

Chemistry in Auckland 1981-2011

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In 1981 Norman Thom (then NZIC's Auckland Branch Editor) wrote an article for this *Journal* entitled *Chemistry in Auckland*,¹ which was published to coincide with the NZIC Golden Jubilee Conference, that was held at the University of Auckland in August that year. This article picks up from that point. The time period discussed covers major changes for science in Auckland, including changes in funding, the restructuring of DSIR, adapting to free market policies, and the evolution of Auckland Institute of Technology to become a University.

Introduction

As New Zealand's largest city, Auckland is home to both the largest University and the largest number of industrial chemistry companies. However, the closure of the Abels Margarine factory in Newmarket, and the imminent departure of its former neighbour Lion Breweries to East Tamaki, means that apart from companies like Nuplex in Penrose, industrial chemistry in Auckland is now mainly confined to the outer suburbs. South Auckland has NZ Steel at Glenbrook, Meadow Lea Foods (margarine and cooking oils) at East Tamaki and DB Breweries at Otahuhu. The North Shore has the Chelsea Sugar Refinery in Birkenhead while West Auckland has Douglas Pharmaceuticals in Henderson. Also, despite Auckland not being a major agricultural area, the Nufarm New Zealand headquarters is in Otahuhu while the dairy industry is well represented with Fonterra Brands at Takanini and Tip Top at Mt Wellington. North of Auckland, near Whangarei, Golden Bay Cement is NZ's largest cement manufacturer, while the NZ Refining Company's Marsden Point facility is the only oil refinery, supplying the majority of the country's refined petroleum products.

Academic chemistry in Auckland is divided between the Albany Campus of Massey University (Institute of Natural Sciences and the Centre for Theoretical Chemistry and Physics) and Auckland University, with applied chemistry being taught at Auckland University of Technology (AUT). Chemistry at Auckland University is further subdivided across three faculties, in a number of schools and departments. The Faculty of Science includes the School of Chemical Sciences and the *Section of Structural Biology* in the School of Biological Sciences, the Faculty of Medical and Health Sciences have the Auckland Cancer Society Research Centre and the School of Pharmacy, while the Faculty of Engineering has the Department of Chemical and Materials Engineering.

Chemistry at the University of Auckland

Chemistry teaching at Auckland University of began in 1883, and the 1983 centenary was commemorated by the publication of a 48-page illustrated history entitled *A Century of Chemistry at the University of Auckland 1883-1983* (Percival Publishing Ltd.), by Professors Con

Cambie and Brian Davis. The publication of this history was celebrated in this *Journal* by reproducing the cover of the booklet as the front page of the June 1983 issue [*This Journal*, **1983**, 77(3)]. Complimentary copies of the booklet were distributed to all Auckland NZIC Branch members, and were available on request to other members of the Institute.

School of Chemical Sciences

The decades since the mid-1980s have seen substantial changes in the Chemistry Department, partially reflected in its recent name change to the School of Chemical Sciences. The personnel, activities, and resources of the Department have all changed significantly over this time, and are described in what follows.

People – The Chemistry Department has undergone almost a complete turnover in academic staff since the mid-1980s – of a list of academic staff in the article by Cambie and Davis, only three remain (Drs. Judy Brittain and Sheila Woodgate, and Assoc. Prof. Peter Boyd). The general staff have showed slightly less turnover during this time, with six (our glassblowers Alistair Mead and Michael Wadsworth, our electronics technicians Ron Bryant and Vern Rule, and two teaching laboratory technicians Jeff Boyle and Glenn Boyes) still here. Many of the staff have retired and, unfortunately, several have died early (John Spedding 1984, John Aggett 1991, Jan Coddington 1992, and Linda Wright and Allan Easteal in 2011). There was a peak in retirements in the late 1990s through 2005, partly as a result of the significant recruitment of the 1960s, and partly as a result of downsizing of the Department in 1999. A growing pattern in the years since the mid-1980s compared to earlier times is the mobility of academic staff. Martin Banwell and Russell Howe moved to university positions in Australia in the late 1980s, and since then Steve de Mora, Peter Hauser, Carol Taylor, Peter Schwerdtfeger, Hicham Idriss, Vittorio Caprio (Cappy) and Jenny Webster-Brown have spent time in our Department before moving on to other academic positions. Of note are: Prof. Peter Schwerdtfeger's move across the harbour to Massey University's Albany campus in 2004 and Jenny's becoming inaugural Professor and Director of the Waterways Centre for Freshwater Management jointly run by the University of Canterbury and Lincoln University in 2010. A further recent pattern has been targeted hiring of academic staff to support areas of growth, including Food Science, Medicinal Chemistry and, more recently, our research initiatives in microfabrication and photonics. Hiring strategies have also been influenced by the Performance Based Research Fund (PBRF), which ranks Departments and Universities by the research activities of their staff.

