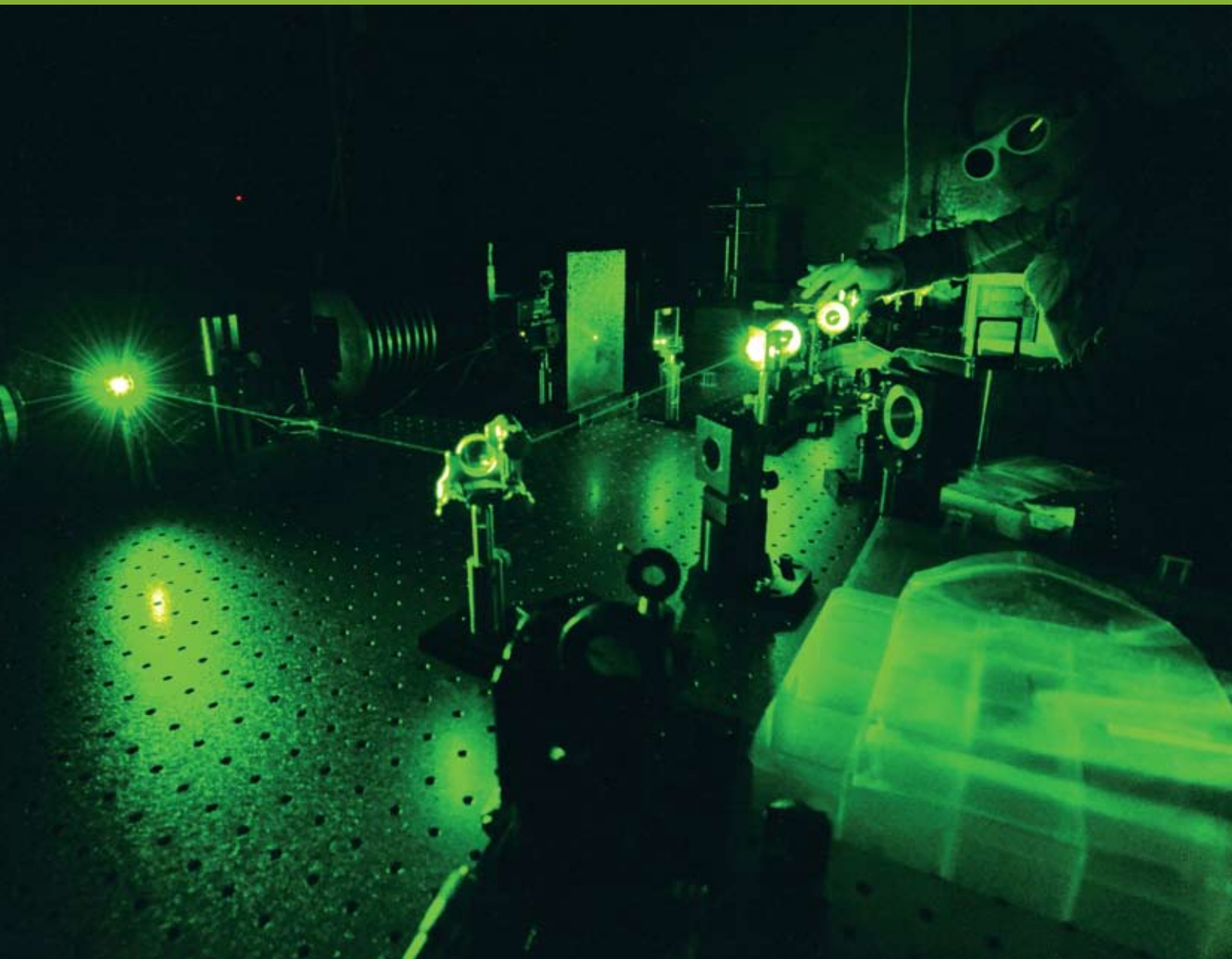


Strategic Priority two

> Grow our research, development and application excellence





< Peter Tyler
– elected RSNZ Fellow

WHAT WE HAVE DONE

A review of our R&D project management system has shown it works well on a day-to-day basis but that overall monitoring and reporting need to be improved and our project selection needs to be better linked into IRL's strategy.

