in 2012. “Our advantage is that we’ve got a really strong collaboration between the immunologists who select the target molecules, chemists who make them, and formulation specialists who work out how to deliver them and stimulate the best immune response.”

This expertise is drawn from research institutes around the country, and the Centre helped bring the scientists together, with support for meetings, cross-disciplinary research projects and studentships. The establishment of a new peptide facility with a licence to manufacture medicines (see page 13), will also advance the work. Silke Neumann, a Maurice Wilkins Centre-funded PhD student in Sarah’s group, is currently developing peptide vaccine formulations and testing them in the laboratory, with the eventual aim of taking them into the clinic.

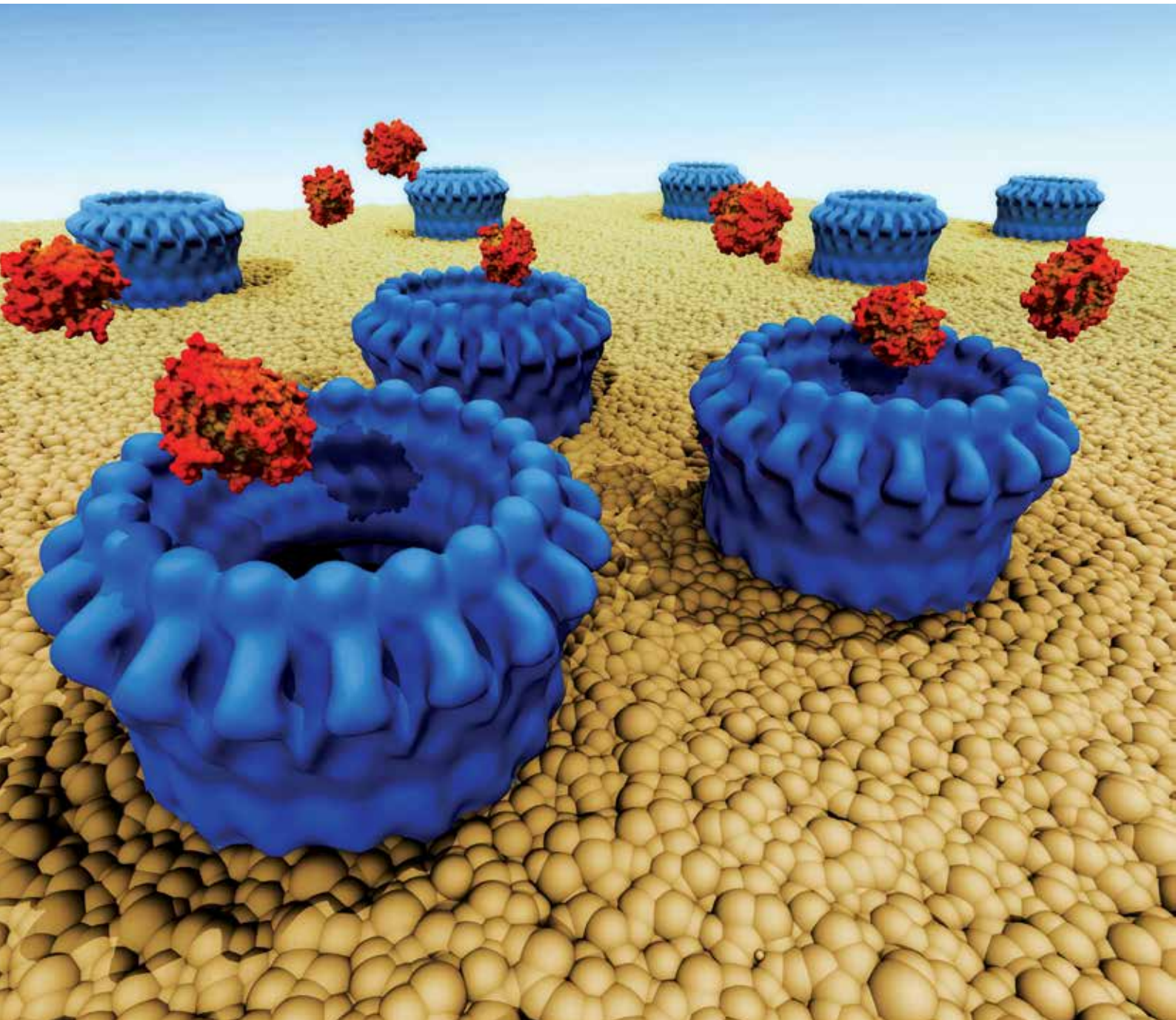
Sarah’s laboratory is also investigating new methods to deliver vaccines. “The World Health Organisation would prefer vaccines not to be given by injection if at all possible,” she explains, in part due to issues with sterile needle supply and people’s resistance to injection. She was part of a Maurice Wilkins Centre delegation to Japan in 2010 that established links with three high profile Japanese research institutions, and vaccine projects in New Zealand and Japan are now benefitting from those connections.

Sarah and her PhD student Teerawan (Mo) Rattanapak worked with Professor Masaru Ishii’s laboratory at the Osaka University Immunology Frontier Research Programme (iFReC) in 2011. The New Zealanders are developing vaccines that can be applied directly onto the skin, for a variety of potential applications including cancer. They used advanced imaging technology at iFReC to evaluate how well their vaccines penetrate the skin and interact with immune cells, and will use the information to refine their formulations.

In 2012, Sarah’s PhD student Kan Kaneko travelled to work with Dr Yasuyuki Ishii at RIKEN Research Centre for Allergy and Immunology. Dr Ishii has developed a vaccine for cedar pollen allergy, which is a major problem in Japan, but at present it can only be given by injection. “Our role is to develop a formulation that can be taken orally, which is more acceptable for an allergy,” Sarah explains.

“The Maurice Wilkins Centre has a focus on vaccine development, especially for the treatment of cancer, and Sarah’s work will play a major role in bringing new vaccines through to the clinic,” says Director Professor Rod Dunbar.





Perforin (blue) creates pores in the surface of cells targeted by the immune system, allowing toxic “killer” molecules inside.

Image courtesy of Dr Mike Kuiper, VLSCI, University of Melbourne

PhD student part of international drug development programme

Maurice Wilkins Centre-funded PhD student Matthew Bull is part of international research on a new class of immunosuppressants being developed initially to protect bone marrow transplants in cancer patients.

People who require a bone marrow transplant after chemotherapy risk transplant rejection by their own immune system. The body identifies the donor cells as foreign, triggering an immune response that can wipe out up to 90 per cent of the transplant in the first 24 hours despite standard immunosuppressant therapy.

Scientists from New Zealand and Australia are working on a new way to temporarily suppress the immune system, allowing the transplant to gain a foothold and begin replenishing the bone marrow in the critical early period. They are targeting a protein called perforin, produced by the immune system to punch holes in cells it sees as a threat and let toxic “killer” molecules inside. They have shown that perforin inhibitors can protect bone marrow transplants in the laboratory, and now they’re refining the drugs with the aim of testing in humans. If successful, the drugs may eventually be used for a wide range of transplants.

Matthew has contributed to the work, providing critical information about the fate of the drugs in the body. His PhD is supervised by Auckland Cancer Society Research Centre (ACSRC) medicinal chemists Dr Julie Spicer and Professor Bill Denny and University of Auckland pharmacologist Dr Nuala Helsby.

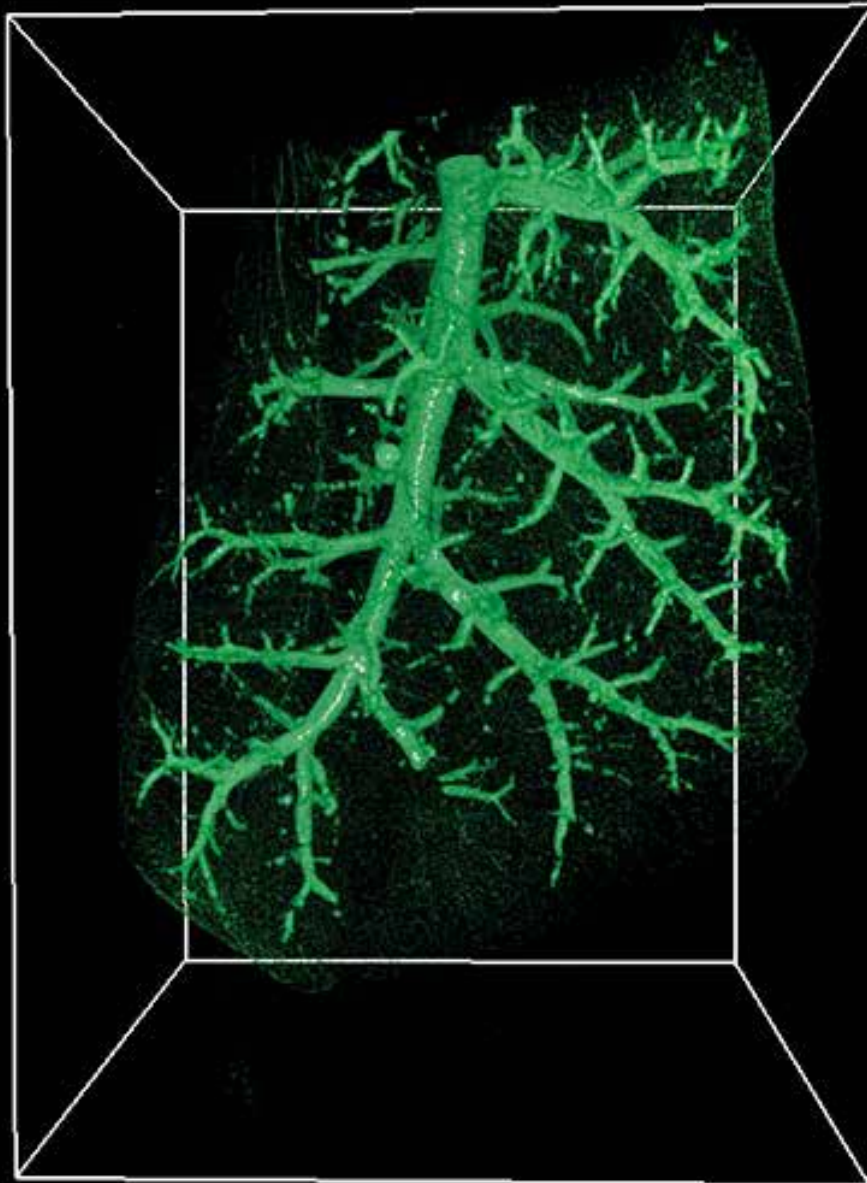
“We’re optimising the compounds, and once we’re happy with how well they inhibit perforin we need to think about the properties we require in a drug, and that’s where Matthew comes in,” says Julie, who leads the project in New Zealand. Amongst those properties, drugs need to reach the right levels in the right tissues, remain active long enough to be effective, and be eliminated when no longer needed.

Matthew studies how the inhibitors pass through the body and are broken down and the chemists use that information to refine the drugs. The programme has now moved beyond the initial inhibitors Matthew focused on for his PhD, but Julie says the foundation he laid has been essential to their subsequent work.

The work began when Professor Joe Trapani, a perforin expert from the Peter MacCallum Cancer Centre in Australia, approached the ACSRC for help designing the drugs. Together with collaborators from Monash University, Queensland Institute of Medical Research, and Medicines Development, they won a prestigious Wellcome Trust (UK) grant for the work.

Matthew is one of a many of postgraduate students supported by the Maurice Wilkins Centre to work on cross-disciplinary projects. He says that being part of an active international drug development programme has been a valuable experience, in particular the exposure to a broad range of scientific fields.





High resolution CT scan showing vascular structure in the lung, generated using the imaging and medical beamline at the Australian Synchrotron.

Image courtesy of James Pearson, Daryl Schwenke, Mikiyasu Shirai and Alberto Astolfo

New technologies for imaging the human body

New Zealand technologies being developed to perform delicate new procedures, locate sites where cancer drugs are active, and model a person's entire skin, were just some of the topics discussed at the 2012 Maurice Wilkins Centre Symposium, which focused on imaging.

"Imaging helps us to understand what's happening in the body in health and disease, and how it responds to treatment, so it's of critical importance for both clinicians and scientists," says Director Professor Rod Dunbar. "The symposium showcased a dazzling array of new technologies, from whole body imaging for medical purposes right down to imaging of single molecules. Our overseas speakers were impressed with the quality of the technology being developed here, and its applications, and new international collaborations have been initiated as a result."

One of the many highlights was Dr Andrew Holden's presentation of simultaneous imaging technology that is allowing radiologists like him to perform delicate new procedures.

Andrew is Director of Interventional Radiology at the Auckland Regional Public Health Service and an Associate Professor at The University of Auckland. His world-leading technology fuses highly detailed 3D MRI images with live x-rays, allowing much more precise work than is possible traditionally with x-rays alone. He showed footage of it being used to guide a needle into the wall of an aorta to glue up a leak around a graft repair, a problem that would otherwise have required major surgery.