Since the mid-1980s, five Professors have been hired to provide academic leadership in the Department. The first

of these, Ralph Cooney, arrived from Australia in 1986 and shortly afterwards took on the Head of Department role, and greatly enhanced the Raman spectroscopy capabilities of the Department. Prof. Cooney continued his focus on Administration by then serving as the first Executive Dean of Science, before taking a leading role in developing the Tamaki campus of the University and in developing joint initiatives with industry such as the Materials Accelerator. In 1994, Douglas Russell arrived from England to take up the Chair in Physical Chemistry, and then led the Department through the very challenging years at the turn of the century. Prof. Ted Baker came from Massey University in 1997 to a joint appointment with the School of Biological Sciences, soon thereafter being named a University Distinguished Professor, then Director of Structural Biology, and later the inaugural director of the Maurice Wilkins Centre for Molecular Biodiscovery. Margaret Brimble returned to New Zealand from the University of Sydney in 1998 to lead the organic chemistry section as its professor. Her leadership resulted in the development of BSc and BSc (Hons) degrees in Medicinal Chemistry, and the growth of a large research group working on a wide range of pure and applied synthetic organic problems.² Margaret is also a leading scientist in the Maurice Wilkins Centre and Head of Medicinal Chemistry with Neuren Pharmaceuticals Ltd. Finally, Prof. David Williams arrived from the UK in 2006, having held a number of leading positions in academia and industry. Since his arrival he has shown a great ability to collaborate and strengthen ties with industry and international research groups, as well as leading the development of our microfabrication capabilities. Since 1984, seven staff have been promoted to Professor on the basis of their research excellence: Charmian O'Connor, Graham Bowmaker, George Clark, Jim Metson, Laurie Melton, Peter Schwerdtfeger, and, most recently, Penny Brothers. Graham, George, and Jim were Heads of Department during our growth years of the 2000s, with Jim progressing to become our inaugural Head of the School of Chemical Sciences. Charmian has contributed to NZ science and academia in many ways, as noted in a recent Chemistry in NZ article,³ but always she found the time to supervise first-year chemistry laboratories as well. Laurie Melton was the foundation director of our Food Science programme, and is now a Principal Investigator with the Riddet Centre of Excellence. George Clark followed his headship with membership of the Environmental Risk Management Authority (ERMA).

Recognition – Our academic staff have received many forms of recognition over the past two decades, and the following listing is very selective. Most notable are Professor Warren Roper's award of a Fellowship of the Royal Society in 1984⁴ and Professor Margaret Brimble's naming as a L'Oreal-UNESCO Women in Science awardee in 2007.⁵ Members of the Department have been recognized in New Year's and Queen's Birthday Honours lists, with Charmian O'Connor being made a Commander of the Most Excellent Order of the British Empire in 1989, Graham White named as Companion of the Queens Service Order for Public Services in 2000, George Clark a Member, New Zealand Order of Merit 2009, Margaret Brim-

ble a Member, New Zealand Order of Merit 2004, and Ted Baker a Companion, New Zealand Order of Merit in 2007. Most of these had citations for services to science, although George's award was cited as being for services to biochemistry!

