

THE SCHOOL OF
CHEMISTRY

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A contribution to the 50th anniversary celebrations of
the University of New South Wales
1949 – 1999

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This book has been compiled by the following group of amateurs who are to be blamed for any shortcomings or oversights: Martin Dudman, Mike Gallagher, Harry Goodwin and Ken McGuffin. In particular, if we have misidentified anyone or failed to identify people known to any reader the School would be glad to know by mail, e-mail or fax addressed to the Head, School of Chemistry at:

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Where years have been given in parentheses these refer to the period of service.

U/K or N/K on a photo indicates that the person is unknown to us.

COVER: A photograph by Max Dupain of the Heffron and Dalton buildings taken from the Roundhouse in the early '60s. On the left is the (then) Metallurgy Building; the open foreground is now largely occupied by the Applied Science Building and the covered walkway from Anzac Parade.

Below is a view from the Eastern end by the same photographer Max Dupain showing a lawn replaced now by the Quadrangle building (1993).

Max Dupain was commissioned by the University council on the

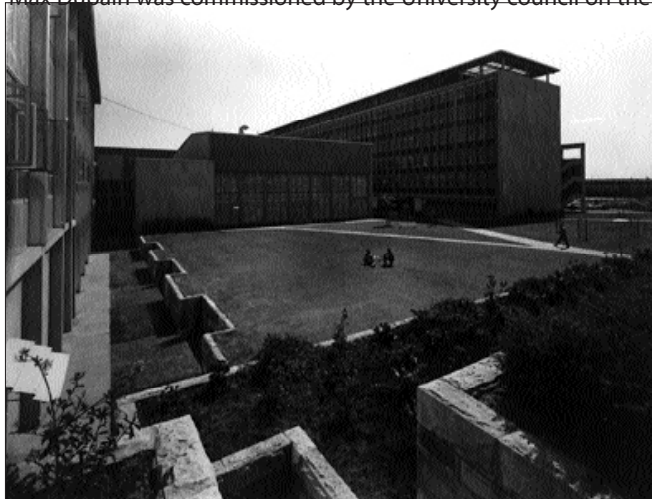


Photo by Max Dupain



UNSW

P R E F A C E

The University of New South Wales celebrates its 50th anniversary in 1999. The School of Chemistry at UNSW is thus also 50 years old this year. In fact, however, the School of Chemistry can trace its origins back to 1879, when William Dixon set up a chemical laboratory and began teaching classes in the School of Arts in Pitt Street, then known as the Technical or Working Men's College. The School is thus also celebrating its 120th anniversary in 1999.

The history of the School over these 120 years is a fascinating reflection of the evolution of science in Australia. From the early emphasis on practical training in industrial chemistry and chemical engineering serving the newly established chemical industry, the School developed gradually a reputation for chemical research, and a greater focus on the fundamental discipline of chemistry. The areas of industrial chemistry, chemical engineering, metallurgy, food technology and biochemistry evolved into separate Departments and Schools, and by the 1960's, the School was firmly established as one of the leading Chemistry Departments in the country.

In 1985, Emeritus Professor Stanley Livingstone undertook a research project into the history of the School. That project forms the basis of the text of this book. The book also contains a compilation of photographs from the University archives and other sources. The noted photographer Max Dupain was commissioned by the University in the 1960's to photograph many aspects of the University's activities, and a number of Dupain photographs are included here.

Stanley has written a lively account of the people and events which shaped the School of Chemistry at

the University of New South Wales. The School grew to its maximum size of 46 academic staff in the 1960's, a period which Stanley describes as "the years of plenty". Subsequent budget cuts and declining undergraduate enrolments have reduced academic staff numbers to the present day 23, with a corresponding decline in technical and support staff. Research student numbers, research productivity and reputation have been maintained, however, during the difficult later years.

The future of the School in the new century will be strongly influenced by the attitudes of Government and the University Administration on the importance of science in Australia's future. The history of the University of New South Wales and of the School of Chemistry teaches that science and technology have played a vital role in this country's past development, and the School firmly believes that this role must continue. The future holds, however, many challenges which the School must deal with if it is to build on the foundations laid over the last 120 years.

A number of people have played important roles in producing this book. Stanley Livingstone's text provides the cornerstone, Martin Dudman and Ken McGuffin have assembled the photographic material, and a committee chaired by Mike Gallagher and including Harry Goodwin, Martin Dudman and Ken McGuffin has compiled the final version. In the production of this book the cooperation of many present and former members of the School and the generous assistance of Mr. Laurie Dillon and his staff in the University Archives Section have been invaluable. Their work is gratefully acknowledged.

A BRIEF HISTORY OF THE SCHOOL OF CHEMISTRY OF THE UNIVERSITY OF NEW SOUTH WALES

THE BEGINNINGS

The University was established in 1949 but the School of Chemistry had already been in existence for 70 years. Its origins go back to the Sydney Mechanics School of Arts, which was established in 1833. In 1845 the School of Arts purchased premises in Pitt Street, Sydney. This building was used by the Sydney Mechanics School of Arts until 1989, when the School of Arts moved to new premises.