Another highlight was Dr Daniel Hausermann's display of what can be achieved with a new imaging and medical beamline at the Australian Synchrotron. The synchrotron, an electron accelerator the size of a football field, creates bright light that is channelled in beamlines for research. The new beamline can be used to study biological structures like tiny blood vessels and dynamic processes like breathing. It is even being used to develop experimental radiotherapy applications that could more accurately deliver radiation to tumours. Daniel leads the team working with the beamline and has offered New Zealand scientists access to it.

Also generating interest was Associate Professor Steven Giese from the University of Canterbury, who presented colour imaging of an atherosclerotic plaque using MARS-CT. The MARS-CT machine is a portable micro CT scanner being developed at Canterbury in collaboration with local industrial partners for commercialisation.

"This is an excellent example of physics and engineering being applied to a biomedical problem," says Rod. "It's great technology that's not only being developed here but is generating genuine business opportunities for New Zealand companies." A clear message from the symposium was the value of biologists and physicists working together. "The Centre has been very successful at integrating expertise in chemistry, biology and computation, and it's clear that there's a lot to be gained by bringing more physicists into our network."





Outreach

International engagement

The Maurice Wilkins Centre is actively building international links for New Zealand biomedical science. As a national Centre of Research Excellence it is in a unique position to represent New Zealand on the global stage, providing a crucial connection between local and international researchers. In addition to investigators' links with scientists, laboratories and companies overseas (see pages 48, 68 and 71), the Centre is building strategic relationships with entire institutions, provinces, and countries, in particular in the Asia-Pacific region

China

Engagement with China became a major focus for the Centre in 2012, culminating in an official visit by State Councillor (now Vice Premier) Liu Yandong, accompanied by Minister of Education Mr Yuan Guiren, Deputy-Minister of Science and Technology Mr Wang Zhigang, Ambassador of China to New Zealand Mr Xu Jianguo and other members of the Chinese government¹ (see page 9).

- In April, Director Professor Rod Dunbar presented the Centre's work at the 3rd China – New Zealand Joint Commission on Science and Technology in Hangzhou.
- In April, Maurice Wilkins Centre scientists were invited to a specially-arranged bilateral forum in Shanghai, as part of China's 4th National Forum on New Technologies in Drug Discovery. A 16 member delegation¹, led by Professor Peter Shepherd, toured the National Center for Drug Screening at the Shanghai Institute of Materia Medica (SIMM, Chinese Academy of Sciences), the Chinese National Compound Library, and Shanghai contract research organisations SYNthesis Medchem, HD Pharma, and WuXi AppTech. Some also visited scientists in Beijing, Guangzhou, and Hong Kong to initiate or advance collaborations.
- In May the Centre hosted a delegation led by Madam Chen Xiaoya, Vice Minister of the Chinese Ministry of Science and Technology and signatory of the Five-Year Roadmap for scientific cooperation between New Zealand and China. During her visit Vice Minister Chen met Chinese scholars studying with principal investigator Professor Margaret Brimble and expressed her pleasure at the opportunities the students had enjoyed in New Zealand.

1. For full lists of delegation members refer to page 48

- Delegations from SIMM and the government-sponsored Guangzhou Institute of Biomedicine and Health (GIBH)¹ visited the Maurice Wilkins Centre in August, to tour its facilities, make new scientific connections and advance collaborative projects. After visiting Auckland the delegates also travelled to Queenstown to speak at the Chemical Biology and Drug Discovery Meeting (see page 36).
- Leaders from Zhejiang Province¹ visited the Centre in September to further investigate collaborative opportunities. The province hosted the 3rd China-New Zealand Joint Commission on Science and Technology and the signing of the Five Year Roadmap, and is seen as central to scientific links between the two countries.
- Professor Peter Shepherd and members of his research group have visited SIMM in June and November to undertake collaborative experiments. For further detail see page 47.

Asian Chemical Biology Initiative

In parallel with the delegations from SIMM and GIBH in August, the Centre also hosted a delegation from the Asian Chemical Biology Initiative (ACBI), led by ACBI Chair Professor Motonari Uesugi (Kyoto University, Japan) and involving eight scientists from Japan, Korea and China¹. These countries are founding members of the ACBI, which aims to accelerate Asian chemical biology by fostering international collaborations and sharing resources, and to promote the field in emerging Asian countries by recruiting and training their brightest graduate students. In 2012 Maurice Wilkins Centre investigators were also invited to join the ACBI as New Zealand representatives.

During the ACBI visit in Auckland, the Centre hosted a meeting of ACBI Executive and gave delegates a tour of facilities at The University of Auckland. The delegates then joined the SIMM and GIBH delegations to travel to Queenstown and speak at the Chemical Biology and Drug Discovery Meeting (see page 36). A number of potential collaborative projects were identified during the visit and individual Centre investigators have been pursuing these.

Multi-national dinner

The Maurice Wilkins Centre hosted a multi-national dinner to welcome the delegations from SIMM, GIBH and ACBI to New Zealand and celebrate increasing scientific co-operation. Honoured guests at the dinner were Ms Liao Juhua, Consul-General of the People's Republic of China to Auckland; Mr Kazutoshi Inadome, Consul-General of Japan to Auckland and Mr Yil Ho Pak, Consul-General of the Republic of Korea. The dinner provided Maurice Wilkins Centre investigators with the opportunity to engage with the visiting Asian scientists.

Japan

As reported in 2011 the Centre's first major international initiative was the establishment of formal links with three high-profile research institutions in Japan: RIKEN Research Centre for Allergy and Immunology, Chiba University Global Centre of Excellence Programme, and Osaka University Immunology Frontier Research Programme. The relationship continued to strengthen in 2012, with planning underway for a joint symposium in New Zealand in early 2013.



- Dr Yasuyuki Ishii from RIKEN visited Professor Sarah Hook at the University of Otago to progress a collaborative project on vaccines targeting human allergies funded by a RIKEN RCAI International Research Collaboration Award which also supports a post-doctoral research fellow in Dr Ishii's laboratory and a PhD student in Professor Hook's laboratory.
- Dr Takaharu Okada, also from RIKEN, spent two weeks with Dr Gib Bogle and Professor Rod Dunbar at The University of Auckland working on collaborative immunology projects in February. Dr Bogle later travelled to Dr Okada's laboratory to continue the work on modelling immunodynamics

Industry engagement

The Maurice Wilkins Centre supports innovation in the biotechnology and drug development sector by providing companies with the expertise and facilities that their research and development programmes require. Centre investigators also provide consultancy to industry as described on page 71.

In 2012 the Centre provided expertise and/or facilities to:

- **AstraZeneca.** This global biopharmaceutical company has a primary focus on the discovery, development and commercialisation of prescription medicines. Professor Margaret Brimble and PhD student Anais Noisier have successfully filed a patent with AstraZeneca which covers a novel method for the manufacture of high value unnatural amino acids. Professor Brimble is now working with Auckland UniServices Ltd to identify suitable companies that can translate this research into the high value manufacturing market.
- **Auckland Clinical Studies Ltd.** This company provides Phase I and II clinical research to local and international pharmaceutical and biotechnology companies. In 2012 Maurice Wilkins Centre investigators Professor Rod Dunbar, Dr Anna Brooks and Dr Vaughan Feisst began work with Auckland Clinical Studies, providing analytical services to support new clinical trials sponsored by two major pharmaceutical companies.
- **Bayer New Zealand Ltd.** This company is part of the global Bayer Group which has major businesses in health care, nutrition and high-tech materials. Maurice Wilkins Centre investigator Professor Margaret Brimble has continued to work with Bayer New Zealand's Healthcare sub-group on new drugs for use in livestock. In addition Maurice Wilkins Centre investigator Dr Vinod Suresh is providing expertise to the company on modelling rumen metabolism.
- **Connovation Ltd.** This company is based in Auckland and undertakes research, development and manufacture of invasive animal pest control technologies. The company aims to develop smarter pest control products which are humane, cost effective and more specifically targeted to pest species. Maurice Wilkins Centre investigator Professor Margaret Brimble is working with the company on designing and synthesizing new molecules as humane rodenticides to replace the toxin 1080.
- **Innate Immunotherapeutics Limited.** This Auckland-based biotechnology company has designed and manufactured a unique immunomodulator microparticle technology platform that has a wide range of potential health applications, with MIS416 being the lead therapeutic candidate. Maurice Wilkins Centre investigator Professor Michael Eccles and PhD student Francesco Mainini are working with the company to develop MIS416 derivatives for use in cancer immunotherapy.



- **Janssen Therapeutics** (division of Johnson & Johnson, USA, formerly Tibotech). Janssen Therapeutics is a pharmaceutical company with a focus on research and development for the treatment of infectious diseases. Maurice Wilkins Centre investigators Associate Professor Brian Palmer and Professor Bill Denny are collaborating (in conjunction with the Global Alliance for TB) with Janssen Therapeutics on the development of an improved, second-generation analogue of Janssen Therapeutics' TB drug bedaquiline, an ATP synthase inhibitor which was approved by the US Food and Drug Administration in late 2012.
- **Landcare Research New Zealand Ltd.** This Crown Research Institute provides solutions and advice for sustainable development and the management of land-based natural resources. Maurice Wilkins Centre investigator Professor Margaret Brimble is working with Landcare Research to develop prodrugs of the rodenticide norbormide that have been patented and will be entering field trials in 2013.
- **Pathway Therapeutics Inc** (USA). This San Francisco-based company was established to discover and develop the next generation of PI3-kinase inhibitors being developed at The University of Auckland for the treatment of cancer. Maurice Wilkins Centre investigators Professors Bill Denny and Peter Shepherd are the company's scientific founders and continue to provide consultancy and contract research services.
- **Proacta Inc** (USA). This clinical-phase biopharmaceutical company, headquartered in San Diego, is developing hypoxia-activated prodrugs for the treatment of cancer. Maurice Wilkins Centre investigators Professors Bill Denny and Bill Wilson are two of the company's scientific founders and, along with investigators Dr Jeff Smaill and Associate Professor Adam Patterson, provide consultancy and contract research services. The investigators use mass spectrometry capabilities purchased by the Maurice Wilkins Centre as part of their ongoing research into new compounds.
- **Zespri International Ltd.** This company is the world's largest marketer of kiwifruit and manages the majority of New Zealand grown kiwifruit export sales. The spread of the bacteria *Pseudomonas syringae* *pv.* *actinidiae* (Psa), which kills the kiwifruit vines, is a significant issue for the industry. Maurice Wilkins Centre investigators Professor Margaret Brimble and Dr Paul Harris are working with Zespri and Plant & Food Research to tackle this problem, by synthesizing antimicrobial peptides from the kiwifruit genome in order to engineer a solution to the Psa bacterial infection.

In addition to these examples, Maurice Wilkins Centre investigators have established a variety of other relationships with companies and non-profit organisations that drive the translation of their research and expertise into new approaches to fighting human disease (see page 71).

Science education

Supporting high-quality science education in New Zealand schools not only encourages the next generation of scientists but also helps others to understand and value science. In 2012 Maurice Wilkins Centre investigators were involved in many science education initiatives, including:

- **NCEA Level 3 Content Day.** This workshop held in November gave secondary school teachers from Auckland and the surrounding regions an intensive update on the latest in biomedical science in topics relevant to the new NCEA curriculum and provided material that the teachers could use in the classroom. The workshop was organised by Rachel Heeney, Head of Biology at Epsom Girls Grammar School, and Professor Peter Shepherd, Maurice Wilkins Centre principal investigator, with support from the Centre. In addition to organising the workshop Rachel and Peter have also co-authored two secondary school textbooks in 2012. See the highlights story on page 17 for more details of the workshop.
- **Maurice Wilkins Centre biology teacher development scholarships.** The Centre sponsors scholarships for high-school biology teachers to attend the Queenstown Research Week. The aim of the scholarships is to give New Zealand teachers the opportunity to attend an international conference on contemporary biological research and to network with colleagues and practicing biologists from around the world. The scholarships covered conference registration, accommodation, and travel to the meeting. Recipients of the awards in 2012, the third year of this programme, were Johnnie Fraser from Nelson College, Diane Sandbrook from Dannevirke High School, David Wedderburn from Westlake Boys High School and Veronica Armstrong from The Correspondence School.
- **Asian Science Camp 2012.** Nga Pae o te Maramatanga organised a delegation of five Maori students to attend this camp in Jerusalem, with partial support from the Maurice Wilkins Centre. The camp involved almost 300 top science students from over 20 countries and featured lectures from several Nobel Prize winners as well as senior Israeli scientists. Feedback from the students was that attending the camp was a life-changing experience.
- **2012 Metagenomic workshop.** The Maurice Wilkins Centre provided student essay prizes for a metagenomics workshop involving Year 13 high school students held at Massey University Albany. The prize winning essays were written by Callum Oliver (Mercury Bay Area School), Amie Limbrick (Epsom Girls Grammar), Sarah Choi (Epsom Girls Grammar School) and Srujana Rao (Epsom Girls Grammar School). The workshop was run by a group of scientists including Maurice Wilkins Centre investigator Dr Justin O'Sullivan. This project has now evolved into Katoa New Zealand, a collaboration between scientists from around New Zealand whose vision is to implement a pan national program of scientific research and education using gene sequencing methods. Katoa New Zealand involves scientists from the University of Auckland, University of Canterbury, University of Otago, Massey University and its members include Maurice Wilkins Centre investigators Dr Justin O'Sullivan and Associate Professor Cris Print.