IRL prides itself on its "Good Employer" policies and has in place best practice processes to create a congenial, collaborative and participative work environment. Our HR systems and processes are designed to deliver reward and recognition on a fair and equitable basis and contribute to the overall development of the individual as well as the organisation.

We promote the Good Employer principles through our policies and practices including:

- leadership, accountability and culture development
- recruitment, selection and induction
- employee development, education and training
- flexibility and work design
- remuneration, recognition and employment conditions
- harassment and bullying prevention
- a safe and healthy environment.

Workforce planning processes are in place at all levels of the organisation and have been endorsed by the Office of the Auditor-General.

Staff development is central to IRL's future growth and the Leadership Development Programme, begun in the 2007/08 financial year, remains a key initiative in this area, with 48 staff attending the programme in the 2008/09 year.

Other staff development activities include internal training courses and participation in national and international seminars, with particular emphasis on science staff developing business skills that complement their scientific expertise.

A number of science and engineering staff attended selected international seminars in their particular area of research interest.

The status of IRL scientists and engineers has been affirmed in the awards they have gained and their contribution at international conferences.



< Tim Kemmitt
 – winner of SEANZ Industry Award for photovoltaics

R&D project management

A review of our R&D project management system has concluded that, in general, it is working well. We did, however, recognise that our reporting and monitoring of projects could be improved and that there needed to be a more specific alignment of projects with our strategic plan. We expect that the introduction of our new financial reporting system, TM1, will help us achieve better oversight of projects by allowing us to monitor integrated data from several sources. Our initiative to develop operational plans (see Strategic Priority four) for our six science and engineering groups is an important step toward ensuring projects meet IRL strategy, especially in the key area of greater engagement with industry.

Good employer policies

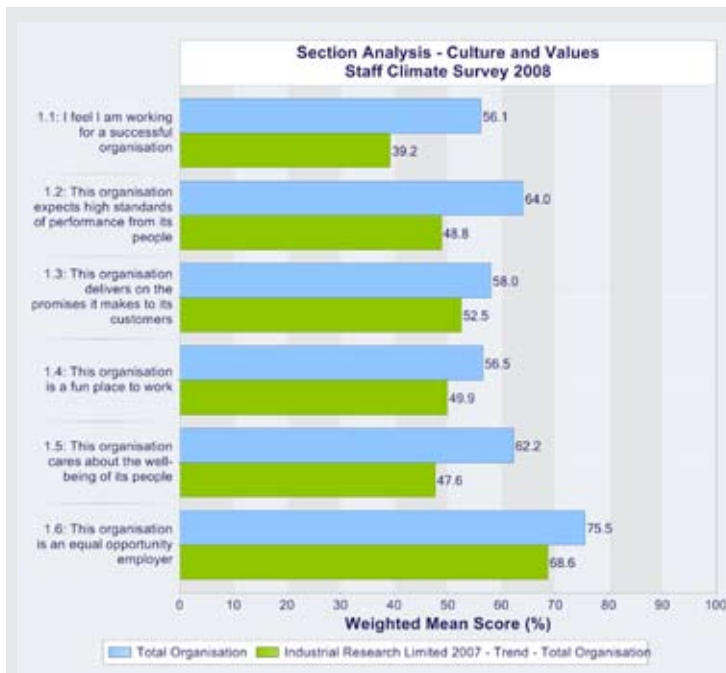
IRL's workforce comes from around 35 different countries, covers a wide age range, is from varied backgrounds, and has a wide variety of skills and a range of physical abilities. The workforce also has a good gender mix, especially in the younger demographic of the workforce, reflecting the growing numbers of women choosing science and engineering as a career. We embrace this diversity by putting in place robust

mechanisms and initiatives to ensure staff feel safe, valued and committed to the organisation.

There are a number of programmes in place to support new recruits and their families and these recognise the fact that a large proportion (around 50%) of IRL's staff are recruited from overseas. The initiatives also recognise the importance of supporting the whole family to ensure long-term retention. The programmes include free English as a second language classes for staff and their families who do not have English as their first language and a dedicated liaison officer to support the staff member and their family on arrival. Our policy of flexible working hours encourages work/life balance.