Technical education in New South Wales can be said to have begun in 1865 when the Sydney Mechanics School of Arts commenced classes in mechanical drawing. In 1869 the first series of science lectures was inaugurated. In 1871 lectures on chemistry were introduced; they were given by Mr. E.H. Rennie, BA, who was a teacher at Sydney Grammar School. Edward Rennie was born in Sydney in 1852 and in 1884 was appointed Foundation Professor of Chemistry in the University of Adelaide, thereby gaining the distinction of being the first Australian-born occupant of a chair of chemistry in this country. He died in 1927 and his name was perpetuated in 1931 when the Australian Chemical Institute established the Rennie Memorial Medal to be awarded annually to the member of the Institute under 33 years of age who, in the opinion of the Council, has contributed most towards some branch of chemical science, as judged by his research work published during the previous ten years.

Rennie's lectures were given on Friday evenings to a class of ten. Professor John Smith, Foundation Professor of Chemistry at Sydney University, acted as examiner. In 1875 Mr Rennie was replaced by Mr Pentecost, who continued until September 1877, when he resigned for personal reasons. His place was taken by Mr W.A. Dixon.

In 1873 a proposal to establish a Technical or Working

Men's College was endorsed by the Committee of the School of Arts and three small allotments of land at the rear of the School of Arts premises were leased for use by the proposed College. In 1878 Parliament granted £2,000 towards the inauguration of the Technical or Working Men's College which was opened in 1878; it was under the control of the committee of the Technical College, itself responsible to the General Committee of the Sydney Mechanics' School of Arts. On 1 October 1883 the Government established the Board of Technical Education which immediately took over control of the Technical College from the School of Arts.

Although mechanics' institutes have been criticized as an educational failure, they filled a need in nineteenth century Australia in that they provided a place for reading, culture, entertainment, and a little learning. Moreover, the Sydney Mechanics' School of Arts spawned Sydney Technical College, which, in turn, spawned the University of New South Wales.

In 1878 Dixon accepted appointment as full-time Lecturer-in-Charge of Chemistry at the Technical College. William Adam Dixon was born in Scotland in 1840 or 1841 and was therefore about 37 years of age in 1878. He had worked as an industrial chemist in Scotland and migrated to Australia, where he established himself in practice in Sydney as an analytical chemist and assayer.

Shortly after his appointment in 1878, Mr Dixon was requested by the Committee of the Technical or Working Men's College to set up a chemical laboratory and he undertook "to furnish it with apparatus, supply reagents, fuel, gas, and any assistance required." This laboratory, situated at the rear of the School of Arts premises in Pitt Street, was ready for classes in 1879 and it is from this date, rather than 1878, that it can be said that the School of Chemistry came into existence.



School of Applied Chemistry Staff 1952

Row 1 seated on grass: N/K; James Rockwell; Anthony Morris; N/K; G. McDonald; N/K; Ian Reece.

Row 2 seated: Helen Maguire (the first [1956] female PhD graduate of the University); Eileen Hunt; Ben Armstrong; Gordon Shaw; Ken Cavill; LWO Martin; Ron Nyholm; Prof. Alexander; Fritz Reuter; Alex Bryson; Bernhard Ralph; Ted Cole; N/K; N/K; N/K.

Row 3 standing: Toni Lenzer; June Griffith; Eileen Laing; Felix Gutmann; Bob Gascoigne; Laurie Short; Charles Death; John Courtney; Greg Buchanan; Bill Dunstan; David Lark; Elice Swinbourne; Dennis McHugh; John Gannon; Jock Main; Elsie Butler; N/K.

Row 4 standing: Stanley Livingstone (forward); George Moir; N/K (forward); Gerry Wilson; N/K; John Tetaz; Gordon Aylward; Nick Tschoegl; Ben Morris; Ernest Challen; Clive Harris; Gordon Barclay; Gavin Barbour; N/K;

Where it all began. The first classes given by what was to become the School of Chemistry were held in a laboratory at the rear of the Sydney School of Arts in Pitt St. in 1879. Remarkably, the building still stands.



DIXON'S PERIOD (1879-1896)

It appears that Mr Dixon was a fortunate choice as the first full-time member of the staff of the Department of Chemistry, as it was originally called. There seems to be little doubt that he was capable of considerable effort and took a great interest in chemistry generally. He had been elected a member of the Royal Society of New South Wales in 1875 and over the years he contributed a total of 12 papers to its Journal.

In 1881 the Committee reported: "Mr Dixon has made good use of the laboratory in original research since his appointment as Chemistry Lecturer, as he has contributed to the Royal Society (of New South Wales) valuable papers on the inorganic constituents of the coals of New South Wales and on the chemical composition of salt bushes and other native fodder plants. For several years Mr Dixon has analysed for the Department of Mines a large number of minerals found in the Colony, and prepared an exhaustive report on the coals of Australasia compared with those of other countries with which they have to compete. At the recent Sydney International Exhibition, Mr Dixon acted as chairman of the Committee for judging minerals etc., and devoted a considerable amount of time to that work." Dixon certainly seems to have been "a man for all seasons".

The number of students taking practical chemistry in 1879 ranged from 9 in the first quarter to 18 in the fourth quarter.

In 1883 Dixon reported: "Several students have made good progress in qualitative analysis and even those who have not done so have learned to use their eyes and brains and have acquired some power of observation. Students on entering are usually remarkably deficient in this power and its acquisition by the practical study of physical sciences is perhaps of nearly as much importance as the knowledge of the sciences themselves." It seems that students have changed little in a hundred years and Dixon's observations are as valid

now as they were then.