- **LENScience (Liggins Education Network for Science).** This classroom-based programme provides secondary school students and teachers with access to practicing scientists and high-quality learning opportunities. In 2012 many Centre investigators once again participated in the programme's popular "Meet the Scientist" sessions or acted as mentors for students completing other science programmes.
- **Rotary National Science and Technology Forum.** This national residential programme is for outstanding all-round science, maths and technology students about to start Year 13. By popular request and for the fifth consecutive year, Maurice Wilkins Centre scientists Drs Jodie Johnstone, Chris Squire and Paul Young ran a practical laboratory session for around 150 students, providing hands on experience in the purification of green fluorescent protein.

Public engagement

The Maurice Wilkins Centre actively engages with the public by sharing news of its research and successes and providing commentary on topical scientific issues. Centre investigators communicate with New Zealanders through the news media, public lectures and presentations, and through visits by school students. In 2012 Centre investigators generated national and regional media coverage on a variety of scientific topics. Examples include:

- Professor John Fraser was interviewed by Close Up, TVONE, the Dominion Post and Marlborough Express, on the emergence of new superbugs in New Zealand.
- Professor Margaret Brimble was interviewed on Saturday Morning with Kim Hill, Radio New Zealand, and in the Listener about her latest research honours (see page 7). Stories also appeared on TV3 News; Checkpoint, Radio New Zealand; Mike Hosking Breakfast, Newstalk ZB; and in the New Zealand Herald.
- High hopes for a new drug for tuberculosis, developed by Dr Brian Palmer and colleagues (see page 19), were reported in the New Zealand Herald online and regional newspapers.
- News that cancer drug PR610, invented by Dr Jeff Smaill and Associate Professor Adam Patterson, would begin clinical trials (see page 15), was reported in regional newspapers and in health and science magazines.
- Dr Siouxsie Wiles, an award winning science communicator (see page 74), generated a significant amount of media coverage for her research on deadly microbes. This included reports in the Sunday Star Times and the New Zealand Herald (online edition) and interviews on Saturday Morning with Kim Hill, Radio New Zealand; Nine to Noon, Radio New Zealand; Graeme Hill's Weekend Variety show, Radio Live. She also spoke about the use of animals in research in North & South magazine, and was interviewed for TV3's 60 Minutes programme to explain a parasite infection called schistosomiasis.
- Dr David Ackerley was interviewed on Our Changing World, Radio New Zealand, about his work engineering microbes to produce cancer drugs and featured in the Genesis Oncology Trust New Hope Newsletter. He was also interviewed on NewstalkZB about his work on biocontrol measures to contain the kiwifruit pathogen Psa and this work was profiled in the Otago Daily Times.
- Dr Anne La Flamme was interviewed on Our Changing World, Radio New Zealand, about her research into new approaches to treating multiple sclerosis.
- Dr Sarah Young's work developing a new cancer treatment by adapting part of a virus used to control rabbits, was reported in the Otago Daily Times.
- Associate Professor Cristin Print was interviewed in the Sunday Star Times, New Zealand Herald, the Listener and for the Fairfax Media website Stuff.co.nz on how genomic information is revolutionising medicine.



- Professor Ian Reid commented on the latest research showing that calcium supplements may be detrimental to heart health, in international media such as the Telegraph, BBC News, Independent, Huffington Post (UK), CBC News (Canada), and ABC News (Australia).
- Professor John Windsor spoke at TEDxAuckland about his research on multiple organ failure (see last year's Annual Report).
- Professor Rod Dunbar spoke on Good Morning, TVONE, about the National Science Challenges and what might be achieved with the funding.
- Maurice Wilkins Centre investigators featured prominently in an event profiling New Zealand health research, focusing on cancer, which debuted in parliament and was also taken to Tauranga and Nelson: Professors Bill Denny, Peter Browett, Michael Findlay and Catherine Day, Associate Professors Cristin Print and Dr Ian Hermans.
- Maurice Wilkins Centre investigators also give public presentations about their research. Some examples of these in 2012 were: Associate Professor Alan Davidson gave a stem cell presentation to The Rotary Club of Auckland; Dr Jeff Smail gave an invited talk to The Rotary Club of Penrose on "The development of new anti-cancer drugs"; Associate Professor Anne La Flamme gave a presentation "The Brain Matters: Progress through Research" at a public event in Wellington, sponsored by the Neurological Foundation of New Zealand; Professor Margaret Brimble presented "Medicinal Chemistry" at The University of Auckland Principal's Forum; Professor Russell Snell gave several public seminars on Alzheimer's disease; Dr Nikki Moreland spoke at Girls in Science (Faculty of Science, The University of Auckland); and Dr Gary Evans spoke at a Chemistry Teachers' Day at Victoria University of Wellington.

Supporting the New Zealand science community

Maurice Wilkins Centre Prize for Excellence in Chemical Research

The 2012 Maurice Wilkins Centre Prize for Excellence in Chemical Research, sponsored by the Centre in partnership with the New Zealand Institute of Chemistry (NZIC), was awarded to Associate Professor Richard Tilley from Victoria University of Wellington in December. The prize is awarded annually to a member of the NZIC who has made a significant contribution to chemical science in the past five years.

Associate Professor Tilley has made a significant contribution to chemical science in the field of materials science with an emphasis on solution synthesis and electron microscopy characterisation of nanoparticles.

Maurice Wilkins Centre Annual Symposium

The theme of the 2012 Maurice Wilkins Centre Symposium was “New ways to image the body - from the macro to the nano”. Imaging technology is vital to the progression of medical science in the clinic and the research laboratory and the aim of the symposium was to highlight new technology that is being developed to look into the body and its cells and present examples of how it is being applied in medicine and biomedical research.

The programme included 19 invited speakers from across New Zealand as well as three from Australia: Dr Daniel Hausermann, Principal Scientist of the Imaging and Medical Therapy Beamline Team at the Australian Synchrotron; Dr Paul Timpson, an Australian Research Council Future Fellow from The Garvan Institute of Medical Research; and Dr Brad Marsh, a senior research fellow from the Institute for Molecular Bioscience at the University of Queensland. The speakers covered a wide range of topics from new radiological and body scanning techniques right down to cellular cartography and the design of new molecular probes.

The symposium was held at The University of Auckland on 23 November and attracted over 300 registrants. For more details of the symposium see the highlights story on page 25.

Protein Structural Biology: The Power of Seeing

This symposium was held to celebrate the career of Distinguished Professor Ted Baker who is recognised internationally for his contributions to the field of structural biology over a career spanning more than 40 years. He was the Founding Director of the Maurice Wilkins Centre in 2002, and was instrumental in the successful development of the Centre.

The programme featured presentations from 18 of Ted's past and present colleagues and students, with the large audience being treated to a festival of structural biology, both historic and current. Topics ranged from the use of structural biology in human therapeutics to the intricacies of enzyme active sites and the technical foundations of crystallography. Also highlighted was Ted's most cited paper, a comprehensive early review of hydrogen bonding in proteins. Writing the paper involved the exchange of typewritten manuscripts by post between New Zealand and the United Kingdom, over the course of a year. Somebody (possibly co-author Rod Hubbard) noted wryly that the paper had been described as “exhaustive and exhausting” – but very widely read.

The speakers shared many other anecdotes about Ted, as a student, a young postdoctoral fellow at Oxford University, a teacher, and a mentor. Present at the symposium were most of Ted's colleagues from the time spent at Oxford in the laboratory of Nobel laureate Dorothy Hodgkin: Professors Guy and Eleanor Dodson, Professor Sir Tom Blundell, Professor Mamannamana Vijayan, Professor John Cutfield, Dr Sue Cutfield and Heather Baker. Ted acknowledged the profound influence that Dorothy had on the development of his career and scientific ethos.

The symposium was convened by Dr Richard Kingston, a former student of Ted's, with support from the Maurice Wilkins Centre, the Faculty of Science at The University of Auckland and the Structural Biology Group, School of Biological Sciences, The University of Auckland.



Tuberculosis drug discovery and immunology symposium

Research on *Mycobacterium tuberculosis*, the bacterium that causes tuberculosis, is a particularly strong theme of the Maurice Wilkins Centre research programme. Centre investigators from throughout the country have expertise in areas spanning the discovery and characterisation of new target molecules within the *M. tuberculosis* organism, to vaccine development, and the development of a new generation of TB drugs (see page 19).

In May 2012 the Centre brought together the majority of these investigators for a joint “Tuberculosis drug discovery and immunology” symposium at The University of Auckland. The programme, organised by Maurice Wilkins Centre investigator Dr Shaun Lott, included three guest speakers from Colorado State University: Professor Ian Orme, Professor Dean Crick and Associate Professor Anne Lenaerts. Colorado State University’s Mycobacteria Research Laboratory is known as one of the leading TB research institutes in the United States. The programme also included fourteen New Zealand speakers from the University of Otago, University of Canterbury, Victoria University of Wellington, the Malaghan Institute for Medical Research, University of Waikato, AgResearch, Auckland District Health Board and The University of Auckland. The symposium proved to be a very valuable forum for sharing the latest research targeting TB, and several areas of complementary expertise and research were identified between the New Zealand and American researchers. The participation of the Colorado State University researchers also helped focus the local investigators on how their work fitted into the international fight against TB – a very valuable perspective in determining the Centre’s strategy for TB research in coming years.

Conferences, meetings and organisations

Scientific conferences, meetings and networks are important fora to share knowledge and form collaborative relationships. In addition to the Symposium and workshops it convenes (see page 35) the Maurice Wilkins Centre supports international scientific meetings held in New Zealand as well as smaller local scientific meetings and networks

In 2012 the Maurice Wilkins Centre sponsored:

- **Queenstown Research Week.** This event incorporated the Queenstown Molecular Biology Meeting and satellite meetings focussed on Genetics, Cancer Biology, Non-coding RNAs and Chemical Biology & Drug Discovery and attracted over 700 national and international delegates and speakers, including many from the Maurice Wilkins Centre. The Chemical Biology and Drug Discovery satellite meeting was held in conjunction with the Asian Chemical Biology Initiative (ACBI) and the programme featured presentations from members of the ACBI delegation as well as visitors from the Shanghai Institute of Materia Medica, Guangzhou Institute of Biomedicine and Health, Peking University and New Zealand scientists working in these areas of research. The meeting, which complemented the activities in Auckland on the previous days (see page 26), was a successful forum for the Asian and New Zealand participants to learn more about each other’s work and identify potential areas for future collaboration.

- **Molecular Modelling 2012: Discovery through Biomolecular Simulation.** This conference, organised by the Association of Molecular Modellers of Australasia, was also held during Queenstown Research Week. The main themes were computer aided drug design, computational chemistry and cheminformatics. The Centre provided sponsorship for keynote speaker Professor Rod Hubbard from the University of York (UK) to attend the conference and a number of its investigators were involved in the organising committee.
- **New Zealand Society for Oncology 2012 Conference.** This annual conference brings together oncologists and cancer researchers and was held in Wellington in May. The Centre provided sponsorship for keynote speaker Associate Professor Robin Anderson from the Peter MacCallum Cancer Centre in Australia.
- **SciCon 2012.** This conference is convened every two years by the New Zealand Association of Science Educators which includes science teachers from primary to tertiary level across all the major science disciplines. In addition to providing sponsorship for the conference the Maurice Wilkins Centre organised for a number of its investigators to speak about their current research to conference delegates.
- **Doing Business with Asia – A Life Science Perspective.** The Maurice Wilkins Centre provided support for this satellite meeting held as part of the NZBIO conference in March. The meeting provided an opportunity for Centre investigators to network with people who have worked between Asia and New Zealand.
- **School of Chemical Sciences Research Showcase 2012.** This showcase run by the School of Chemical Sciences at The University of Auckland profiled the work of postgraduate chemistry students, including a number of Maurice Wilkins Centre PhD students, to an audience made up of academics from throughout the University, industry partners, and the general public. The Centre sponsored a prize for the 'best biology related poster' which was awarded to PhD student Ms Anaise Noisier.
- **CellML workshop.** CellML is an open standard language being developed by the Auckland Bioengineering Institute to store and exchange computer-based mathematical models of biological processes. The CellML workshop provides an opportunity to update users on recent developments and discuss future work with the language. Delegates included visitors from the United Kingdom, Japan, Norway and the United States as well as staff and students from the Auckland Bioengineering Institute.
- **Stem Cell Research Network Meeting.** The intention of this network is to foster a collegial and collaborative network among university researchers who have an interest in all aspects of stem cell research. This inaugural meeting, organised by Maurice Wilkins Centre investigators Drs Hilary Sheppard and Vaughan Feisst, featured a series of excellent talks from key researchers in the stem cell field from across The University of Auckland and attracted 50 participants.
- **Stratus.** This network at The University of Auckland supports emerging researchers and works to raise their profile in both academic and public communities.



Service

Maurice Wilkins Centre investigators support both the national and international science communities through service in leadership roles and on many advisory boards and panels.