Career progression for science staff is by way of a structured competency-based system that recognises individual staff development and is integrated with our unique Performance Planning and Review system. A robust exit process encourages staff to critique existing systems and processes and suggest improvements.

In order to recruit and retain the best talent available, IRL operates a market-competitive remuneration system linked to a robust and effective performance review process. This ensures high performance is both encouraged and rewarded.





< Chris Sutton
– distinguished scientist in MSL
with replica of the kilogram prototype

Our efforts in this area have been endorsed by the results of our Staff Climate Survey. The latest survey, completed in August 2008, showed improved satisfaction ratings, compared with the 2007 survey, with IRL's policies and processes in leadership and development, performance and feedback, and reward and recognition. IRL also rated strongly as an equal opportunity employer and a large majority of respondents said they were intending to continue working at the organisation for at least the next 12 months. A majority also said they believed the organisation cared about the wellbeing of its people.

When the survey was done, many of the policies such as the performance-linked remuneration system and Leadership Development Programme were relatively new and we would expect to see this upward trend continue in future surveys as those policies become bedded in the company culture.

Workforce planning

IRL has in place well-established workforce planning systems to ensure the company is able to meet its future workplace needs appropriately and this was confirmed through an independent audit conducted by the Office of the Auditor-General in August 2008. Workforce planning includes the collection of a range of workforce data to identify the current and future skillsets required and the design of initiatives to ensure these are available. We also use established methodologies to monitor and evaluate short- and long-term initiatives for staff development.

As part of this process we have introduced a system, using the Intranet, where staff are encouraged to manage their own career development by recording details of their achievements in terms of papers, patents and other indicators of performance excellence. The system is a useful tool in planning and monitoring staff development from year to year and in encouraging a culture of research excellence within the organisation.

Data from the *What's Your Problem New Zealand?* competition on the research needs of New Zealand industry will also be useful in future workforce planning.

Discrimination, harassment and bullying prevention

IRL has effective policies and processes to manage the extensive diversity within the workplace. We offer an Employee Assistance Programme on site for staff who need support. IRL is committed to fostering a work environment in which the cultural practices and values of different ethnic groups are acknowledged and respected and where discrimination, harassment and bullying of any sort are not tolerated. Four staff members have been designated as contact points for staff with concerns about harassment and/or bullying. No incidents of discrimination, harassment or bullying were reported in the 2008/09 year.

Leadership Development Programme (LDP) 2008/09

The LDP is open to all staff and, to date, nearly 20% of staff have graduated from the programme. The programme aims to equip individual staff members with the knowledge, skills and tools to increase their potential and their effectiveness in the workplace. The programme was a finalist in the 2009 Wellington Gold Awards in the Team Gold category, which honours organisations that invest in people and empower teams.

Its success is evident in the ideas it has generated on how IRL can work more efficiently and effectively to increase productivity, to improve its profile and raise its performance.

What's Your Problem New Zealand? was one initiative to come out of the LDP. A team of four IRL scientists, Paul Benjes, Robert Holt, Nick Long and Madhu Vasudevamurthy, was required to present ideas for promoting and positioning

STAFF ENDORSEMENTS OF THE LDP PROGRAMME

“...(the course gave) a sneak preview of an MBA course. Scientists and engineers typically get zero exposure to this stuff... and I think it is definitely worthwhile to have had the introduction and be put beyond our comfort zone a little.”



Eric Speck and Les Roberts >
– site service

IRL to a Dragons' Den of judges. They proposed holding a competition with \$1m in R&D services from IRL as the prize. By encouraging clients and potential customers to come to IRL with their ideas for growing their business through R&D, the competition, they argued, would build awareness of IRL and help IRL better understand the future R&D needs of New Zealand companies. The Dragons were enthusiastic about the idea and more than 100 companies entered the competition, which was won by New Zealand-owned company Resene Paints. IRL R&D will allow the company to produce high-performance paints that have up to 80% sustainable ingredients, breaking the long-term reliance on gas and oil derivatives in manufacturing these paints.

Another initiative from the LDP is the Advanced Leadership Development Group. This group brings together alumni of the LDP to evaluate IRL processes and policies and identify how they might be improved.