In 1881 the chemistry course included two lectures and one laboratory session per week, extending over two years. The fees charged were 31 shillings and sixpence per quarter for the lectures and 21 shillings for the practical sessions - not a negligible sum in those days. The lectures were given in the evenings and the practical work could be done on Monday and Friday evenings. However, the laboratory was open on week days from 10 am to 5 pm and from 10 am to 1 pm on Saturdays, and many of the students did at least some of their practical work in the daylight hours. To qualify for the certificate of Expert in Chemistry (sic) the student had to obtain certificates in each of: Mathematics - Algebra, Euclid (4 books), Plane Trigonometry - Applied Mechanics, and to satisfy the examiners as to his knowledge of English and book-keeping.

The chemistry laboratory at the School of Arts site in Pitt Street had been in use for nearly fourteen years when the new laboratory at Ultimo was opened in July 1892. This laboratory was described as a rectangular building, having accommodation for 40 students at the one time. Each student was provided with a working bench, drawer, and cupboard with locks and keys. Each bench was fitted with water and gas and the student had within his reach all the reagents he required. The lecture room could seat 100 students and it had cedar cupboards and cases on both sides containing apparatus for lectures and chemical and metallurgical specimens. There was a storeroom and an instrument room which housed chemical and assay balances, spectrosopes, and a barometer.

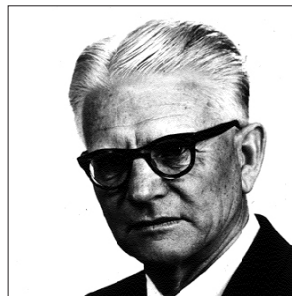
In 1892 a Diploma course in Chemistry was introduced. The requirements involved a minimum of two years part-time study. The first year comprised courses in Inorganic Chemistry (non-metals), Practical Chemistry (Quantitative Analysis), Physics, Mathematics, and Mineralogy. Requisite subjects in the second year were



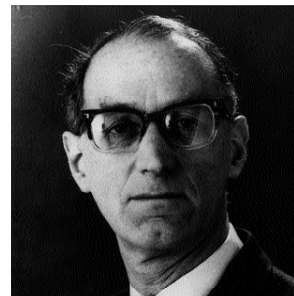
Valentin S. Rawson 1949 -



Albert E. Alexander 1952 -



David P. Mellor 1956 - 1968



Stephen J. Angyal 1968 -
1970



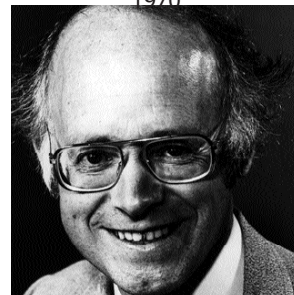
G.W. Kenneth Cavill 1971



Lloyd E. Smythe 1972 - 1975



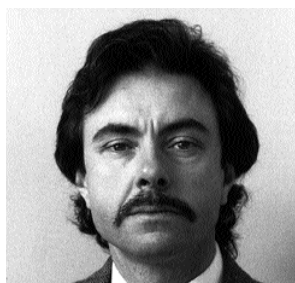
James S. Shannon 1976 -
1977 & 1980 - 1984



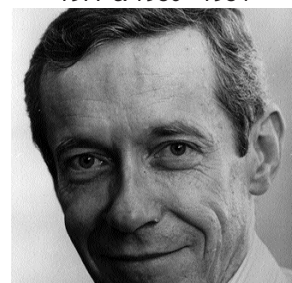
Raymond M. Golding 1978



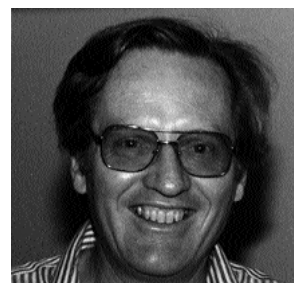
Stanley E. Livingstone 1978 -



Peter J. Derrick 1985 - 1987



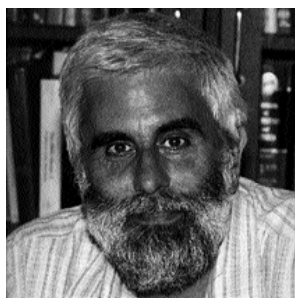
David St.C Black 1988 - 1990



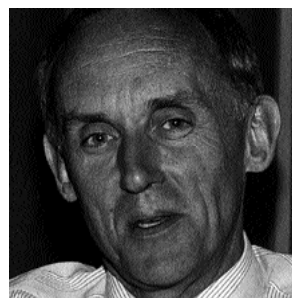
Ian G. Dance 1990 - 1993



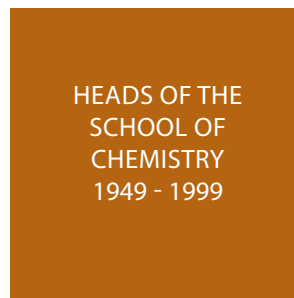
D. Brynn Hibbert 1993 -
1996



Michael N. Paddon-Row
1996 - 1997



Russell F. Howe 1998 -



HEADS OF THE
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Inorganic Chemistry (metals), Practical Chemistry (Quantitative Analysis), Practical Metallurgy or Fire Assaying. The Practical Chemistry courses involved attendance for at least three sessions per week throughout the year.