Activities – In the mid-1980s the Chemistry Department had a traditional structure with Inorganic, Organic, and Physical sections with Analytical developed shortly thereafter; Radiochemistry was also a significant focus of the Department. The 1988 fire destroyed most of the Radiochemistry equipment, and the 1991 review of the Department recommended that Radiochemistry research and teaching be phased out. At this time the Department and University were also branching into Environmental Chemistry, with Steve de Mora establishing many inter-departmental research initiatives and then Dave Shooter also focusing his research in this area. With the establishment of a School of Environmental and Marine Science based at Tamaki in 1995, much of the environmental focus was removed from the direct oversight of the Department.

In 1995, the Forensic Science programme was set up as a joint initiative between the University and ESR Ltd. At that time it was one of only two such programmes in Australasia.⁶ Originally set up as an independent programme within the Science Faculty, subsequently it was incorporated into the Chemistry Department. The inaugural (and current) Director, Dr. Douglas Elliot, holds a joint position between ESR and the University. This joint programme model means that students benefit from exposure to University lecturers and to practising forensic scientists, together with practitioners in related fields. The programme began offering Postgraduate Diplomas and MSc degrees, and more than 100 students have graduated with the latter degree, in topics ranging from modern DNA analytical methods, finger-mark analysis, blood-stain pattern analysis, and methods for drug analysis to studies of forensic science service provider models. Students can now also obtain a PhD in Forensic Science, with subjects ranging from post-mortem insect colonisation to synthesis of finger-mark reagents and provenance of nephrite (one of the types of highly valued pounamu or NZ greenstone).

The Food Science programme started in 1996, with Assoc. Prof. Laurie Melton moving from the University of Otago as inaugural Director. The programme began by offering Postgraduate Diplomas and MSc degrees, but an undergraduate programme and PhD were subsequently added. To support these initiatives, five additional academic staff have been hired, although one (Paul Kilmartin) moved across to the Wine Science programme when it began. Professor Charmian O'Connor also contributed teaching and research supervision from the start of this programme.³ Masters student research has ranged from development of new dairy food products and utilization of fish wastes to location of functional molecules in plant cell walls; PhD research has been on topics such as micro-oxygenation of wine, pressure-assisted thermal sterilization, and encapsulation of functional foods.

An additional Postgraduate Diploma and MSc programme in Polymers and Coatings Science was also initiated dur-

ing this same period, with Neil Edmonds as Director. Due to changing enrolment patterns and industry needs, it has evolved into a Postgraduate Certificate programme run from the Faculty of Engineering and associated with the Plastics Centre of Excellence. This centre is a joint enterprise between the University and Plastics NZ based on the Tamaki campus.

In 2003 the University instituted a postgraduate programme in Wine Science, with Paul Kilmartin becoming the inaugural Director and Dr. Laura Nicolau appointed to provide sensory and volatiles analysis expertise. The programme also includes a microbiological approach led by Dr. Matthew Goddard and Prof. Richard Gardner, acknowledging the critical roles of yeasts and bacteria in wine development. The academic staff have been joined by winemaker Randy Weaver, who took over the Directorship this year. These are exciting times for the Wine Science programme, which will be moving its teaching and winemaking to the Goldie winery site on Waiheke, which has been generously donated to the University by Kim and Jeanette Goldwater.

The Department began an undergraduate programme in Medicinal Chemistry in 2002. This programme provides a more structured choice of courses than the standard Chemistry degree, including courses in Medicinal Chemistry, Issues in Drug Design and Development, Pharmacology, and Physiology as well as *traditional* chemistry courses; it has proved very popular with students.

The development of new programmes, combined with the starting of a Pharmacy School (whose students take four chemistry courses) and the introduction of a Common First-Year for intending medical and health science students (that includes a first-year chemistry course) has meant that enrolments in the Department have increased significantly since the late 1990s. However, this evolution has not been without its critics.^{3,7} By 2011, it was recognized that this wide range of activities required both additional administrative support and a name that was more representative of its breadth of coverage, and so the Department became the School of Chemical Sciences.