Internal training programmes

During the year, internal training programmes were offered, open to all staff wishing to extend their skills. These included courses on finances for non-financial managers as well as sessions on people management and supervision. Focused training sessions on health and safety were also held during the year.

International business seminars

During the year, science staff attended international seminars where innovation and technology transfer were explored and discussed.

Robert Holt, Andy Kay and Barry Marlow were part of a New Zealand delegation to a three-day innovation seminar in Finland which explored the strategy adopted by the Finns to turn their country into a high-tech exporter when, with the breakdown of the Soviet Union, it lost its major market for its agricultural exports.

Nick Long attended a week-long course in Singapore, run by the Swiss-based business school IMD and the MIT Sloan School of Management, entitled Driving Strategic Innovation.

Madhu Vasudevamurthy attended the 2009 Annual Meeting of the US Industrial Research Institute (IRI) held in Boston, where the theme was R&D under pressure.

Scientific and technology workshops

Science and engineering staff have attended specialist workshops in their particular research field as part of IRL's ongoing commitment to continuing development of science and technical skills:

- > Phillip Rendle of the Carbohydrate Chemistry Group attended a workshop at the Duke Translational Medicine Institute in the US on adjuvants and adjuvanted preventive and therapeutic vaccines for infectious disease indications.
- > Rob Kemp of the Engineering and Applied Physics Group attended a training course on thin film coating theory and practice.
- > Jeremy Wu of the Materials and Energy Group spent two weeks at the prestigious London Centre for Nanotechnology, working with a small group of PhD and post-doctorate students on producing thin film ceramic membranes suitable for separating and purifying hydrogen.

“...one of the main points of these sessions was to develop the relationships with each other in the organisation, which is the first step to developing common goals for the organisation as a whole.”

“...it was great to see the CEO playing a very active role in this programme... sharing his views about the vision for IRL and his wish for staff members to make an active contribution towards the rebuilding of IRL.”

“...it gave us a chance to step back and look at IRL from a different viewpoint...”



< Hayley Auld
– Human Resources

Other training programmes

Two management staff attended the Ernst & Young Executive Programme held in Taupo in March 2009. This long-established programme is a collaboration between Ernst & Young and the University of Virginia's Darden Graduate School of Business Administration, one of the top business schools in executive management education in the world. The two-week course analyses the international and national business environment, explores issues around strategy, leadership and change and aims to develop participants' management and personal skills.

The Industrial Research Charitable Trust

This Trust, established in 2005 with a personal donation from philanthropist Sir Roy McKenzie, supports young scientists working in IRL's Carbohydrate Chemistry Group on the discovery and development of new drugs for the treatment of unmet medical needs such as cancer and malaria. In the 2008/09 year, five young researchers undertook research studies for higher degrees with money from the Trust. Three of these were PhD students.

Contributing expertise

During 2008/09, Measurement Standards Laboratory (MSL) staff were called on to share their expertise both domestically and internationally. Researchers have been commissioned to give measurement training courses to staff at some of New Zealand's largest companies. Three MSL scientists also provided training to the Indonesian national metrology institute – KIM-LPI – as part of a project to upgrade Indonesia's measurement capability.

Keith Jones of MSL is a member of a review team set up by the Chilean government to review its measurement infrastructure to ensure it meets the country's needs. Chile is diversifying its economy and recognises that expanding economic activity

away from traditional mining into agriculture and manufacturing requires a corresponding expansion of the measurement infrastructure and is keen to benefit from the New Zealand experience on how to target the critical areas. He has also been appointed to a New Zealand Electricity Commission Industry Reference Group that is helping review the industry Codes of Practice on electricity metering.

Paul Benjes, General Manager of IRL's GlycoSyn business unit, was one of the speakers at a New Zealand business forum held in Singapore in April 2009. He spoke, as a representative of the CEO, about IRL's successful business model of partnering its ground-breaking carbohydrate chemistry (including GlycoSyn's process development and manufacturing capability) with world-class biology to produce exciting new drug candidates. These partnerships include a 15-year collaboration with the Albert Einstein College of Medicine in New York and latterly with Singapore's Institute of Medical Biology. Paul Benjes says the Singaporean participants were particularly interested in the Einstein collaboration. "They were very impressed in particular with the licensing and sub-licensing deals around a novel class of therapeutics, dubbed the 'immucillins', which have application in the treatment of T-cell cancers and T-cell mediated autoimmune diseases such as psoriasis and rheumatoid arthritis."