In the Calendar in the late 1890's it was stated: "Complete instructions can be imparted in every branch of chemistry bearing on arts, industries, or manufactures, and aid given in organic research (sic). It has to be borne in mind, however, in designing and furnishing the laboratory, that the student should learn to improvise apparatus with materials at hand - that is, to use his brains rather than rely on the instrument maker." Many present-day teachers of chemistry would not quibble with the last statement, although they would probably be somewhat hesitant about making a statement along the lines of the first sentence.

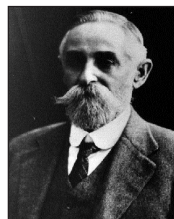
In 1895 Dixon announced that he would give a special course of ten lectures to Public School teachers on Saturday mornings; the fee for the course was ten shillings and sixpence. Apparently these courses were not a success, since it seems that they were not given in subsequent years. Nevertheless Dixon's initiative in this direction is highly commendable and it is noteworthy that 65 years later the School of Chemistry inaugurated Summer Schools in Chemistry for school teachers.

THE PERIOD OF REV. J. MILNE CURRAN (1897-1902)

Dixon retired from his position as Lecturer-in-Charge of Chemistry at the end of 1896. In 1897 the Department was reorganized and renamed the Department of Chemistry, Geology, Mineralogy, Metallurgy, and Mining, with Rev. J. Milne Curran as Lecturer-in-Charge.

John Milne Curran was quite a remarkable person. He was born in 1859 in Ireland. In 1875 he responded to an appeal to migrate to New South Wales in order to study at a seminary at Bathurst for training Irish and Australian

priests for the Roman Catholic Church. From his arrival in 1875 until his ordination in 1881, Curran came under the influence of Rev. Julian Woods, who during his pastoral life had become an outstanding geologist. Following his mentor's example, Curran studied geology privately.



In 1881 Curran was posted to Dubbo and appointed Inspector of Schools for the Bathurst diocese. He continued his geological studies, making many field trips in the district. In 1891 he was elected a Fellow of the Royal Society of New South Wales and for his detailed paper (55 pp) entitled "Contribution to the Microscopic Structure of Some Australian Rocks", published in the Society's journal the Society awarded him a medal, a prize of £25, and a travelling lectureship in the Department of Public Instruction. Between 1884 and 1891 he was the author of 12 papers published in the journals of the Linnean and Royal Societies; in addition he wrote several other articles published in various journals. He became known throughout the State, especially to goldminers, for his geological knowledge of the country.

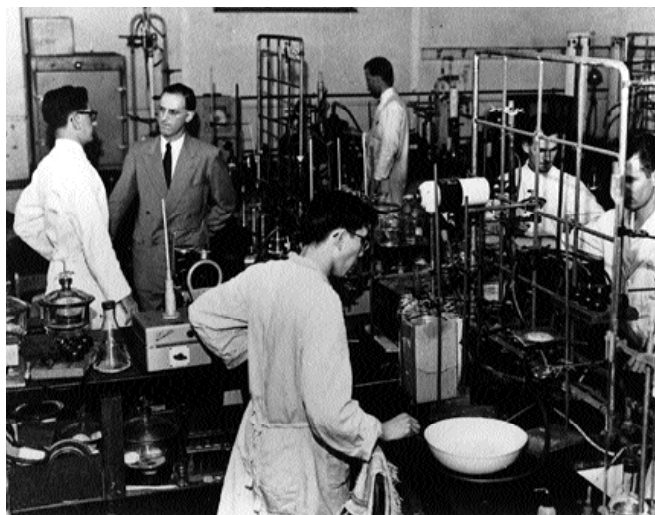
Curran accepted appointment as Lecturer in Geology at Sydney Technical College in 1896, and in 1897 he was appointed Lecturer-in-Charge of the reorganized Chemistry Department upon Dixon's retirement. He worked in Ultimo on week days, exercised his ministry in the Bathurst diocese each week-end, and grasped every opportunity to pursue his field work. His book, *The Geology of Sydney and the Blue Mountains*, was considered a standard reference work.

Curran remained as Lecturer-in-Charge of the Department until 1902, when he resigned to take up the position of Government Geologist. He was one of the first to delineate the extent of country likely to benefit