Resources – Most activities within the Department have continued to be located in the main building on Symonds Street. However, that statement obscures the transitions since the *space wars* and *unacceptable working conditions* mentioned in the 1991 review of the Department. These descriptions were contemporaneous with the effects of the September 1988 fire in the Advanced Physical and Inorganic Teaching Laboratory, which destroyed that area while the acidic fumes also adversely affected equipment in many areas of the Department. Consequently, this date represents a good starting point for this section of the account. The building had been constructed in the *brutalist* style of the mid-1960s, and it was a dominant feature of the Symonds Street ridge skyline until the recent construction of apartment buildings further up the hill. Memorable features within the building were long, dark corridors, large narrow staff offices with built-in laboratory benches and fume canopies, and multiple small two- and four- person laboratories with limited fume extraction

capabilities. By the late 1980s, the facilities were aging, and the laboratory design and fume hoods did not meet modern safety expectations. The Department also had to relinquish space in the building, as the then-current norms of floor-space-to-size of Department were applied. In fact, this consideration continued for another decade, with the Department's research and administrative space eventually contracting to Floors 4-7, with Geology, Biochemistry, and then Electrical and Computer Engineering occupying some of the lower floors. The major initiatives of Food Science and then Medicinal Chemistry, and an improving outlook across chemistry, strengthened the case for renovation of the upper floors, and this started in 2002. This renovation represented a logistical challenge that is still with us today – how to retrofit a 1960s concrete structure with sufficient fume hoods and associated ducting to support a modern chemistry department. To a large extent, this was solved by placing most fume hoods on the top two floors. However, fume-cupboard exhaust air that has to come from somewhere. That balancing act of air intakes and extraction is still a work in progress, with additional air intakes likely to be added to the building.

The renovation of the building also allowed the construction of a special purpose industrial kitchen facility, with adjacent sensory evaluation room, for use by the Food Science programme. This is supported by more traditional laboratory space for food analysis and physical measurements.

The contraction in space noted above coincided with growth in student numbers in both the traditional areas of chemistry and the applied programmes associated with the Department. Much of this growth was accommodated on the Tamaki campus – first with Environmental Chemistry and then Polymer Chemistry using laboratory facilities already present there, and then Wine Science and Polymers and Coatings Science occupying newly constructed premises. As noted above, the winemaking and teaching parts of Wine Science will move out to Waiheke in the near future, with the likely relocation of the wine analysis facilities to the city campus. Moving in the opposite direction will be the Light Metals Centre, a research centre associated with the Department that is focused on the production and use of magnesium and aluminium. This research centre has over 30 staff and students, and coordinates international teaching and training programmes.⁸

The 1988 fire and the loss of floor space both impacted on the teaching laboratories. Perhaps this is most clearly seen for the Analytical Laboratory, which has been translocated from the 1st floor to the 7th floor, then to the ground floor. There have been two comparatively recent major renovations – the first, in 1997, allowed all advanced teaching laboratory courses to be taught in two ground-floor laboratories, with enclosed spaces for the analytical chemistry and general instrumentation, and improved fume hood access compared to the original design. In 2005, laboratory space was further contracted, with the first-year laboratories also sharing the ground floor. A combination of a co-operative technician team and creative storage solutions has facilitated smooth running of the laboratories in this area.