About 250 representatives from Singapore's business and science communities attended the forum, which also outlined trade, investment and commercial opportunities in New Zealand in the creative industries, information and communications technologies and clean energy technologies.

Research Scientist Shaun Hendy was a member of a Ministry of Research, Science and Technology nanotechnology delegation to Japan. The delegation visited the National Institute of Materials Science in Tsukuba and the Tokyo Institute of Technology (Tokyo Tech).

Geoff Willmott and Shaun Hendy organised a workshop on microfluidics in Wellington in June, the first of its kind held in



IRL Mechanical Workshop staff >



< David Archibald, Mark Phegan and Chris Jordan
– IT Solutions

New Zealand. The workshop – organised with funding from the government's International Science and Technology (ISAT) Linkages Fund and the MacDiarmid Institute – was attended by microfluidics researchers from around New Zealand. Guest speakers were Chiara Neto and Barry Cox, from the Universities of Sydney and Wollongong, both of whom are collaborating with IRL on the behaviour of liquids at the micro- and nano-scale. The workshop was a first step towards setting up a microfluidics network in New Zealand.

IRL's mechanical engineering workshop constructed a time capsule for the Royal Society of New Zealand (RSNZ) to be placed in the Society's planned new premises in Thorndon, Wellington. The capsule is of aluminium fashioned in the shape of the lead-rubber bearings invented in the 1970s by Bill Robinson while working at IRL's predecessor, DSIR. Robinson Seismic Bearings are used in buildings and bridges in earthquake-prone areas including California, Japan and Wellington, where the Beehive, Te Papa and Wellington Hospital are all equipped with them. The time capsule has other IRL connections too. Among the items inside is a length of IRL HTS Roebel cable and a document containing the thoughts of eight IRL scientists and technicians on the possible technological advances we may see during the half century before the capsule is opened in 2059.

IRL's Human Resources Manager, Keyur Anjaria, was invited to speak at a seminar sponsored by the New Zealand Chambers of Commerce and the Office of Ethnic Affairs on the economic benefits of diversity in the workforce. He told the seminar about the facilities IRL provides for the 50% of staff who have come from 35 overseas countries. These include English as a second language classes, a liaison office to help the new employee and their family settle in and a welcome pack with information about New Zealand. In turn, he says, overseas staff bring benefits to IRL such as "easier entry into foreign markets and enhanced reputation and public image".

Bridget Ingham, in her role as part-time technical director of the New Zealand Synchrotron Users' Group, organised in April 2009 to increase awareness in the New Zealand research community of synchrotron science. Eleven research institutions, including IRL, are members of the Group, which was formed as a result of New Zealand's investment in the Australian Synchrotron near Melbourne, which became operational in July 2007. Twelve New Zealand researchers who have used the facility since it became operational in July 2007 described how it had helped their research.

Conference papers and keynote speeches

IRL staff have presented papers on their research at a range of significant international and national conferences and other forums during the past 12 months. In all, around 260 papers were presented, including the following:

- › Applied mathematician **Graham Weir** was a keynote speaker at the 2009 Australian and New Zealand Industrial Applied Mathematics conference in Queensland. His topic was new developments in mathematical models of geothermal energy fields.
- › **Ian Brown** was a keynote speaker at the 5th International Conference on Advanced Materials and Processing held in Harbin, China in September 2008. His paper on hydrogen separation materials research at IRL was the opening address in a session dealing with advanced steels, high-temperature metallic materials, and ceramics.
- › **Nineteen IRL scientists** presented papers on their research during the Advanced Materials and Nanotechnology conference, AMN4, held in Dunedin in February. Their topics included nanoparticles, molecular materials for conductivity, hydrogen materials, advanced materials characterisation, modelling, novel semiconductors, composites and nanopores. The conference attracted 300 delegates from New Zealand, Asia, Europe, Australia and North America.
- › **Bob Buckley** delivered an invited talk on HTS applications of wire and cable at an international workshop on electronic materials and their applications at the University of Wollongong in Australia. Attendees included Australian and international experts working in areas including superconductors, magnetic materials and devices and electronic materials for bio-applications.
- › **Alan Coulson** was invited to speak about IRL's cognitive radio research at the 10th Australian Communications Theory Workshop. This research is exploring radio systems that will sense and select a target signal in a crowded radio spectrum. The team also displayed posters on aspects of their research at the workshop, which brings together Australia's leading telecommunications researchers as well as international experts in the field.
- › **Owen Catchpole** gave a keynote presentation on the extraction of lipids from fermentation biomass using IRL's