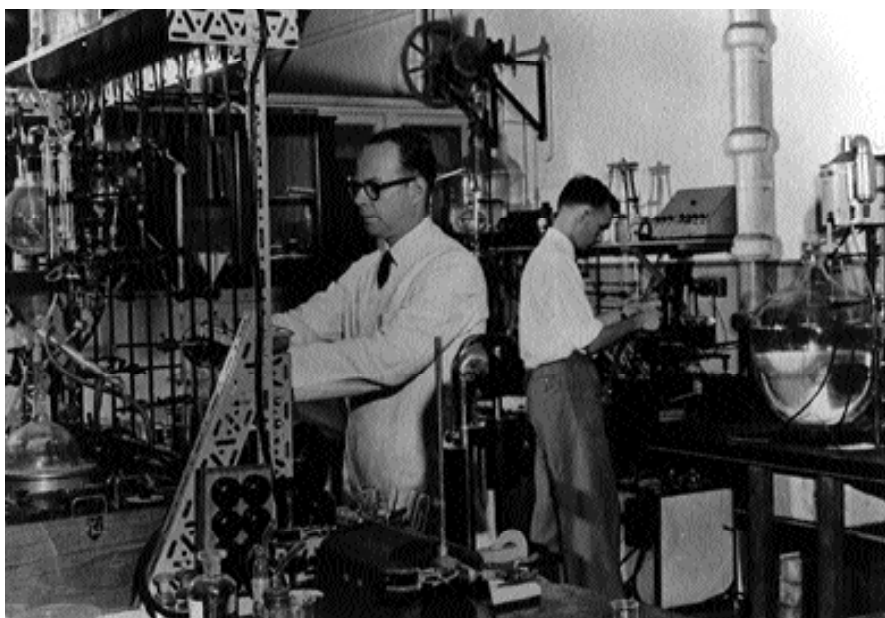
PRACTICAL CHEMISTRY IN THE EARLY DAYS AT ULTIMO



A third year physical chemistry class in the late 1950s. The lecturer-in-charge, David Lark (seated far right), was a member of the academic staff from 1948 - 1982.



An organic chemistry research laboratory in the 1950s with Stephen Angyal (1953 - 1979) (second from left) who retired as Professor and Dean of Science and remains active in chemistry to the present day. Ron Warrenner (far right), then a PhD student with Dr. Gordon Shaw is now Professor of Chemistry at Central Queensland University.



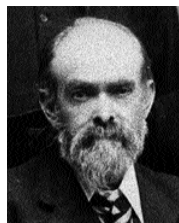
Technical Officers Nick Tschogel (left) and Jeff Barnes in their research laboratory. Nick subsequently went to the Caltech and Jeff to the University of Queensland

from artesian boring and travelled extensively throughout the State making geological surveys, giving advice on mining, and encouraging investment in mining ventures. He died in the Sydney suburb of Centennial Park in 1928.

H . G . S M I T H

It is interesting to note that in the merit listings in Chemistry for 1889 in second-year Theoretical Chemistry H.G. Smith obtained the only First-grade Pass. H.G. Smith was to become a pioneer in Australian phytochemistry and one of the two main lecture theatres in the present School of Chemistry is named after him.

Henry George Smith was born in 1852 in Kent. Apparently his schooling was minimal and he became a painter and signwriter. After contracting pneumonia, on medical advice he left England in the hope of regaining his health in a warmer climate, and arrived in Sydney with his wife and family in 1883. He obtained work as a signwriter in the Technological Museum, which was still housed in a galvanized iron building in the Domain. He became interested in chemistry and enrolled as a student at the Technical College in 1888. Dixon recognized



Smith's ability and greatly encouraged him. In 1891 Smith was appointed laboratory assistant at the Technological Museum and during the next few years he published papers on mineralogy and was appointed Mineralogist to the Technological Museum.

Due to the influence of J.H. Maiden, Curator of the Technological Museum, Smith's interests switched from mineralogy to organic chemistry. Maiden was a botanist and he persuaded Smith to investigate the chemistry of Australian plants. Their first conjoint paper appeared in 1895. Shortly afterwards R.T. Baker was appointed Economic Botanist and Curator of the

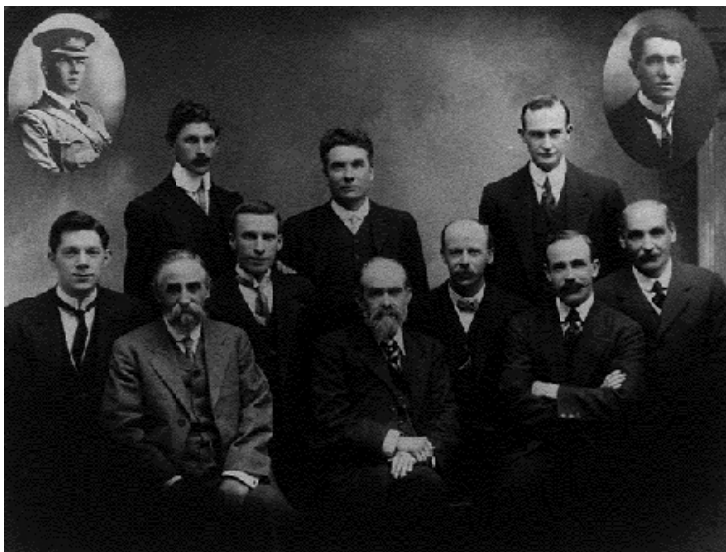
Technological Museum, since Maiden had become Director of the Botanic Gardens. Baker and Smith embarked upon a collaborative research effort, which was to continue for more than twenty years, concerned with the investigation of the chemical constituents of the essential oils of the eucalypts. Some of the results of their work were published in two beautifully illustrated books, *A Research on the Eucalypts*, especially in regard to their Essential Oils and *The Pines of Australia*.

In 1897 the subject of Organic Chemistry was introduced as an elective in the second year of the Technical College Diploma course in Chemistry and Smith was appointed as (part-time) Teacher of Organic Chemistry in order to teach it, although he himself had never had any formal instruction in the subject. In 1898 Smith had been appointed assistant Curator and Economic Chemist at the Technological Museum, a position which he held until his retirement in 1921.