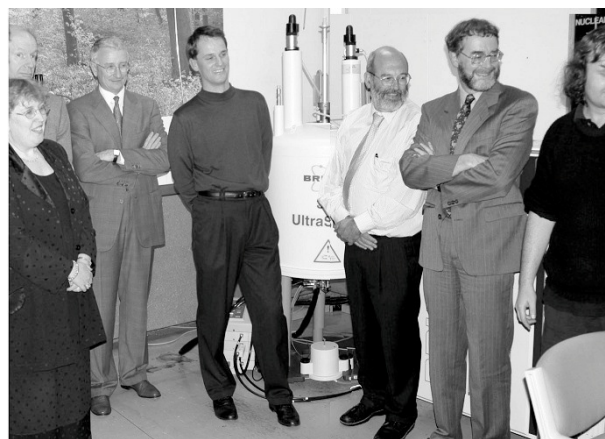
The late 1980s were marked by the acquisition of several key pieces of instrumentation that have served as keystones for research in the Department. In 1986, the first super-conductivity NMR spectrometer (a 400 MHz instrument) was delivered. At that time it was the most powerful in NZ, with access shared between Chemistry, Biochemistry, the Auckland Cancer Centre, and Waikato University. The same year, a high-resolution mass spectrometer was installed at the then DSIR in Mt Albert as a joint facility with the Department, and this continued to operate until 2009. A key initiative one year later was setting up the Research Centre for Surface and Materials Science, housing NZ's only X-ray photoelectron spectrometer. Although housed in the Faculty of Engineering, this facility was used and championed by chemists as well; it has served as both a key research tool and a service facility for NZ industry. Finally, a Raman analysis suite was developed in 1989 and included the first Raman microscope in NZ. Single crystal X-ray diffraction studies have a long departmental history dating from F. J. Llewellyn in 1948. However, the 1981-1996 period saw the X-ray facilities significantly improved, with new computing and low temperature facilities. This combination of instrumentation brought the Department into the *modern era* for synthetic and materials chemists, although the high demand for NMR analyses meant that in 1991 a second smaller NMR spectrometer was also installed.

In contrast to the contraction upwards in the Chemistry Building, the Department has been able to develop the basement (prime space if you are a physical chemist or NMR spectroscopist) into a major instrumentation centre. From the initial installation of the pulsed radiolysis suite, the basement has blossomed into a hive of research activity, with NMRs (up to 600 MHz), X-ray suite (single crystal and powder), micro-fabrication suite, and Photon Factory (including femtosecond laser spectroscopy and laser fabrication facilities). The Department has celebrated the steps along the way, with a formal opening of the basement NMR facility in 2001 and a grander *Basement Opening Party* in 2010. The latter was marked by the presentation to the Vice-Chancellor and the former Dean of Science of some of the smallest certificates of appreciation in the world, prepared using the laser machining facility in the Photon Factory.

Another major change in the last two decades has been the increasing use of computers. In the 1980s the departmental secretaries began using word processors, and by 1991, Dr. Sheila Woodgate and her son Scott, together with Terry Mitchell, were writing software to support first-year chemistry learning. The increasing availability of computers changed the nature of administrative support, with a reduced need for typing and an increased need for access to the central University software systems. In 2001 the Department website went live in a format that was only revised this year. At around that time, Sheila realized that the web would make an excellent platform for expanding *Bestchoice*, as her tutorial software was by then known. With the help of David Titheridge, *Bestchoice* has expanded into many thousands of pages of tutorials and guided questions. From its original use for first-year chemistry students it has now extended to



Chemistry Department building at Auckland University 2001. The grassy area is now the Kate Edger Information Commons.



Opening of the original basement NMR suite in 2001: L-R: Margaret Brimble, Graham Bowmaker, John Hood, Brent Copp, Peter Gluckman, Douglas Russell, Michael Walker.

upper-level courses in chemistry and other subjects, is widely used in NZ high schools, and has been adopted in the UK as well. In 2007, Sheila was awarded an Auckland University Innovation in Teaching Award, and *Bestchoice* has also featured in a recent *Chemistry in NZ* article.⁹

School of Biological Sciences - Section of Structural Biology

One of the key linkage areas between chemistry and biology is the field of structural biology – the investigation of the molecular structure of the DNA, enzymes, antibodies, and other biomolecules that playing critical roles in living organisms. Improvements in our ability to perform X-ray studies of large biomolecules, combined with electron microscopy and solution NMR spectroscopy, have provided tools for unprecedented understanding of the structure and function of biological components at the molecular level. The information gained from these techniques is now combined with structural bioinformatics to both provide an integrated view of the organization and evolution of biological structures, and also make predictions about biomolecular function.^{10,11} Led by Professor Ted Baker, the 2006 recipient of the Royal Society of New Zealand Rutherford Medal, the Structural Biology section in the School of Biological Sciences has strong ties to both the School of Chemical Sciences and the Maurice Wilkins Centre for Molecular Biodiscovery. Other chemists in the Section include Andrew Dingley (NMR) and Chris Squire (X-ray crystallography).