National roles

In 2012 Centre investigators served in advisory and governance roles in many New Zealand organisations including:

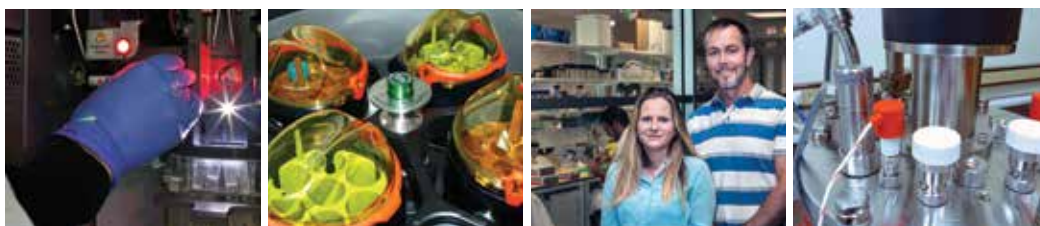
- Auckland City Hospital Oncology Research Committee
- Australasian Society for Immunology
- Australian & New Zealand Society of Blood Transfusion
- Biomolecular Interaction Centre (University of Canterbury)
- BoviQuest Scientific Advisory Board
- Cancer Society of New Zealand
- Canterbury Medical Research Foundation
- Health Research Council of New Zealand
- Institute of Environmental Science and Research
- Landcare Research
- Lotteries Health Research
- Marsden Fund Council and Panels
- Maurice and Phyllis Paykel Trust
- Melanoma Network of New Zealand
- Middlemore Tissue Bank Scientific Advisory Board
- Ministry of Health
- Ministry of Science and Innovation
- National Committee for Crystallography
- National Ethics Advisory Committee
- National Institutional Biosafety Committee Board, ERMA
- Neurological Foundation of New Zealand
- New Zealand Bioinformatics Institute
- New Zealand Genomics Ltd
- New Zealand Hygiene Foundation
- New Zealand Institute for Rare Disease Research Ltd
- New Zealand Institute of Chemistry

- New Zealand Science Media Centre
- New Zealand Society for Biochemistry and Molecular Biology
- New Zealand Society for Oncology
- OBodies Ltd Scientific Advisory Board
- Queenstown Molecular Biology Meetings Society
- Royal Society of New Zealand
- Rutherford Foundation
- Society of Crystallographers in Australia and New Zealand
- Tertiary Education Commission (PBRF assessment panels)
- Wellington Health and Biomedical Research Society
- Wellington Medical Research Foundation

International roles

In 2012 members of the Maurice Wilkins Centre served in more than 100 advisory, editorial and governance roles in international organisations based in the United States of America, Australia, the United Kingdom, Denmark, Canada, France, Sweden, Malaysia and Egypt.





Organisational Development

Research seeding programme

One of the Maurice Wilkins Centre's main objectives is to encourage early-stage research collaborations between investigators from different scientific disciplines, achieved through its contestable research seeding programme. Three rounds of the programme were held in 2012 and 28 new projects were approved.

New initiatives

The Maurice Wilkins Centre fosters new multidisciplinary, collaborative research that involves Centre investigators by providing working expenses to initiate work on ground-breaking projects. The aim is to spark projects that will grow into highly innovative and sustainable research programmes.

Projects awarded funding in 2012:

- Molecular analysis of rheumatic fever autoantibodies: Moreland, Dunbar and Baker, The University of Auckland
- Defining the toxicity of obesity conditioned mesenteric lymphatic fluid in acute severe illness: Windsor, Premkumar, Phillips and Greenwood; in collaboration with Dr Silas Vilas Boas, The University of Auckland
- The role of lung-resident CD103⁺ dendritic cells: Kirman, University of Otago; Wiles, The University of Auckland
- Identifying novel inhibitors of a crucial biosynthetic enzyme from *Mycobacterium tuberculosis*: Reichau and Parker, University of Canterbury; Flanagan and Baker, The University of Auckland
- Do bacterial non-coding RNAs subvert eukaryotic host defences?: Phillips, Print, Swift, Blenkiron and Askelund, The University of Auckland
- The role of p53 isoforms in the promotion of tumour invasion, angiogenesis and metastases: Braithwaite and Baird, University of Otago; Print, The University of Auckland
- Effects on human keratinocytes of drugs targeting melanoma: Cursons, Cooling, Hurley, Feisst and Dunbar, The University of Auckland; in collaboration with Prof Edmund Crampin, The University of Melbourne

- Use of circular polarized light for the detection and grading of live cancer cells: Eccles, University of Otago; Baguley, The University of Auckland; in collaboration with Prof Igor Meglinski and Mrs Lynn Slobbe, University of Otago
- Single cell metabolomics: high resolution mass spectrometry of cell contents, one cell at a time: D Williams, Dunbar, Greenwood; in collaboration with Prof Mike Dragunow, Assoc Prof Cather Simpson and Mr Bryon Wright, The University of Auckland
- Establishment of a strain repository for group A streptococcus (GAS) isolates and whole genome sequencing of GAS isolates of relevance to New Zealand: Moreland, Williamson, Dunbar and Fraser, The University of Auckland; in collaboration with Dr Phil Carter, Institute of Environmental Science and Research
- Engineering super-stable human antibody fragments with isopeptide bonds: Moreland, Baker and Young, The University of Auckland
- Molecular analysis of the major pilus gene from group A streptococcus strains commonly isolated from disease patients in New Zealand: Proft, Moreland and Loh, The University of Auckland
- Metabolic profiling of sequence type (ST)131 *Escherichia coli*: Wiles and Williamson, The University of Auckland; Patrick, University of Otago
- Glycopramlintide – investigation of the effect of glycosylation on therapeutic amylin analogues: Fairbanks, University of Canterbury; Brimble and D Hay, The University of Auckland
- Development of new FGF-receptor inhibitors for use in conjunction with hypoxia activated pro-drug triggers: Smaill, Patterson, Flanagan and Shepherd, The University of Auckland
- A racemic system for studying gamma-secretase activating protein: Harris, Squire, Young, and Dickson, The University of Auckland

Access to advanced equipment

The cost of accessing advanced equipment can be a barrier to scientific discovery. Through this category, Maurice Wilkins Centre investigators can access the Centre's advanced equipment anywhere in New Zealand to initiate exciting new projects.

Projects awarded funding in 2012:

- Evaluation of zinc finger nuclease specificity by exome sequencing: Wilson and Print, The University of Auckland
- Small RNA sequencing of medicinal maggot secretions: Blenkiron, Windsor, Phillips; in collaboration with Dr Lisa Brown, The University of Auckland
- Investigation of the molecular mechanisms of adipose-derived stem cell differentiation potential: Feisst, Brooks and Sheppard, The University of Auckland



- High resolution HLA genotyping of melanoma patients and melanoma cell lines by next generation sequencing: Verdon, The University of Auckland
- The effect of apelin peptides on bone cells: Cornish, Brimble and Kowalczyk, The University of Auckland
- Determination of novel auto-phosphorylation sites in PI3-kinase: Buchanan, The University of Auckland
- Exome sequencing of a family with familial dominant focal segmental glomerulosclerosis and bicornuate uterus: Davidson, Holm and Print, The University of Auckland; in collaboration with Dr Janak de Zoysa, Waitemata District Health Board
- Identification of microRNA candidates as biomarkers of the cancer-associated down regulation of the hepatic drug metabolizing enzyme CYP2C19: Helsby and Blenkiron, The University of Auckland
- Isolation, identification and composition of small toxic vesicles carried in mesenteric lymph during sepsis: Phillips, Brooks, Blenkiron and Hickey; in collaboration with Dr Jiwon Hong, The University of Auckland
- The effects of fixation on RNA-sequencing data in cancer tissues: Print and Blenkiron; in collaboration with Dr Ben Lawrence and Mr Peter Tsai, The University of Auckland.
- Sequencing the genomes of ancestral *Citrobacter rodentium*: Wiles and Hurley, The University of Auckland
- Characterisation of granulovirus polyhedral envelope membrane: Chui, Metcalf and Middleditch; in collaboration with Dr Adrian Turner, The University of Auckland

New investigators

In 2012, the Maurice Wilkins Centre continued to strengthen its national network of investigators with thirteen new associate investigators invited to join the Centre:

- Professor Margaret Baird, Department of Pathology, University of Otago
- Professor Antony Braithwaite, Department of Pathology, University of Otago
- Associate Professor Alan Davidson, Department of Molecular Medicine and Pathology, The University of Auckland
- Professor Rob Doughty, Department of Medicine, The University of Auckland
- Dr Richard Douglas, Department of Surgery, The University of Auckland
- Professor John McCall, Department of Surgical Sciences, University of Otago
- Associate Professor Sally McCormick, Department of Biochemistry, University of Otago
- Dr Nikki Moreland, School of Biological Sciences, The University of Auckland
- Professor Martyn Nash, Auckland Bioengineering Institute, The University of Auckland
- Professor Bruce Smaill, Auckland Bioengineering Institute, The University of Auckland
- Professor Russell Snell, School of Biological Sciences, The University of Auckland
- Dr Julie Spicer, Auckland Cancer Society Research Centre, The University of Auckland
- Professor David Williams, School of Chemical Sciences, The University of Auckland



Equipment and facilities

The Maurice Wilkins Centre was awarded \$4.3 million of capital equipment funding in 2002, and a further \$2.7 million in 2007, to purchase capital equipment for the CoRE, as part of its government funding. This investment in capital equipment through CoRE funding has enabled new research to be carried out, fostered national collaborations and contributed to many research publications.

Many items of equipment purchased with the first allocation of this funding are now reaching the end of their usable lifetime. The Centre began a replacement programme for smaller value items of equipment in 2011 and is developing a strategy around the replacement of large items of equipment.

While primarily used by Maurice Wilkins Centre investigators, the capital equipment purchased by the Centre has also provided valuable services for many New Zealand biotechnology companies and researchers based at CRIs and Health Boards.

In 2012 the Centre client list included:

- Auckland Clinical Studies Ltd
- New Zealand Racing Laboratory Services
- Waitemata District Health Board
- Auckland District Health Board
- Living Cell Technologies Ltd
- New Image Group Ltd
- Auckland University of Technology
- MP Biomedicals LLC

In 2012 a new good manufacturing practice (GMP) facility for manufacture of vaccine components was completed at The University of Auckland. This new facility, located at the School of Biological Sciences is now licensed by Medsafe to produce medicines that can be used in human trials. See the highlights story on page 13 for more information about this facility.

Equipment provided by the Maurice Wilkins Centre has enabled investigators to develop new technology. For example, in 2012 Mr Petr Tomek, a PhD student supervised by Associate Professor Lai-Ming Ching developed a new fluorescence assay for measuring the activity of an enzyme thought to be involved in immune suppression in cancer patients, indoleamine 2,3-dioxygenase. The new assay is 30-fold more sensitive and more stable than existing assays and is highly amenable for use in high throughput screening and when used with the Centre's Janus Robotic workstation, has the capacity to assay around 5,000 data points in one working day. A paper describing the new assay has been accepted for publication in 2013 and will be included in next year's report.

Human capability

The multidisciplinary and collaborative nature of Maurice Wilkins Centre research provides an excellent training environment for the young scientists and students who are our future science leaders.

PhD student support

The Centre supports a large cohort of PhD and MSc students within its associated research groups by providing funds for stipends, working expenses and travel, as well as opportunities to access specialised research equipment and facilities. In 2012 the Maurice Wilkins Centre provided full or partial scholarships for 35 PhD students. Twelve Maurice Wilkins Centre-associated PhD students completed their studies in 2012.

Future Science Day

In November, the Centre once again convened a successful Future Science Day incorporating career advice for young scientists and research presentations from PhD students.

The morning sessions of the programme featured research presentations from twelve senior Maurice Wilkins Centre PhD students: Simon Fung, Jen Sweny, Dmitri Joseph, Joseph Gingell, Weilin Hou, Katrin Schunemann, Yee Syuen Low, Matthew Bull, Paul Haseler, Hayden McEwen, Maggie Au and Nicola Blackmore.

The first session in the afternoon included an interview with Dr Jim Watson focussed on “Developing science careers in New Zealand” facilitated by Centre investigator Dr Hilary Sheppard, and a presentation from Dacia Herbulock (Science Media Centre) on “Tips for improving your science communication”.

The last session of the day was focussed on “What the Maurice Wilkins Centre can do for you” and included presentations from four affiliate investigators, Dr Anna Brooks, Dr Esther Bulloch, Mr Richard Sequira and Dr Vaughan Feisst, who were enabled through the Centre’s Flexible Research Seeding Programme to either develop their own personal expertise and skills or to develop new independent research (see following page). After these presentations Emeritus Professor Dick Bellamy facilitated a discussion session during which suggestions were invited for other initiatives the Centre could support which would benefit early career scientists.



Personnel exchanges

In order to maintain a world class research programme it is important that Maurice Wilkins Centre investigators and students keep up to date with international developments in their fields. The Centre provides support for staff and students to travel to conferences and technical workshops, and to visit other laboratories in New Zealand and overseas to acquire new skills and techniques.

In late 2011 the Centre launched a new scheme to help its early-career scientists train in cutting-edge technology, and share what they learn with their New Zealand colleagues. The contestable programme supports affiliate investigators' travel to international workshops and laboratories to learn new technical skills. A criterion for a successful application is that the investigator must present a plan for how they will disseminate their new knowledge and skills to other members of the New Zealand science community on their return.