Shortly after his death in 1924, the Royal Society of New South Wales set up the Smith Memorial Committee to raise funds for a memorial. In April 1927 the Committee handed over the funds to the Australian Chemical Institute with a recommendation that an H.G. Smith Memorial Medal be awarded annually to the Institute member who has contributed most to the development of some branch of chemical science, as judged by his research work published during the previous ten years. Thus the H.G. Smith Medal is the most prestigious award given by the Institute.

THE PERIOD OF CLUNIES ROSS (1 9 0 4 - 1 9 1 4)

In 1904 the Department again became known as the Department of Chemistry and Metallurgy, and W.J. Clunies Ross was appointed Lecturer-in-Charge. He was related to John Clunies Ross, the Scottish sea captain who settled in the Cocos Islands in 1827 and to whose descendants Queen Victoria granted the territory in



The first Council of the Sydney Technical College Chemical Society, 1913. Rear: (l. to r.) E.S. Stokes, P.J. Woollett, A.D. Olle, H. Tindale, R. Bagley. Middle: C.V. Treloar, A.R. Penfold, A. Cronin, G. Inglis-Hudson. Front: H.G. Smith, W.J. Clunies-Ross, R.W. Challinor.



UNSW has always been at the forefront of modern instrumentation even when they had to build it themselves. Here, Dr Ron Werner, later to become Principal of the institute of Technology (now UTS) shows Professor A. E. Alexander and Mausell Davies (University of Wales) a single beam grating diffracting

1886. William John Clunies Ross was born in London in 1850 and made his first visit to Australia in 1864. Returning to England, he began his career in a counting house of a large business in London, but later studied science at Kings College London whence he graduated BSc. He returned to Australia and in 1884 he was appointed as Principal of the Technical College at Bathurst.

In 1904 he was transferred to Sydney to become Lecturer-in-Charge and immediately became an active member of the Royal Society of New South Wales. He was the author of 14 papers published in Australian journals. He was also the (sole) author of two books: viz., *The Metallurgy of Silver* (1885) and *Outlines of the History of Chemistry* (1910). Clunies Ross remained Lecturer-in-Charge until his death on 7 November 1914,

eight weeks before he was due to retire after 30 years service in technical education in New South Wales. One of his four sons, Sir Ian Clunies Ross, became Professor of Veterinary Science at Sydney University (1940) and the first Chairman of CSIRO (1949).

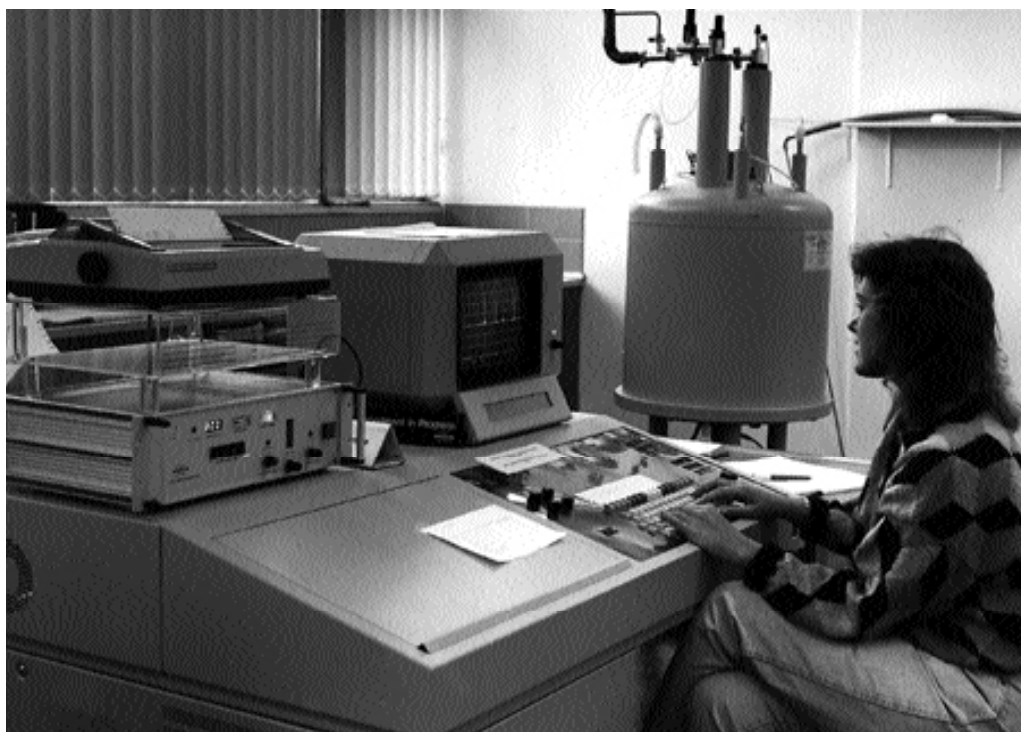
In 1906 the Theoretical Chemistry, Practical Inorganic Chemistry, Quantitative Analysis, Organic Chemistry, and Assaying courses each extended over two years. Some of these courses could be taken concurrently but the Diploma in Chemistry required a minimum of three years and four years would be regarded as the norm. In 1908 the numbers of students taking instruction were as follows: Inorganic Chemistry, 435; Metallurgy and Assaying, 47; Organic Chemistry, 14. In 1909 it was stated that "The Department of Chemistry and Metallurgy is