Auckland Cancer Society Research Centre

While Medicinal Chemistry at Auckland University is taught in the School of Chemical Sciences, its major application is in the Auckland Cancer Society Research Centre (ACSRC) located on the Grafton (Medical School) Campus of the University. The ACSRC officially came into existence in 1998, with the signing of a memorandum of understanding between the Auckland Cancer Society and the University. This agreement established it as an autonomous research centre in the Faculty of Medical and Health Sciences of the University, but with a joint management board comprising both the University and the Cancer Society.

Prior to 1998, the Cancer Research Laboratory (CRL), as it was then known, was administered solely by the Cancer Society, with rental payments made to the University for the Medical School facilities. The Cancer Society continues to provide core funding to the Centre, although its staff are now officially employees of either the University, or Auckland UniServices Limited, the commercial arm of the University. Total staff numbers now exceed eighty, with approximately 40% chemistry research or support staff, and the remaining 60% comprising biologists, pharmacologists and clinicians. To cover this diverse nature of researchers, the ACSRC is administered by three Co-Directors that include Professor Bill Denny, the senior medicinal chemist in the Centre since the 1981 death of foundation Director Professor Bruce Cain.

The Auckland Cancer Society set up the original CRL with the aim of carrying out research into the treatment and causes of cancer. The primary objective of the research programme has always been the development of more effective chemotherapy and radiotherapy treatments for cancer, and the identification of both the causes of and protective factors against cancer. Since its inception in 1956, the ACSRC has published nearly 1,000 papers in peer-reviewed international scientific and medical journals, and filed more than 100 patent applications for new anti-cancer drugs. In that time the centre has developed nine cancer drugs that have been evaluated in clinical trials, both in NZ and overseas, the latest being the phosphatidylinositol-3-kinase (PI3K) inhibitor PWT33597 which commenced clinical trial on 1 July 2011.

The ACSRC is one of the few academic centres in the world to achieve real successes in the development of drugs for clinical use, and it has the distinction of being the first laboratory in the Southern Hemisphere to discover, trial, and bring an anti-cancer drug into clinical use. This notable academic achievement was acknowledged by the RSNZ in 1996, by the award of the Rutherford Medal for Science and Technology to *Professor William A Denny and the Auckland Cancer Research Laboratory for sustained innovation in the development of new anti-cancer drugs.*

Finally, research initiated in the ACSRC has also become the founding technology for two start-up (spin-out) companies, Proacta Inc. (www.proacta.com) now based in San Diego, and Pathway Therapeutics Inc. (www.pathwaytx.com) now based in San Francisco. The research work lead-

ing up to the setup of these two companies, and several of the other drug development projects of the ACSRC, has been described by previous articles in this *Journal*.¹²⁻¹⁴

Maurice Wilkins Centre for Molecular Biodiscovery

The Maurice Wilkins Centre for Molecular Biodiscovery (MWC) was initially known as the Centre for Molecular Biodiscovery (CMB), when it was established as one of the first seven NZ Centres of Research Excellence (CoRE) in 2003. Its name was changed to honour the NZ-born Nobel Laureate Maurice Wilkins, who shared the 1962 Nobel Prize in Physiology or Medicine with James Watson and Francis Crick *for their discoveries concerning the molecular structure of nucleic acids and its significance for information transfer in living material*. An article on Maurice Wilkins's contribution to this award appeared in the March 2003 issue of this *Journal*.¹⁵

The initial overall goal of the MWC was to address the challenges and opportunities of the genomic revolution in the biological sciences by integrating five major research groups from within the University, two of which were led by chemists, namely Ted Baker (Structural Biology - who became the first Centre Director), and ACSRC Co-Director Bill Denny. One of the main aims was to develop new therapeutic agents for medicine, aimed at diabetes, cancer and infectious disease. The successful integration of biology and chemistry, linked by molecular structure, was critical to this goal. This joint biological chemistry approach was continued in 2005 when the MWC expanded its initial five research groups by a further three, including the Organic and Medicinal Chemistry group of Margaret Brimble. In addition, many Auckland-based chemists are MWC Associate Investigators and these include Brent Copp, Andrew Dingley, Paul Harris, and Johannes Reynisson (Chemical Sciences), Jack Flanagan, Michael Hay, Brian Palmer, Jeff Smaill, Gordon Rewcastle, and Moana Tercel (ACSRC), and Chris Squire (Biological Sciences).