During 2012, four affiliate investigators travelled under the scheme:

- Dr Anna Brooks runs a flow cytometry facility at The University of Auckland which is equipped by the Maurice Wilkins Centre and used by a wide range of researchers. She attended an international technical congress on cytometry in Leipzig, Germany, which attracted more than 1,000 delegates including many of the industry's experts, and involved hands-on time at workshops and tutorials. "It was hugely valuable experience for not only getting assurance that we are running our flow cytometer to leading edge standards, but also for the connections made through networking," she says. "It allowed me to enhance my skills as a flow cytometry manager and learn about all the new technologies and applications to help get the most out of our facility." As a result of attending the congress, Anna was invited to be part of the organising committee for the 2013 Australasian Flow Cytometry Group (AFCG) annual meeting and to chair a flow cytometry workshop as part of 2013 International Society for Cell Therapy (ISCT) meeting.
- Dr Esther Bulloch from The University of Auckland attended an intensive week-long course on nuclear magnetic resonance (NMR) spectroscopy at Stradbroke Island, Australia. Organized by The Australian and New Zealand Society for Magnetic Resonance (ANZMAG), and presented by international expert Professor James Keeler from the University of Cambridge, it included both theory and practical exercises. "I gained a deeper understanding of how NMR spectroscopy works," says Esther. "This has been invaluable for my own research into the structure of proteins from viruses, for which I use NMR spectroscopy on a regular basis." It has also benefited other Maurice Wilkins Centre researchers whom Esther assists in using NMR spectroscopy to analyse protein function. "The knowledge I gained has strengthened my ability to provide practical expertise and advice on NMR spectroscopy to others," she says. Esther also developed links with Australian colleagues that may allow her to access more powerful facilities than those currently available in New Zealand.
- Julia MacDonald, a Maurice Wilkins Centre-funded PhD student from The University of Auckland, travelled to the University of Melbourne to use and learn about analytical ultra centrifugation (AUC). Julia is studying a newly-discovered human protein implicated in a rare form of kidney stone disease. The data she gathered

using AUC showed unequivocally that the protein was configured in the way that other experiments performed in Auckland had suggested. "This trip added to the multi-disciplinary nature of my PhD, allowing me to obtain high-quality data about my protein. I also made useful connections with Australian researchers at the Bio21 Institute in Melbourne, and experienced working in a laboratory outside New Zealand," she says. Julia plans to share her experience with her colleagues. When she travelled to Melbourne, AUC was unavailable in New Zealand but in early 2013 an analytical centrifuge was installed at the University of Canterbury (Dr Renwick Dobson) and will be made available to researchers around New Zealand.

- Richard Sequeira, a PhD student from The University of Auckland studying *Staphylococcus aureus*, travelled to work with close collaborators at the University of Greifswald, Germany, where he gained access to one of the most impressive proteomics facilities in Europe. "It was an amazing experience, to not only learn and work with experts in their fields, but to also see the level of collaboration and projects shared amongst the European countries. I am extremely grateful to the Maurice Wilkins Centre for their support of not only the project but in assisting my development as a researcher," he says. As well as giving a presentation on his trip at the Centre's annual Future Science Day Richard has already shared his knowledge with a fellow New Zealand researcher, suggesting a new method for approaching a problem.

During 2012 the movement of PhD students between the laboratories of Maurice Wilkins Centre investigators across New Zealand has continued. This has largely been due to the requirement that PhD students funded through the multidisciplinary training category of the Centre's research seeding programme spend time working in more than one scientific discipline.

In 2012 the Centre also provided support for the following international exchanges:

- Dr Greg Smith, a research fellow working with Professor Peter Shepherd, visited the Shanghai Institute of Materia Medica (SIMM) in June to run pilot collaborative research experiments. Based on the success of the pilot visit, Greg and two other members of the Shepherd group, Dr Christina Buchanan and Ms Woo Lee all visited SIMM for a week in November to perform research and to set up assays for high throughput screens.
- Stephanie van Dalen, an international student from the Netherlands joined the lab of Professor Peter Shepherd for 6 months in 2012 as an intern to work on VEGF receptor inhibitors for targeting angiogenesis in cancer.
- Auckland Bioengineering Institute student Greg Bass spent 3 months at the Babraham Institute in Cambridge (UK) working with Dr Llew Roderick to generate data on calcium fluxes and NFAT translocation for his project researching spatio-temporal decoding of calcium signalling pathways in the heart. Greg's costs were supported by the Whitaker Foundation (USA), the Babraham Institute and the Maurice Wilkins Centre.
- Dr Rajan Gogna from Ohio State University spent five weeks in Auckland as a Visiting Research Fellow with Professor Peter Shepherd in mid-2012 working on a collaborative project investigating the relationship between p53 and PI3K. A joint publication based on this collaboration is in preparation.



International visits

The Maurice Wilkins Centre runs an international engagement programme to build partnerships with priority international institutions that benefit the Centre's investigator network. In 2012 this involved sending a delegation of Centre investigators to Shanghai in China and hosting a number of visiting delegations in New Zealand (see page 26). In addition to these activities, the Centre continues to host visits from international and national officials and scientists.

International and national officials and delegations

In 2012 Maurice Wilkins Centre investigators hosted or participated in visits by the following officials and delegations:

- *Hon Steven Joyce, Minister of Tertiary Education, February 2012*
- *Chinese Ministry of Science and Technology delegation to New Zealand, May 2012:*
Vice-Minister Chen Xiaoya, Vice-Minister of Science and Technology, Mr Manda Wang, First Secretary, Affairs of Science and Technology, Chinese Embassy, Wellington and seven other Chinese officials.
- *Zhejiang Province delegation to New Zealand, September 2012:*
Mr Jiang Taiwei, General Director and Ms Zeng Xiaopeng, Director, Division of International Cooperation, Zhejiang Provincial Department of Science & Technology; Mr Yu Fenghua, Director, Zhejiang Provincial Science and Technology Development Center; Mr Wang Yiqi, Director, Zhejiang Provincial S&T Exchange Center with Foreign Countries; Mr Zhou Qunchang, Director, Science and Technology Department of Qingtian County; Ms Liu Jun, Director, Institute of Statistics and Evaluation, Academy of Scientific & Technical Information of Zhejiang Province.
- *Chinese State Councillor delegation to The University of Auckland, December 2012:*
State Councillor Liu Yandong; Minister Yuan Guiren, Minister of Education; Vice-Minister Wang Zhigang, Vice-Minister of Science and Technology; Ambassador Xu Jianguo, Ambassador of China to New Zealand; Deputy Secretary-General Jiang Xiaojuan, General Office of the State Council; Vice-Minister Song Tao, Vice-Minister of Foreign Affairs; Director General Xu Lin, Hanban; Chinese Consul-General in Auckland Liao Juhua; Miao Shaobo, Secretary to the State Councillor; Xie Feng, Director-General, Department of North American and Oceanian Affairs, Ministry of Foreign Affairs; Jin Xiaoming, Director-General, Department of International Cooperation, Ministry of Science & Technology; Hou Yue, Counsellor, Protocol Department, Ministry of Foreign Affairs; Meng Mian, Counsellor, Information Department, Ministry of Foreign Affairs; Li Qiao, Director, Political Section, Chinese Embassy, Wellington; Xie Chengsuo, First Secretary, Affairs of Science and Technology, Chinese Embassy, Wellington.

New Zealand Government Officials: Mr Carl Worker, Ambassador of New Zealand to China; Ms Caroline Bilkey, Chief of Protocol, Ministry of Foreign Affairs and Trade; Mr Andrew Bishop, China Unit, Ministry of Foreign Affairs and Trade.

International science delegations

- *Maurice Wilkins Centre delegation to Shanghai, China, April 2012:*
Professor Peter Shepherd, Professor Bill Denny, Professor Margaret Brimble, Associate Professor Michael Hay, Dr Adam Patterson, Dr Jeff Smaill, Dr Jack Flanagan, Dr Diana Gash, Dr Seishi Gomibuchi, Mr Peter Lai and Dr Janice Choi, The University of Auckland; Dr Gary Evans and Dr Olga Zubkova, Callaghan Innovation; Associate Professor Emily Parker, University of Canterbury; Associate Professor David Larsen, University of Otago; Mr Adam Podmore, Auckland UniServices Ltd.
- *Colorado State University delegation to Auckland for TB workshop, May 2012:*
Professor Ian Orme, Professor Dean Crick, Associate Professor Anne Lenaerts and Professor Henry Thompson.
- *Shanghai Institute of Materia Medica delegation to New Zealand, August 2012:*
Mr Jianjun Cheng, Secretary; Professor Ye Yang, Deputy Director; Professor Ming-Wei Wang, Director, National Centre for Drug Screening; Professor Jianping Zuo, Professor Jia Li, Professor Fajun Nan, Professor Xin Xie, Ms Xueping Duan, Ms Yanlin Lin.
- *Guangzhou Institute of Biomedicine and Health delegation to New Zealand, August 2012:*
Professor Donghai Wu and Professor Ke Ding.
- *Asian Chemical Biology Initiative delegation to New Zealand, August 2012:*
Professor Motonari Uesugi, Professor Itaru Hamachi and Ms Mitsue Nakashima, Kyoto University, Japan; Professor Hiroyuki Osada and Professor Minoru Yoshida, Advanced Science Institute, RIKEN, Japan; Associate Professor Hiroki Oguri Hokkaido University, Japan; Professor Yan-Mei Li, Tsinghua University, China; Professor Ho Jeong Kwon, Yonsei University, Korea; Professor Sung Hoon Kim, Seoul National University, Korea.



International scientists

The Maurice Wilkins Centre hosts visits from international scientists so that they can share their knowledge and research experiences with the New Zealand research community and establish research links.

Visitors to the Centre in 2012 were:

- Professor Barbara Broeker, Greifswald University, Germany
- Professor Janine Cossy, ESPCI ParisTech, France
- Dr Helen Davies, University of Melbourne, Australia
- Professor Eleanor Dodson, The University of York, UK
- Professor Guy Dodson, The University of York, UK
- Dr Jilly Evans, PharmAria Therapeutics LLC, USA
- Dr Mark Gallop, Biotechnology Consultant, USA
- Dr Alan Garny, INRIA, France
- Professor Roderick Hubbard, The University of York, UK
- Professor Steve Kent, University of Chicago, USA
- Professor Paul Klenerman, University of Oxford, UK
- Associate Professor Peter Vee Sin Lee, University of Melbourne, Australia
- Professor Xuejun Li, Peking University, China
- Dr Ashley Mansell, Monash University, Australia
- Professor Harald Martens, Norwegian University of Life Sciences, Norway
- Professor Alex Matter, A-STAR, Singapore
- Associate Professor Sheila McAlpine, The University of New South Wales, Australia
- Dr Takahura Okada, RIKEN Research Centre for Allergy and Immunology, Japan
- Professor David Paterson, University of Oxford, UK
- Dr Tom Pfeifer, Centre for Drug Research and Development, Canada
- Professor Michael Sacks, University of Texas at Austin, USA
- Professor Shankar Subramaniam, University of California San Diego, USA
- Professor Aimin Xu, The University of Hong Kong, China
- Professor Weiliang Zhu, Shanghai Institute of Materia Medica, China

The centre also hosted numerous visits by scientists from within New Zealand.

External funding

Many of the projects within the Maurice Wilkins Centre research programme are supported by additional grants from other funding sources. The Centre also targets a proportion of its research budget to seed and develop new projects to the point where they become successful in securing competitive funding.

New Zealand funding

In 2012 Maurice Wilkins Centre investigators were awarded new grants worth more than \$30 million from New Zealand funding sources for research projects to be carried out over the next one to five years, including \$20 million from the Health Research Council of New Zealand and \$6.7 from the Marsden Fund.

International funding

In 2012 Maurice Wilkins Centre investigators secured new funding of over \$1.5 million from international sources to support future research.



Governance and management

Scientific Advisory Board

In its 2012 review, the Maurice Wilkins Centre's Scientific Advisory Board, comprising five internationally recognised scientists and bio-entrepreneurs, was of the unanimous view that the Centre is a productive, world-class science centre that undertakes remarkable and highly successful interdisciplinary programmes.

The comprehensive review, conducted from 26 to 28 September, included formal presentations to the Board on the Centre's research as well as discussions with senior and younger investigators and students. In its report following the meeting the Board made recommendations about the strategy the Centre should employ into the future, and these are now being considered by the Centre and its host institution, The University of Auckland.

The Board is chaired by Dr Jim Watson, Chief Executive Officer of Caldera Health Limited, who has founded and led biotechnology companies in New Zealand and held senior positions in science and government. Joining Dr Watson for this review were: Professor Peter Andrews, an eminent Queensland scientist and bio-entrepreneur, and a former Queensland Chief Scientist; Professor Suzanne Cory, President of the Australian Academy of Science and former Director of the Walter and Eliza Hall Institute of Medical Research; Professor Shankar Subramaniam, Professor and Chair of Bioengineering at the University of California, San Diego; Dr Jilly Evans, a world-leading drug developer and founding member of PharmAria Therapeutics, San Diego. Two members of the board were unable to attend this meeting, Professor Sir Tom Blundell, University of Cambridge and Professor Dick Wettenhall, University of Melbourne.