PRIZES

Most prizes offered by the School for excellence in chemistry are funded by donations from the chemical industry or other employers of chemistry graduates. The School, and particularly the prizewinners are, of course grateful for this generosity, though sometimes these donations were less than extravagant. Professor Mellor once wrote to a very large Sydney brewery in the late sixties noting that they had funded a prize of \$4.20 (two guineas) since before WW2 and perhaps they might like to increase it. They refused on the grounds that they would have to increase all the other prizes they offered and they could not justify such lavishness. That prize is no longer offered. On the other hand Parke W. Pope and George Wright, respectively Chairman and Managing Director of Farmer and Company (a Sydney department store) generously sup-



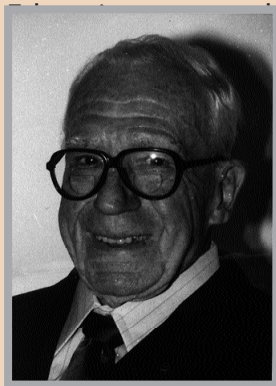
Prizewinners in 1996 with Professor Brynn Hibbert. (l. to r.) Hugh Harris, Catherine Whitby, Pariyanuj Chaimungkalanont, Felix Ho, Nicholas



The School has always maintained an extremely high level of instrumentation. Recent acquisitions which did not exist or were virtually unknown in 1949 are shown in these two photographs. Above: the surface science facility set up in the early 1990s to examine the chemical and structural nature of surfaces, their modification and the reactions that occur thereon. Left: a modern 300MHz nuclear magnetic resonance spectrometer now routinely used by graduate students and here operated by Dr. Susan Bradley, a Canadian Post-doctoral researcher.

ENDOWED LECTURES

The school has a number of these administered by its Chemical Society. The Mellor and Dwyer Lectures were established in honour of these chemists and are held at appropriate occasions. The Andrews Lectures, held every second year, are supported by income from contributions from chemists around Australia though most generously by Andrew Ungar, after whom the Lectures are named and, since his death, by his wife Beryl. The Jeffrey lectures were funded from a bequest to the Society by R.E. Jeffrey, a member of the (then) Sydney Technical College Chemical Society from 1921 and an active supporter of the (now) UNSW Chemical Society until his death in 1966. The Howard Lectures arise from a bequest to the Society by Theo Howard, a graduate (M.Sc.) of Sydney University who, after a lifetime in Technical



Theo Howard



R. E. Jeffrey

intended to afford a complete training in Theoretical and Practical Chemistry to those who aspire to the position of Assayer, Metallurgist, or Works Chemist, when supplemented by experimental work in the laboratory of a mine or chemical works.... Many students who commenced their chemical studies at Sydney Technical College are now occupying responsible positions in various parts of Australia, in U.S.A., and elsewhere."

THE FOUNDATION OF THE SYDNEY TECHNICAL COLLEGE CHEMICAL SOCIETY

Following upon discussions with the senior chemistry students in 1911, Richard Challinor and Archibald D. Olle made the suggestion during the ANZAAS meeting in 1912 that a chemical society be formed. And at a reunion dinner of past and present students, on 5 April 1913, it was formally agreed that the Sydney Technical College Chemical Society be inaugurated. The first meeting was held on 2 August 1913. The composition of the first Council of the Society was: President, W.J. Clunies Ross; Vice Presidents, H.G. Smith, E.S. Stokes, T. Guthrie; Honorary Secretaries, A.R. Penfold, C.V. Treloar; Honorary Treasurer, R. Bagley; Members of Council, R.W. Challinor, A. Cronin, H. Tindale, G. Inglis-Hudson, A.D. Olle, P.J. Woollett.

The scientific contributions at the first meeting were an exhibit and notes on "Ferrozyl Indicators" by H. Tindale and a paper "The Analysis of Commercial Red Lead" by A.R. Penfold. The early contributions had a strongly practical bias and the Presidential Address delivered by the first three Presidents showed their interest and concern about the application of science and industry to national development at a time when Australia was taking the first steps to develop her secondary industries. The titles of these addresses were: W.J. Clunies Ross (1914), "Methods of Industrial Chemical Research"; H.G. Smith (1915), "The National Value of