Other Centres of Research Excellence

Although the MacDiarmid and Riddet Institutes are based elsewhere, a number of Auckland-based chemists are associated with these research organizations. Principal Investigators of the MacDiarmid Institute (Wellington) include Jim Metson, Jadranka Travas-Sejdic, and David Williams while Associate Investigators include Duncan McGillivray, Peter Schwerdtfeger and Cather Simpson. Similarly, Laurie Melton is a Principal Investigator with the Riddet Institute (Palmerston North) while Associate Investigators include Duncan McGillivray and Paul Kilmartin.

Massey University-Albany

Chemistry at the Massey-Albany is located in the Institute of Natural Sciences and includes the Centre for Theoretical Chemistry and Physics (CTCP), which is part of the NZ Institute for Advanced Study. The CTCP Director is theoretical chemist Professor Peter Schwerdtfeger who moved to Albany from Auckland University in 2004 to join Assoc. Prof. Al Neilson (organometallic chemistry)

and Dr. John Harrison (chemical reaction dynamics and spectroscopy) who were already teaching chemistry on that campus.

AUT

In 1989 the then Auckland Technical Institute (ATI) became able to confer degrees, and in recognition of this change altered its name to Auckland Institute of Technology. The first graduands of the Bachelor of Health Science (Nursing) graduated in 1993, and the Bachelor of Applied Science was introduced in 1994. In 2000, the institution became NZ's 8th university, being renamed as Auckland University of Technology (AUT). Chemistry at AUT is within the School of Applied Sciences and research involves food chemistry (including analysis of current and potential aquaculture species), biofilm research, and environmental analysis. AUT offers BSc and BSc(Hons) degrees in Applied Chemistry, a Postgraduate Diploma in Science (Food Chemistry), an MSc (Food Chemistry and Microbiology), and associated PhD programmes. Many of the staff have multidisciplinary interests, but those with chemistry as a primary interest are: Dr. John Robertson (pollutant removal from soils, and food and environmental analysis), Assoc. Prof. Owen Young (food chemistry, especially concerning flavourings and biofilms), Dr. Roger Whiting (measurement of colour, nanotechnology, and wine flavours), Dr. Mark Duxbury (analytical chemistry), and Dr. Nazimah Hamid (flavour chemistry and sensory analysis).

Institute of Environmental Science and Research (ESR) in Auckland

The involvement of ESR in the Forensic Science programme at Auckland University has been described earlier in this article. Other aspects of their Forensic work in Auckland have been described previously in this *Journal*.¹⁶

Auckland Secondary School Chemistry

There are approximately ninety secondary schools in the Auckland region and their chemistry teachers are supported locally by the Auckland Chemistry teachers Support Group coordinated by Ian Torrie, and nationally by the New Zealand Association of Science Educators (NZASE). The NZIC also supports teachers through its publication *ChemEd NZ* and its specialist education group. The most recent chemistry education conference in Auckland was *ChemEd 2007*, which was held at the University of Auckland.

NZIC in Auckland

Although the NZIC Journal, *Chemistry in New Zealand*, is now published in Christchurch, for many years prior to 2005 it was published from Auckland, with Auckland-based editors including Stan Brooker (1947-1953 and 1979-1981), Tony Herd (1982-1983), Bruce Graham (1984-88), Ron Hall (1989-1992) and Robert Lyon (1993-2000). Also, in 1998 the NZIC Secretariat moved from Wellington to Auckland, under the commercial management of Ancat Holdings Ltd., where it remained until transferring in 2005 to its current location in Christchurch.

Recent Auckland-based NZIC Presidents have included Alan Mackney (1984/85), Bill Denny (1994/95), George Clark (1999), Graham Bowmaker (2005), and current President Gordon Rewcastle (2011). Other Aucklanders to have held senior NZIC positions in the last thirty years include John Rogers (Secretary 1981-1988) and Denis Karl (Registrar/Treasurer 1989-1997).