Governing Board

In 2012 the Governing Board consisted of Mr Bill Falconer (Chair), Ms Maxine Simmons (Biocatalyst Ltd), Professor Warren Tate (University of Otago), Professor Jane Harding (The University of Auckland), Professor Grant Guilford (The University of Auckland), and Professor Louise Nicholson (The University of Auckland).

Professor Warren Tate was appointed to the Board in January 2012. Professor Tate is a member of the Biochemistry Department at the University of Otago and is internationally respected for his work in understanding protein synthesis in living cells. He has served in a number of national and international roles in his career to date. He was awarded the 2010 Rutherford Medal, New Zealand's top science honour, and was named a Companion of the New Zealand Order of Merit in 2011.

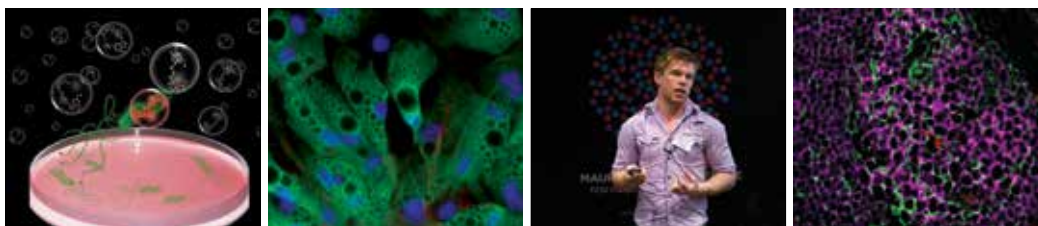
Professor Louise Nicholson was appointed to the board in March 2012. Professor Nicholson is the principal investigator of the Molecular Neuroanatomy Laboratory in the Department of Anatomy with Radiology and the Centre for Brain Research in the Faculty of Medical and Health Sciences at The University of Auckland. Professor Nicholson also serves in a number of national and international roles and is very involved in outreach initiatives for brain research, including the international 'Brain Bee Challenge' and 'Brain Day' events.

During the year the Board monitored progress of the Maurice Wilkins Centre research programme and its compliance with its funding mandate and budget. In addition the Board provided advice and direction on strategies for development of the Centre's research programme, on the Centre's international engagement programme and further improvements to the Centre's Annual Plan document.

Management Committee

The Maurice Wilkins Centre Management committee consists of the Centre's principal investigators; Professors Rod Dunbar (Director), John Fraser (Deputy Director), Ted Baker, Margaret Brimble, Garth Cooper, Bill Denny, Peter Hunter and Peter Shepherd. The committee controls the operation of the Centre, under the guidance of the Governing Board and the Scientific Advisory Board and met eight times during 2012.





Research Outputs

Publications

In 2012 research outputs from Maurice Wilkins Centre investigators included more than 508 peer-reviewed scientific papers and reviews published in international journals, and numerous patents. Research directly supported by the Maurice Wilkins Centre generated the following 119 scientific papers and 8 patents published or filed.

Papers and reviews

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Patents

Patents published

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Patents filed

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2. Brimble, M.A., Papst, S., Peltier, R., Tilley, R. D., Williams D. E. Metal nanoparticles. US Provisional Patent Application 13,561,527, 2012.
3. Brimble, M.A., Papst, S., Peltier, R., Tilley, R. D., Williams D. E. Iron nanoparticles. NZ Patent Application 598940, 2012.
4. Hopkins, B., Brimble, M.A. Rennison, D., Bova, S., Cavalli, M., Laita, O. Rodenticidal compounds. NZ Patent Application 598698, 2012.
5. Williams, G.M., Brimble, M.A. Synthetic polypeptides and uses thereof. US Provisional Patent Application 61,604,352, 2012.



Presentations

The international significance of the research being done by Maurice Wilkins Centre investigators and their teams is demonstrated by more than 160 invitations to give international and national presentations in 2012. The presentations included invited lectures at conferences and seminars at academic institutions in Argentina, Australia, Austria, Belgium, Canada, China, Denmark, France, Germany, Greece, India, Israel, Italy, Japan, Korea, Lithuania, Malaysia, Norway, Peru, Portugal, Puerto Rico, Saudi Arabia, South Africa, Spain, Switzerland, Vietnam, the United Kingdom, the United States of America and New Zealand, as shown in the diagram below.



Presentation highlights

Significant presentations given by Maurice Wilkins Centre investigators in 2012 include:

- Dr David Ackerley gave a keynote presentation “Development of enzymes that co-metabolise prodrugs and PET probes for anti-cancer gene therapy” at the New Zealand Society for Oncology Conference in Wellington.
- Professor Ted Baker was invited to give two plenary lectures in 2012. He delivered the lecture “Laue’s legacy to biology: the impact of X-ray diffraction on our understanding of living systems” to the 20th meeting of the German Crystallographic Society held in Munich, Germany. He also gave the lecture “Key roles for post-translational modifications in bacterial pili” to the ComBio2012 Conference held in Adelaide, Australia.
- Professor Margaret Brimble was invited to give a presentation at the 19th International Conference on Organic Synthesis in Melbourne in July. This prestigious biennial conference typically attracts over 1,000 participants from over 30 countries.

- Professor Gregory Cook, from the University of Otago, received the Distinguished Orator Award from the New Zealand Microbiological Society and gave the distinguished speaker's address at the Society's annual conference.
- Professor Bill Denny was invited to give the plenary lecture at the Australian Cancer Therapeutics CRC Annual Retreat in Melbourne. The lecture was entitled "Drug development in a University setting; the Auckland Cancer Society Research Centre." He also gave the Bruce Cain Memorial Lecture at the New Zealand Society for Oncology 2012 Conference.
- Dr Andrew Fidler was a Keynote Speaker at the 2012 International Society for Chemical Ecology Annual Meeting at Vilnius in Lithuania. The title of the presentation was "Activation of a tunicate xenobiotic receptor by marine microalgal biotoxins."
- Professor Colin Green was invited to give the Dame Ida Mann Memorial Lecture at the 44th Annual Science Congress of the Royal Australia and New Zealand College of Ophthalmologists in Melbourne in November. The lecture was entitled "Targeting gap junction channels to treat ocular injury and chronic disease".
- Professor Peter Hunter gave three plenary lectures in 2012 at the 8th European Solid Mechanics Conference (Graz, Austria), the Society for Industrial and Applied Mathematics Conference on Life Sciences (San Diego, USA) and at the Bioengineering12 Conference (Oxford, UK). He also gave keynote lectures on "Computational Physiology and the VPH/Physiome Project" at the World Congress on Medical Physics and Biomedical Engineering (Beijing, China) and at the Systems Biology of Mammalian Cells conference (Leipzig, Germany).
- Professor Ian Reid was invited to give nine plenary and keynote lectures on his work in bone research at meetings held in 2012; the Association Recherche Circulation Osseuse (Brussels, Belgium), the Saudi Osteoporosis Society International Conference (Riyadh, Saudi Arabia), Advances in Mineral Metabolism (Snowmass, USA), the 15th International and 14th European Congress of Endocrinology (Florence, Italy), the International Symposium on Nutritional Aspects of Osteoporosis (Lausanne, Switzerland), the International Workshop on Advances in the Molecular Pharmacology and Therapeutics of Bone Disease (Oxford, UK), the European Federation of Internal Medicine (Madrid, Spain), the Argentinean Society of Osteoporosis (Buenos Aires, Argentina) and the Indian Society of Bone and Mineral Research (Lucknow, India).
- Professor John Windsor was invited to give the BJS Distinguished Visitor 2012 Lecture, at the Royal Australasian College of Surgeons 81st Annual Scientific Congress held in Kuala Lumpur (Malaysia) in May. His plenary lecture was entitled "Collaborations with Universities in the making of an academic surgeon" and he also gave a keynote lecture at the congress entitled "Acute pancreatitis: order or disorder". Professor Windsor was the "Michael and Janie Miller Visiting Professor 2012" at the University of Witwatersrand in Johannesburg (South Africa) and gave the "Michael and Janie Miller Lecture", entitled "Innovations in the management of early severe pancreatitis" at the 23rd Biennial Surgical Symposium - Mastery of Surgery in June. Professor Windsor was also invited to give the "Jepson Lecture" at the 49th Annual Scientific Meeting of the Surgical Research Society of Australasia in November (Adelaide, Australia) with the lecture entitled "Streams in the Desert".



Collaborations

The Maurice Wilkins Centre contributes to and benefits from an extensive network of national and international collaborations that has been built up by our investigators over a number of years. The research funded through the Centre has strengthened many of these existing links and helped to establish new collaborations.

The international reach of these collaborations is shown in the diagram below.



New academic collaborations

University of Alberta (Canada)	University of Sheffield (UK)
Baylor College of Medicine (USA)	University of Warwick (UK)
Colorado State University (USA)	Australian National University (Australia)
Howard Hughes Medical Institute (USA)	Macquarie University (Australia)
The Rockefeller University (USA)	Monash University (Australia)
University of Massachusetts Medical School (USA)	University of Queensland (Australia)
Centre for Free-Electron Laser Science (Germany)	University of Sydney (Australia)
Jülich Research Centre (Germany)	Guangzhou Institute of Biomedicine and Health (China)
Julius Kühn-Institut (Germany)	Shanghai Institute of Materia Medica (China)
University of Rostock (Germany)	Tsinghua University (China)
Universidad Politécnica de Madrid (Spain)	Yonsei University (South Korea)

Continuing academic collaborations

North America

Simon Fraser University (Canada)
 University of British Columbia (Canada)
 University of Victoria (Canada)
 Albert Einstein College of Medicine (USA)
 Duke University (USA)
 Global Alliance for TB Drug Development (USA)
 Harvard University (USA)
 IUPS International Physiome Project (USA)
 Ludwig Institute for Cancer Research (USA)
 Massachusetts Institute of Technology (USA)
 Mayo Clinic (USA)
 Medical College of Wisconsin (USA)
 New York University (USA)
 Pennsylvania State University (USA)
 Proacta Inc (USA)
 Stanford University (USA)
 Salk Institute (USA)
 Seattle Biomedical Research Institute (USA)
 Texas Medical Center (USA)
 The International TB Structural Genomics Consortium (USA)
 The Scripps Research Institute (USA)
 The University of Chicago (USA)
 The University of Illinois (USA)
 University of North Carolina (USA)
 University of Washington (USA)
 Wake Forest University (USA)
 Yeshiva University (USA)

UK and Europe

Virtual Physiological Human (VPH) Institute (Belgium)
 Arhus University (Denmark)
 Aachen University (Germany)
 The Philipp University of Marburg (Germany)
 The University of Kiel (Germany)
 University of Münster (Germany)
 University of Iceland (Iceland)
 Dublin City University (Ireland)
 National Institute of Occupational Health (Norway)
 Norwegian University of Life Sciences (Norway)
 Drugs for Neglected Diseases Initiative (Switzerland)
 Leiden University (The Netherlands)
 Maastricht University (The Netherlands)
 Aston University (UK)
 Cardiff University School of Medicine (UK)
 European Bioinformatics Institute (UK)
 Imperial College London (UK)
 Nottingham University (UK)
 The John Innes Centre (UK)
 University of Cambridge (UK)
 University College London (UK)
 University of Manchester (UK)
 University of Oxford (UK)
 University of Warwick (UK)



Asia Pacific

Burnett Institute (Australia)

Children's Medical Research Institute,
Sydney (Australia)

La Trobe University (Australia)

Monash University (Australia)

Peter MacCallum Cancer Centre (Australia)

The South Australian Research and
Development Institute (Australia)

The University of Melbourne (Australia)

The University of Western Australia
(Australia)

University of Sydney (Australia)

University of Queensland (Australia)

Walter and Eliza Hall Institute (Australia)

Hong Kong University of Science and
Technology (China)

Osaka University (Japan)

Riken Centre for Allergy and Immunology
(Japan)

Singapore National Imaging Institute
(Singapore)

Inje University (South Korea)

Seoul National University (South Korea)

Middle East

Israel Oceanographic and Limnological
Research (Israel)

Uptake of Maurice Wilkins Centre research and expertise

The primary focus of the Maurice Wilkins Centre is on finding new ways to effectively target human disease. The Centre drives the translation of its research and expertise from the laboratory through a variety of partnerships with commercial and non-profit organisations, in New Zealand and overseas.

The creation of spin-out companies is an important pathway for the development of the Centre's research, and often brings in international partners and funds. Maurice Wilkins Centre investigators maintain close links with such companies and further work is regularly contracted back to their research groups. The Centre has close links with companies spun out by its investigators such as Proacta Inc and Pathway Therapeutics Ltd.