Graeme Gainsford >
– 2009 Shorland Medal winner

near-critical dimethyl ether extraction technology at the 9th International Symposium on Supercritical Fluids (ISSF) 2009 conference in France.

Staff achievements

In 2008/09, IRL scientists and engineers received recognition for the high quality of their research work from their peers, from industry and the nation.

- > **Jeff Tallon**, senior research scientist with the HTS Group, was named a Companion of the New Zealand Order of Merit in the 2009 Queen's Birthday Honours List. The honour acknowledges his services to science in a career spanning 40 years. He is most well known for his research, beginning in the 1980s, into the highly unusual properties of high temperature superconductors. He and his colleagues in the HTS Group have discovered and patented many novel HTS materials, including the only material currently being developed for cables, magnets, motors and transformers.
- > **IRL's Superconductor Roebel Cable team** was awarded the 2008 RSNZ Cooper Medal for their work in turning fragile high temperature superconducting (HTS) wire into cable – a discovery that extends the range of potential applications for HTS technology and gives New Zealand a head start in this emerging technology. The medal is awarded every two years to an individual or team that publishes the best single account of original research in physics or engineering, with preference given to research that contributes to the development of New Zealand natural resources or to an innovation with potentially substantial ongoing economic benefit to the country.
- > **Peter Tyler**, Distinguished Scientist in the Carbohydrate Chemistry Group, has been elected a Fellow of the RSNZ. Fellowships are awarded for distinction in research or the advancement of science or technology. In Peter Tyler's case, his election recognises his achievements in creating complex molecules that are potent drugs. The design and execution of the process for producing these synthetic molecules involves a minimal number of steps and is on a scale that makes it commercially viable.
- > **Shaun Coffey**, IRL CEO, was elected a Companion of the RSNZ for eminence in the leadership of science and technology.
- > **Lai Yeap Foo** won the 2008 New Zealand Association of Scientists (NZAS) Marsden Medal in recognition of his major contribution to the chemistry of natural products in New Zealand in identifying bioactive compounds with significant health benefits in a range of fruits, berries and seeds. The award cites the important contribution he has made in developing a wide range of techniques to identify the chemical structures of many complex tannins and related compounds for which the chemical structures had earlier been considered to be intractable.
- > **Graeme Gainsford**, senior scientist, was awarded the 2008 NZAS Shorland Medal given in recognition of the significance and originality of a personal life-time contribution to basic or applied science in New Zealand – in this case, crystallography or the science of crystal structure and phenomena. He specialises in single crystal X-ray diffraction studies of small molecules and the medal recognises the contribution he has made to IRL's drug discovery and development programme as well as to materials science projects, including materials to store hydrogen energy.
- > **Tim Kemmitt**, senior research scientist with the hydrogen and distributed energy team, won a Sustainable Electricity Association of New Zealand (SEANZ) Industry Award for his work on photovoltaics (PV) for solar power generation. He received the Sharp Award for the most innovative approach to raising the standard of the PV industry, for both commercial and domestic application. The award recognised his research using quantum dots and nanotechnology to produce more efficient solar cells that are potentially cheaper to produce – an important factor in increasing uptake of solar energy.