In addition to the 1981 Golden Jubilee Conference, Auckland-based NZIC Conferences took place in 1987 (*Commercialization of Chemistry*) and 1993 - a joint meeting with the Medicinal and Agricultural Division of the Royal Australian Chemical Institute (RACI). This was also the first NZIC conference to change from the traditional August time to the current December time period. The hugely successful 2006 *Back to the Basics* (Rotorua) conference was also organised by the NZIC Auckland Branch, and featured a valedictory address by retiring Auckland University Inorganic Chemistry Professor Warren Roper FRS. Special note of the imminent retirement of fellow Auckland Professors Charmian O'Connor and George Clark was also made at the conference dinner.

Other Auckland-based meetings have included the 7th IUPAC Conference on Physical Organic Chemistry (August 1984) and an international organometallic and coordination chemistry conference held in January 1999 in honour of Warren Roper's 60th birthday. In addition, June 1984 saw an NZIC Auckland Branch-organized Symposium on *Health Hazards of Chemicals in the Workplace*. Thanks to commercial sponsorship the symposium was a great financial success, returning a healthy profit, the interest on which has meant that the Branch has been financially solvent ever since. Unfortunately, the non-financial outcomes of the symposium were not as successful, as the most significant hazardous chemical event to have occurred in Auckland in the last 30 years occurred just six months later. The December 1984 ICI chemical warehouse fire in Mt Wellington resulted in one death, and caused injuries to 60 fire fighters who came into contact with chemicals. The investigation into the fire concluded that our rules and regulations were inadequate with many gaps, overlaps and areas of poor performance, and that change to our laws was needed. The result of the investigation was NZ Hazardous Substances and New Organisms Act (HSNO), which came into force in 1996.

Finally, any analysis of the Auckland contribution to the work of the NZIC cannot forget the endeavours of John Packer (and the assistance he received from Roger Whiting, John Robertson and Heather Wansbrough) in editing three versions of the NZIC publication *Chemical Processes in New Zealand* (Vol. 1, 1978; Vol. 2, 1988; 2nd Ed. 1998). John Packer is now retired in Christchurch, but we owe him a great deal of gratitude for his enormous contribution to Chemistry in Auckland over many years.

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References

1. Thom. N. G. *Chem. in NZ* **1981**, 45, 112-120.

2. Brimble, M.A.; Harris, P. W. R. *Chem. in NZ* **2011**, 75, 133-136.
3. O'Connor C.J. *Chem. in NZ* **2007**, 71, 43-46.
4. See: *Chem. in NZ* **1989**, 53, 23.
5. See: *Chem. in NZ* **2007**, 71, 39-42.
6. Miskelly, G. *Chem. in NZ* **1998**, 62(3), 9-11.
7. Schwerdtfeger, P. *Chem. in NZ*, **2008**, 72, 72-74.
8. Metson, J.; Lavoie, P.; Perander, L.; Etzion, R. *Chem. in NZ*. **2010**, 74, 96-100.
9. Woodgate, S.; Titheridge, D. *Chem. in NZ* **2008**, 72, 63-67.
10. Baker, T.; Arcus, V.; Johnston, J.; Peterson, N.; Lott, S. *Chem. in NZ*, **2004**, 68, 29-33.
11. Baker, E. N. *Chem. in NZ*, **2011**, 75, 27-33.
12. Denny, W. A. *Chem. in NZ*, **1987**, 51, 89-93; **1995**, 59(4), 29-32; **2004**, 68(1), 19-23.
13. Rewcastle, G. W. *Chem. in NZ*, **1989**, 53, 145-150.
14. Rewcastle, G. W.; Denny, W. A. *Chem. in NZ*, **2002**, 66(3), 22-25; **2009**, 73, 76-78.
15. Gray, V. *Chem. in NZ* **2003**, 67, 50-54.
16. Bedford K. R.; Mitchell J. W. *Chem. in NZ* **2004**, 68, 38-39.