The Maurice Wilkins Centre also partners with established companies, and the knowledge and expertise that its investigators have developed in scientific fields vital to the biotechnology and pharmaceutical sectors are highly sought after. Examples of contract research and the provision of facilities to industry are outlined on page 29 - 30 of this report. The Centre's investigators also act as consultants for a number of national and international companies. In 2012 the expertise of Maurice Wilkins Centre investigators was sought by:

Aeroqual Ltd	FB Rice (Australia)
AFT Pharmaceuticals Ltd	Fisher and Paykel Healthcare
Alder Biopharmaceuticals Inc (USA)	Fonterra Co-operative Group Ltd
Amgen Inc (USA)	Glycosyn
AstraZeneca (UK)	Industrial Research Ltd (now Callaghan Innovation)
Biomatters Ltd (Auckland)	Innate Therapeutics Ltd
Bayer Animal Health Ltd	Integrated BioTherapeutics (USA)
Cancer Research Technology Ltd (UK)	Izon Sciences Ltd
Canterbury Scientific Ltd	Janssen Therapeutics (USA)
Centella Therapeutics Inc (USA)	L2 Diagnostics LLC (USA)
CoDa Therapeutics Inc (USA)	Landcare Research New Zealand Ltd
CoDaTherapeutics Ltd (NZ)	Lanzatech NZ Ltd
Comvita Ltd	Livestock Improvement Corporation Ltd
Connovation Ltd	Merck & Co Inc (USA)
Dairy NZ	Novartis International AG (Switzerland)
Douglas Pharmaceuticals	OBodies Ltd
Enzymatics Inc (USA)	



Onyx Scientific Ltd (UK)

Seeka Kiwifruit Ltd

Paraco Technology Ltd

Sirtex Medical Ltd (Australia)

Pathway Therapeutics Ltd (USA)

Tetralogic Pharmaceuticals (USA)

Proacta Therapeutics Ltd (USA)

VQ Orthocare (USA)

Ruga Corp (USA)

Zespri International Ltd

Sanofi Aventis LLC (USA)

The establishment of partnerships with international non-profit organisations is another way in which the Maurice Wilkins Centre achieves uptake of its research and expertise.

For example, researchers associated with the Centre and based at the Auckland Bioengineering Institute are paid to work on the "Human Physiome Project", along with European collaborators, under the European Commission Framework Programme. Maurice Wilkins Centre investigators are also involved with international non-profit organisations such as the Global Alliance for TB Drug Development and the TB Structural Genomics Consortium.

Awards and honours

International, national, and institutional honours won by Maurice Wilkins Centre investigators, affiliates, and students in 2012:

- **EMBS Academic Career Achievement Award**

Distinguished Professor Peter Hunter, Director of the Auckland Bioengineering Institute, was awarded the Academic Career Achievement Award of the International Institute of Electrical and Electronics Engineers' (IEEE) Engineering in Medicine and Biology Society (EMBS). The award recognised his pioneering contributions to multi-scale physical modelling of biological systems, especially the Physiome Project.

- **Rutherford Medal, Hector Medal, MacDiarmid Medal**

Distinguished Professor Margaret Brimble from The University of Auckland won three awards at the Royal Society of New Zealand's annual research honours celebration, including the top award. The honours recognise her exceptional contribution to New Zealand society in science and technology (Rutherford Medal); outstanding contribution to the advancement of chemical sciences (Hector Medal); and research with the potential for human benefit (MacDiarmid Medal) (see page 7).

- **Sir Charles Hercus Medal**

Professor John Fraser, Dean of Medical and Health Sciences at The University of Auckland, received the Sir Charles Hercus Medal, for excellence in health science. The medal honours his pioneering studies on bacterial superantigens, which have major implications for understanding and treating a variety of human infectious diseases (see page 7).

- **Pickering Medal**

Professor David Williams from The University of Auckland received the Pickering Medal, the Royal Society's top award for achievement in technology. It recognised his contribution to the development of biomedical and gas sensors, which have been commercialised (see page 7).

- **Thompson Medal**

Dr Richard Furneaux, Distinguished Scientist and group manager of carbohydrate chemistry at Callaghan Innovation, won the Royal Society's Thompson Medal. The award honours his outstanding and inspirational leadership of carbohydrate chemistry research and its commercial application to biotechnology in New Zealand (see page 7).



- Companion of the New Zealand Order of Merit**

Distinguished Professor Margaret Brimble, formerly a Member of the New Zealand Order of Merit, was made a Companion of the New Zealand Order of Merit in the 2012 New Year Honours, for services to science.
- University of Auckland Commercialisation Medals**

Distinguished Professor Bill Denny and Professor William Wilson, from the Auckland Cancer Society Research Centre (ACSRC), were inaugural recipients of The University of Auckland's Commercialisation Medals. The honour recognised the ACSRC's role in taking ten novel anti-cancer drugs to clinical trial, filing around 100 patents and launching three start-up companies which have raised more than US \$50 million.
- Gold Medal for Research Excellence**

Associate Professor Mark Hampton, who leads the Centre for Free Radical Research at the University of Otago, won the university's Gold Medal for Research Excellence.
- Science Communicator Award**

Dr Siouxsie Wiles from The University of Auckland won the New Zealand Association of Scientists' Science Communicators Award. It recognises her commitment to communicating a range of scientific issues of interest to the public, in addition to her specialist area (microbiology), through traditional print and broadcast media outlets as well as social media and other communication formats.
- New Zealand Society for Oncology Translational Research Award**

Distinguished Professor Bill Denny received the New Zealand Society for Oncology Translation Research Award, awarded to a member of the society who has made an outstanding contribution to the field of translational cancer research.
- Arthritis New Zealand National Distinguished Service Award**

Professor Colin Green from The University of Auckland was presented with an Arthritis New Zealand National Distinguished Service Award by the Governor-General at Government House. The award related largely to his work for Arthritis New Zealand as a member of their grant review panel.
- Distinguished Orator Award**

Professor Gregory Cook, from the University of Otago, received the Distinguished Orator Award from the New Zealand Microbiological Society and gave the distinguished speaker's address at the society's annual conference.

- **Chair of Marsden Fund Council**

Professor Juliet Gerrard from the University of Canterbury was named the new chair of Marsden Fund Council, replacing Distinguished Professor Peter Hunter whose term expired in early 2012.

- **Educational Publishing Awards**

Professor Peter Shepherd with co-author Rachel Heeney, Head of Biology at Epsom Girls Grammar School, won the Best Book or Series in Secondary Publishing award at the Copyright Licensing New Zealand (CLNZ) Educational Publishing Awards for their text book, "Life Processes, Ecology and Evolution – NCEA Level 2", published by Pearson Education New Zealand. (For more on Peter and Rachel's work supporting biology teachers see page 17).

- **Fellowships**

Two researchers associated with the Maurice Wilkins Centre received prestigious research fellowships in 2012: Dr Renata Kowalczyk was awarded the Rutherford Foundation Freemasons Roskill Foundation Postdoctoral Fellowship and Dr Brie Sorrenson won a Heart Foundation (New Zealand) Research Fellowship.



Financial Report 2012

Operating Fund^a

	\$ 2012	\$ 2011
<u>Income</u>		
CoRE grant	4,015,450	3,994,871
Equipment user charges ^b	248,977	227,149
Other income ^c	27,449	36,059
Balance from previous year ^d	2,594,489	2,454,596
Total Income	6,886,365	6,712,675
<u>Expenditure</u>		
Salaries ^e	977,591	996,073
Overheads	960,223	906,270
Project costs ^f	1,280,491	978,246
Student support (PhD and other) ^f	722,866	667,679
Travel	208,717	62,007
Depreciation	586,624	507,912
Total Expenses	4,736,512	4,118,186
Income less expenditure^g	2,149,853	2,594,489

Capital Expenditure Fund

Income

Balance of TEC grant 2002	10,556
Balance of TEC grant 2008	9,562

Total Income 20,118

Expenditure

Capital expenditure 2012 20118

Funds carried forward to 2013 0

Notes

- a) This financial report is for the period 1st January to 31st December 2012 and covers the second six months of the Maurice Wilkins Centre Year 10 and the first six months of Maurice Wilkins Centre Year 11 (CoRE grant 2008 to 2014). This report only details income and expenditure relating to the CoRE grant funding that the Centre receives from the Tertiary Education Commission. It does not contain details of external operating funding to Centre investigators from other funding agencies.
- b) These equipment user charges are collected by the Centre from users of the large items of capital equipment purchased with funding from the Centre capital equipment fund. The charges are used to offset the operational and depreciation costs of the equipment.
- c) This income is from The University of Auckland Foundation and UniServices and has been used to balance costs incurred by the Maurice Wilkins Centre in 2012 for salaries.
- d) This balance of funding is from previous years of the Maurice Wilkins Centre will be used to fund initiatives supporting the Centre's research programme from 2013 to the end date of the current funding grant from the Tertiary Education Commission. The funding provided in the current grant is based on a flat line budget which does not allow for annual increases in salaries or other operating costs. To ensure that these costs are able to be met in later years of contract, the Centre's operating budget has been structured so that expenditure is less than income in the early years of this grant and the resulting credit balance is used to ensure continuity of support for the Centre's research programme in the later years of the grant.
- e) Summary: Maurice Wilkins Centre supported research staff FTEs 2012

Principal Investigators	0.50
Research Fellows	9.48
Research Technicians	4.53
Total	14.51

The expenditure on salaries includes an adjustment of -\$173,594.12 that was transferred to the Maurice Wilkins Centre from another fund at The University of Auckland in recognition of personnel support provided for operation of the protein X-ray facility from 2008 to 2012. These funds will be used in 2013 and 2014 to provide further support for the facility.

- f) These costs include the costs of subcontracts for associate investigators' research projects during 2012.
- g) This balance of funding will be used to fund initiatives supporting the Maurice Wilkins Centre research programme from 2013 to the end date of the current funding grant from the Tertiary Education Commission (see note d).



Directory

Governing Board

Mr Bill Falconer (Chair)
Prof Grant Guilford
Prof Jane Harding
Prof Louise Nicholson
Ms Maxine Simmons
Prof Warren Tate

Scientific Advisory Board

Dr Jim Watson (Chair)
Prof Peter Andrews
Prof Sir Tom Blundell
Prof Suzanne Cory
Dr Jilly Evans
Prof Shankar Subramaniam
Prof Dick Wettenhall

Principal investigators

Prof Rod Dunbar (Director)	School of Biological Sciences	The University of Auckland
Prof John Fraser (Deputy Director)	Dean, Faculty of Medical and Health Sciences	The University of Auckland
Prof Ted Baker	School of Biological Sciences	The University of Auckland
Prof Margaret Brimble	School of Chemical Sciences	The University of Auckland
Prof Garth Cooper	School of Biological Sciences	The University of Auckland
Prof Bill Denny	Auckland Cancer Society Research Centre	The University of Auckland
Prof Peter Hunter	Auckland Bioengineering Institute	The University of Auckland
Prof Peter Shepherd	Department of Molecular Medicine and Pathology	The University of Auckland

Associate investigators

Dr David Ackerley	School of Biological Sciences	Victoria University of Wellington
Assoc Prof Iain Anderson	Auckland Bioengineering Institute	The University of Auckland
Prof Vic Arcus	Department of Biological Sciences	University of Waikato
Prof Paul Atkinson	School of Biological Sciences	Victoria University of Wellington
Dr David Baddeley	Department of Physiology	The University of Auckland
Prof Bruce Baguley	Auckland Cancer Society Research Centre	The University of Auckland
Prof Margaret Baird	Department of Pathology	University of Otago
Mr Adam Bartlett	Department of Surgery	The University of Auckland
Dr Mik Black	Department of Biochemistry	University of Otago
Dr Gib Bogle	Auckland Bioengineering Institute	The University of Auckland
Prof Antony Braithwaite	Department of Pathology	University of Otago
Dr Reuben Broome	Department of Medical Oncology	Auckland City Hospital
Prof Peter Browett	Department of Molecular Medicine and Pathology	The University of Auckland
Dr Christina Buchanan	Department of Molecular Medicine and Pathology	The University of Auckland

Assoc Prof Lai-Ming Ching	Auckland Cancer Society Research Centre	The University of Auckland
Prof Gregory Cook	Department of Microbiology and Immunology	University of Otago
Dr Mike Cooling	Auckland Bioengineering Institute	The University of Auckland
Assoc Prof Brent Copp	School of Chemical Sciences	The University of Auckland
Prof Jillian Cornish	Department of Medicine	The University of Auckland
Dr Edmund Crampin	Auckland Bioengineering Institute	The University of Auckland
Prof Kathryn Crosier	Department of Molecular Medicine and Pathology	The University of Auckland
Prof Phil Crosier	Department of Molecular Medicine and Pathology	The University of Auckland
Prof John Cutfield	Department of Biochemistry	University of Otago
Dr Gabriele Dachs	Department of Pathology	University of Otago Christchurch
Assoc Prof Alan Davidson	Department of Molecular Medicine and Pathology	The University of Auckland
Prof Catherine Day	Department of Biochemistry	University of Otago
Dr Andrew Dingley	School of Chemical Sciences	The University of Auckland
Prof Rob Doughty	Department of Medicine	The University of Auckland
Dr Richard Douglas	Department of Surgery	The University of Auckland
Prof Mike Eccles	Department of Pathology	University of Otago
Dr Gary Evans	Callaghan Innovation	
Prof Antony Fairbanks	Department of Chemistry	University of Canterbury
Dr Andrew Fidler	Cawthron Institute	
Prof Mike Findlay	Department of Oncology	The University of Auckland
Dr Jack Flanagan	Auckland Cancer Society Research Centre	The University of Auckland
Dr Richard Furneaux	Callaghan Innovation	
Prof Juliet Gerrard	School of Biological Sciences	University of Canterbury
Prof Dave Grattan	Department of Anatomy and Structural Biology	University of Otago
Prof Colin Green	Ophthalmology	The University of Auckland
Assoc Prof David Greenwood	Plant and Food Research	
Prof Parry Guilford	Department of Biochemistry	University of Otago
Assoc Prof Mark Hampton	Free Radical Research Group	University of Otago Christchurch
Dr Paul Harris	School of Chemical Sciences	The University of Auckland
Assoc Prof Debbie Hay	School of Biological Sciences	The University of Auckland
Assoc Prof Michael Hay	Auckland Cancer Society Research Centre	The University of Auckland
Dr Nuala Helsby	Department of Molecular Medicine and Pathology	The University of Auckland