^ IRL's Superconductor Roebel Cable team



Keith Jones >
– Recipient of 2008 APMP Award

- > **Andreas Luxenburger**, carbohydrate chemist, was named 2009 NZBIO Young Biotechnologist of the Year. The biennial award is presented to a scientist under the age of 40 whose work demonstrates the potential for future leadership in biotechnology. The NZBIO Awards committee noted that the award was in recognition of his important role in developing a pharma-biotech industry in New Zealand, noting that “his efforts in partnerships and collaborations contribute one of the best emerging assets New Zealand has in its efforts to establish an industry around drug discovery and development”.
 - > **Keith Jones** of MSL received the 2008 Asia Pacific Metrology Programme (APMP) Award for his contribution to metrology in the region. He has played an active role in the APMP since 2000 and chaired the Executive Committee between 2005 and 2007. He is currently an advisor to the Programme.
 - > **Rod Weston**, of IBT Group, was awarded a Doctorate of Science from the University of Auckland. This is the highest science degree available and is awarded for original published work that provides a candidate with authoritative international standing in his field. The degree is recognition of real distinction in science and is awarded rarely. In fact the last chemist to receive such a degree from Auckland did so 22 years ago. Rod’s submission was for a contribution to the chemistry of New Zealand natural products. His work included a substantial research programme which defined the steranes and triterpanes in New Zealand’s crude oil and coal. This work, which was carried out with colleague Tony Woolhouse, defined the age of the oil and that it was derived from native land vegetation. This was a significant finding at the time as most of the world’s petroleum oil was known to be derived from marine biota. His more recent work has defined some antibacterial natural products in New Zealand honeys and the aromatic components of volatile oils from native plants that could be developed as source oils for perfumes.
 - > **Shaun Hendy**, applied mathematics research scientist, has been appointed deputy director of the MacDiarmid Institute for Advanced Materials and Nanotechnology – one of eight Centres of Research Excellence (CoREs) in New Zealand. He is the only CRI scientist with a formal leadership role in a New Zealand CoRE.
 - > **Andrew Dawson**, a PhD student supervised by IRL research engineer Paul Harris, has won a prestigious international student innovation competition run by US company PZFlex to inspire novel uses for its software in solving complex engineering problems. Entrants were invited to submit a proposal for investigation of a technology using PZFlex as the virtual prototyping software. Andrew’s proposal was in the field of medical ultrasound and looked at the waveguiding properties of underlying fibrous tissue structure. Entries in the competition came from students in top institutions and universities in the UK, USA, Japan and China.
 - > **Sherry Xu**, a Victoria University of Wellington PhD student supervised by Najeh Al-Salim of IRL and Richard Tilley (VUW), won the prize for Best Student’s Poster Presentation at the 2009 MacDiarmid Institute AMN4 conference held in Dunedin.
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- During the year, two scientists have been promoted to the position of Distinguished Scientist – the top grade in the career path for science staff.
- > **Mike Andrews**, of IRL’s Engineering and Applied Physics Group, received his promotion for his work on silicon and acoustic sensors that have pushed the technological boundaries of imaging and detecting. These include sensors used to measure the Martian atmosphere and others that have helped raise the quality of New Zealand agricultural produce by improving fruit storage and analysing the quality of products such as meat and timber.
 - > **Chris Sutton’s** promotion to Distinguished Scientist recognises his considerable achievements in the field of metrology – the science of measurement. He holds the statutory title of Chief Metrologist of the Measurement Standards Laboratory (MSL) as “verifying authority” in respect of units of measurement. He serves on national and international committees that oversee and ensure worldwide consistency in international measurements. He was also involved in the preparation of New Zealand’s Measurement Standards Act in 1992, which led to the establishment of MSL. His own research has also contributed to scientific advances in the fields of pressure balances, mass and, later, length measurement. This includes world-leading work on



< Phil Rendle
– Research Scientist Carbohydrate Chemistry

the performance of gas-operated pressure balances. This work led him to propose the use of twin pressure balances as the basis for a Watt balance experiment to measure the Planck Constant and ultimately provide a way to express a kilogram weight in terms of the Planck Constant.

Other recent awards to IRL people

COOPER MEDAL
Peter Saunders 2004

RUTHERFORD MEDAL
Jeff Tallon 2002

HECTOR MEDAL
Ken MacKenzie 2003
Richard Furneaux 2006
Tim Haskell 2007

ANTARCTIC MEDAL
Tim Haskell 2008

MARSDEN MEDAL
Tim Haskell 2006

PICKERING MEDAL
Robert Buckley 2004

IRL staff have been accorded 13 New Zealand and international Academy Fellowships in the past six years