Dr Ian Hermans	Malaghan Institute of Medical Research	
Dr Tony Hickey	School of Biological Sciences	The University of Auckland
Prof Sarah Hook	School of Pharmacy	University of Otago
Dr Julia Horsfield	Department of Pathology	University of Otago
Prof Geoffrey Jameson	Institute of Fundamental Sciences	Massey University
Dr Stephen Jamieson	Auckland Cancer Society Research Centre	The University of Auckland
Dr Mia Jüllig	School of Biological Sciences	The University of Auckland
Dr Richard Kingston	School of Biological Sciences	The University of Auckland
Dr Joanna Kirman	Malaghan Institute of Medical Research	
Prof Kurt Krause	Department of Biochemistry	University of Otago
Assoc Prof Anne La Flamme	School of Biological Sciences	Victoria University of Wellington
Assoc Prof David Larsen	Department of Chemistry	University of Otago
Prof Graham Le Gros	Malaghan Institute of Medical Research	
Dr David Long	Auckland Bioengineering Institute	The University of Auckland
Dr Kerry Loomes	School of Biological Sciences	The University of Auckland
Dr Shaun Lott	School of Biological Sciences	The University of Auckland
Prof John McCall	Department of Surgical Sciences	University of Otago
Dr Melanie McConnell	Malaghan Institute of Medical Research	
Assoc Prof Sally McCormick	Department of Biochemistry	University of Otago
Assoc Prof Mark McKeage	Department of Pharmacology	The University of Auckland
Prof Andrew Mercer	Department of Microbiology and Immunology	University of Otago
Assoc Prof Peter Metcalf	School of Biological Sciences	The University of Auckland
Assoc Prof Alok Mitra	School of Biological Sciences	The University of Auckland
Dr Nikki Moreland	School of Biological Sciences	The University of Auckland
Dr Kathy Mountjoy	Department of Physiology	The University of Auckland
Dr Rinki Murphy	Department of Medicine	The University of Auckland
Prof Martyn Nash	Auckland Bioengineering Institute	The University of Auckland
Assoc Prof Richard Newcomb	Plant and Food Research	
Prof Poul Nielsen	Auckland Bioengineering Institute	The University of Auckland
Dr Justin O'Sullivan	Liggins Institute	The University of Auckland
Dr Gavin Painter	Callaghan Innovation	
Assoc Prof Brian Palmer	Auckland Cancer Society Research Centre	The University of Auckland
Prof Emily Parker	Department of Chemistry	University of Canterbury
Dr Wayne Patrick	Department of Biochemistry	University of Otago

Assoc Prof Adam Patterson	Auckland Cancer Society Research Centre	The University of Auckland
Assoc Prof James Paxton	Department of Pharmacology and Clinical Pharmacology	The University of Auckland
Dr Anthony Phillips	School of Biological Sciences	The University of Auckland
Assoc Prof Cristin Print	Department of Molecular Medicine and Pathology	The University of Auckland
Assoc Prof Thomas Proft	Department of Molecular Medicine and Pathology	The University of Auckland
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Prof Ian Reid	Department of Medicine	The University of Auckland
Assoc Prof Gordon Rewcastle	Auckland Cancer Society Research Centre	The University of Auckland
Dr Johannes Reynisson	School of Chemical Sciences	The University of Auckland
Prof Franca Ronchese	Malaghan Institute of Medical Research	
Prof Bruce Smail	Auckland Bioengineering Institute	The University of Auckland
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Prof James Sneyd	Department of Mathematics	The University of Auckland
Assoc Prof Christian Soeller	Department of Physiology	The University of Auckland
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Dr Christopher Squire	School of Biological Sciences	The University of Auckland
Dr Vinod Suresh	Auckland Bioengineering Institute	The University of Auckland
Dr John Taylor	School of Biological Sciences	The University of Auckland
Assoc Prof Matt Templeton	Plant and Food Research	
Dr Moana Tercel	Auckland Cancer Society Research Centre	The University of Auckland
Dr Peter Tyler	Callaghan Innovation	
Dr Joel Tyndall	School of Pharmacy	University of Otago
Dr Siouxsie Wiles	Department of Molecular Medicine and Pathology	The University of Auckland
Prof David Williams	School of Chemical Sciences	The University of Auckland
Dr Geoff Williams	School of Biological Sciences	The University of Auckland
Prof William Wilson	Auckland Cancer Society Research Centre	The University of Auckland
Prof John Windsor	Department of Surgery	The University of Auckland
Dr Sarah Young	Department of Pathology	University of Otago
Dr Shaoping Zhang	School of Biological Sciences	The University of Auckland



Affiliate investigators

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Ms Soumeya Ali Jaballah	School of Biological Sciences	The University of Auckland
Dr Catherine Angel	School of Biological Sciences	The University of Auckland
Ms Maggie Au	School of Biological Sciences	The University of Auckland
Mr Htin Aung	Department of Microbiology and Immunology	University of Otago
Mrs Heather Baker	School of Biological Sciences	The University of Auckland
Dr Ghader Bashiri	School of Biological Sciences	The University of Auckland
Ms Nicola Blackmore	Department of Chemistry	University of Canterbury
Dr Cherie Blenkiron	Department of Molecular Medicine and Pathology	The University of Auckland
Dr Muriel Bonnet	Auckland Cancer Society Research Centre	The University of Auckland
Dr Anna Brooks	School of Biological Sciences	The University of Auckland
Mr Matthew Bull	Auckland Cancer Society Research Centre	The University of Auckland
Dr Esther Bulloch	School of Biological Sciences	The University of Auckland
Ms Kristina Burkert	School of Biological Sciences	The University of Auckland
Mr Jason Busby	School of Biological Sciences	The University of Auckland
Mr Colm Carraher	School of Biological Sciences	The University of Auckland
Ms Ai Fen Chai	School of Biological Sciences	The University of Auckland
Ms Ann Chang	Department of Molecular Medicine and Pathology	The University of Auckland
Dr Elaine Chiu	School of Biological Sciences	The University of Auckland
Ms Fiona Clow	Department of Molecular Medicine and Pathology	The University of Auckland
Ms Tammie Cookson	Department of Chemistry	University of Canterbury
Dr Janine Copp	School of Biological Sciences	Victoria University of Wellington
Dr Matthew Cumming	Department of Biochemistry	University of Otago
Dr Stephanie Dawes	School of Biological Sciences	The University of Auckland
Dr James Dickson	School of Biological Sciences	The University of Auckland
Ms Alicia Didsbury	School of Biological Sciences	The University of Auckland
Dr Renwick Dobson	School of Biological Sciences	The University of Canterbury
Dr Genevieve Evans	School of Biological Sciences	The University of Auckland
Dr Vaughan Feisst	School of Biological Sciences	The University of Auckland
Mr Matteo Ferla	Department of Biochemistry	University of Otago
Ms Orla Finch	School of Chemical Sciences	The University of Auckland
Dr Damien Fleetwood	School of Biological Sciences	The University of Auckland
Mr Simon Fung	Auckland Cancer Society Research Centre	The University of Auckland
Dr Olivier Gasser	Malaghan Institute of Medical Research	

Mr Ray Ge	School of Biological Sciences	The University of Auckland
Dr Monica Gerth	Institute of Natural Sciences	Massey University
Mr Joseph Gingell	School of Biological Sciences	The University of Auckland
Dr David Goldstone	School of Biological Sciences	The University of Auckland
Dr Chris Guise	Auckland Cancer Society Research Centre	The University of Auckland
Dr Cyril Hamiaux	Plant and Food Research	
Ms Paulina Hanson-Manful	Institute of Natural Sciences	Massey University
Mr Paul Haseler	School of Chemical Sciences	The University of Auckland
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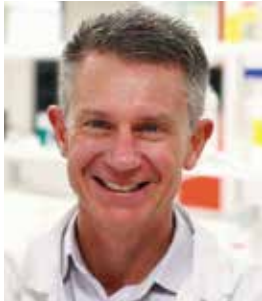
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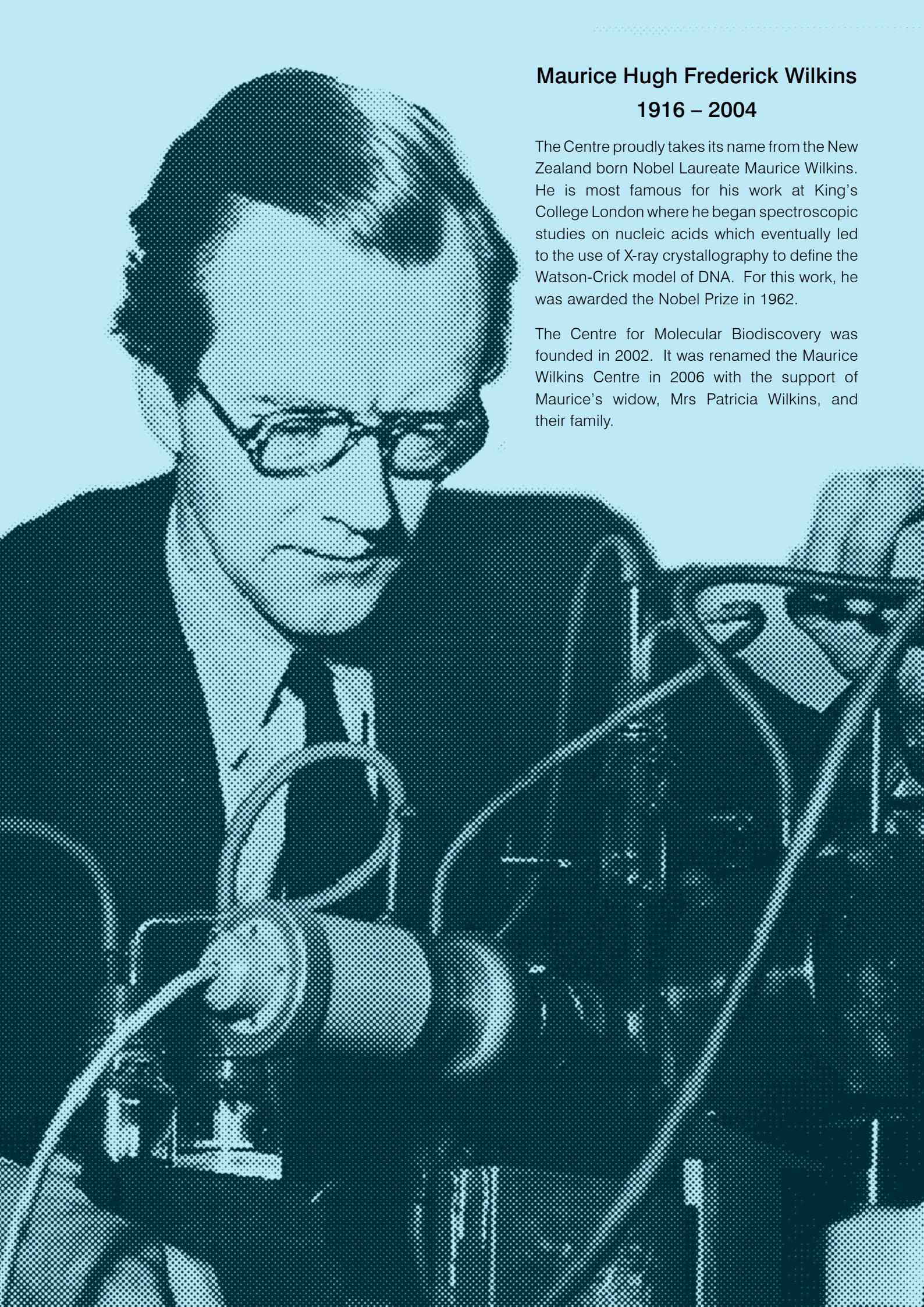
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Maurice Hugh Frederick Wilkins

1916 – 2004

The Centre proudly takes its name from the New Zealand born Nobel Laureate Maurice Wilkins. He is most famous for his work at King's College London where he began spectroscopic studies on nucleic acids which eventually led to the use of X-ray crystallography to define the Watson-Crick model of DNA. For this work, he was awarded the Nobel Prize in 1962.

The Centre for Molecular Biodiscovery was founded in 2002. It was renamed the Maurice Wilkins Centre in 2006 with the support of Maurice's widow, Mrs Patricia Wilkins, and their family.