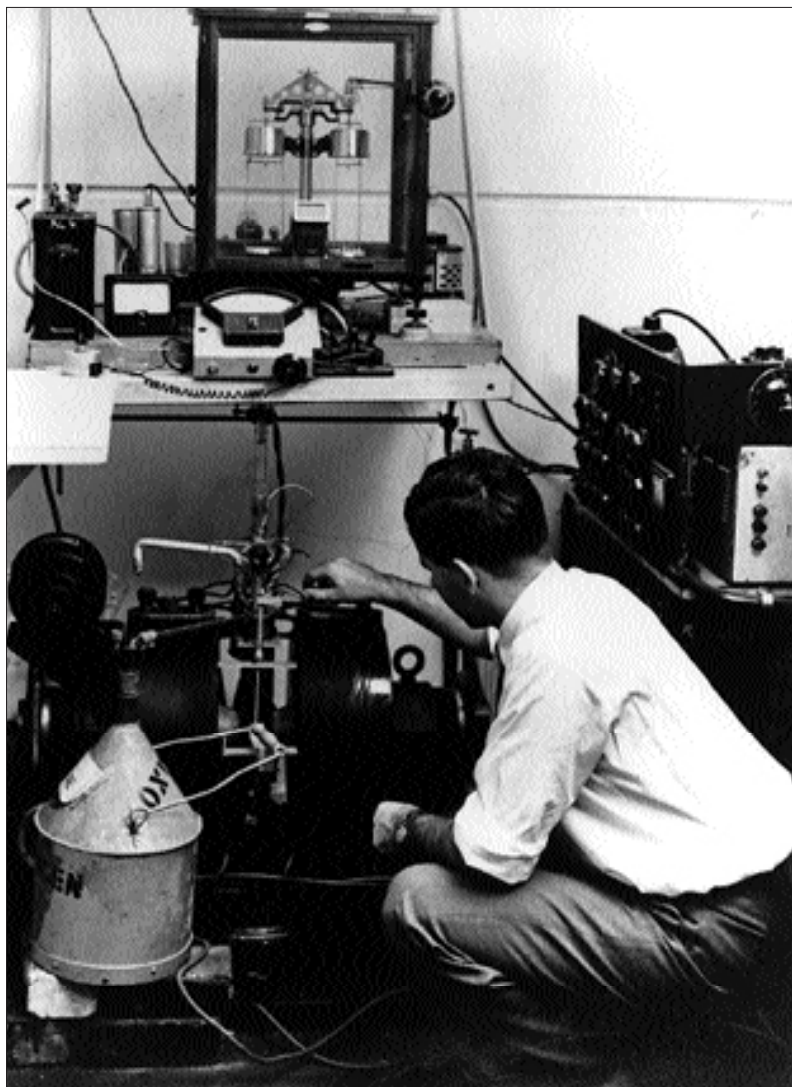


Photo by Max Dupain

Instrumentation in chemistry has advanced exponentially in accuracy, sensitivity and scope in the years since WW2. Structural and analytical problems which would have occupied a researcher for months or even years may now be resolved routinely in hours or days. These two photos show (left) A variable-temperature Gouy balance, used for measuring magnetic susceptibilities of metal complexes. It is operated here by Dr. Ray Martin (1954 - 1959) who went on to become Professor of Inorganic Chemistry and then Vice-Chancellor at Monash University. Brian Figgis (1950 - 1955) was closely involved in the construction and operation of this equipment. He subsequently became recognised as a leading magnetochemist and was appointed Professor of Inorganic Chemistry at the University of Western Australia. (above) Dr. Alex Bryson (1938 - 1967), first Head of the first University Department of Analytical Chemistry in Australia., using a polarograph. Though both methods find only occasional use today they were state-of-the art in the fifties. Dr. Alex Bryson is still alive, 97 at the time of publication and probably the oldest surviving

CREATIVE BUYING

The ingenuity shown by Dr. Murphy was later reflected in the resourcefulness in the staff in general in overcoming the often tedious procedures imposed by the administration for purchases.

The ordering of equipment items in particular was a cumbersome process and required approval by no less august a body than the Vice Chancellor's Advisory Committee for items costing in excess of a relatively modest sum which was only \$600 even as recently as the early eighties. In order to obviate this additional source of delay it was not unknown to break down the equipment into components which could be ordered separately. The suppliers were generally cooperative in this and were happy to provide individual quotes for the separate components! Times have changed, however, and generally for the better in this regard. The relative isolation of Australia from most markets was a much greater problem in the days before the general use of air freight and the fax machine speeded things up and have resulted in deliveries not too much longer than those applying in the country of origin.. Earlier, long delays in delivery were taken for granted though the experience of one senior member of staff in having to wait two years for 1 gram of a relatively innocuous chemical to arrive was not quite typical. Staff learnt to try to anticipate needs and ordered chemicals well in advance of expected use. The result sometimes was that when the chemicals eventually arrived the

radio personalities of the day, Bob Dyer and Jack Davey.



Dr Murphy demonstrated to the capacity audience that as a showman he was by no means inferior to these two professionals. He poured a large bottle of whisky into a tray, then poured liquid nitrogen over it to freeze the whisky. He then poured some mercury into a matchbox and placed a pencil upright in the mercury. He then froze the mercury with liquid nitrogen. He now had a mercury hammer which he used to break up the frozen whisky. He then threw the pieces to the audience, who scrambled wildly to get them.

Robert Kenneth Murphy was born in Newark, New Jersey, U.S.A. on 19 July 1887 and died in Sydney, aged 84, on 31 May 1972. When Robert was seven years old, his father sold out the Johnson and Murphy Shoe Company and bought the Genesee Paper Mill in Rochester, N.Y., whither the family moved. The four boys were sent to boarding school in Canada. Here Robert learned to play cricket as well as football and ice-hockey. In 1905 he entered Columbia University, New York.

Murphy commenced the newly established chemical engineering course at Columbia in 1906 and graduated "first" in 1910. At Columbia he distinguished himself in sport, being captain of the ice-hockey team, vice-captain of the football team, and stroke of the eight and was selected for the All American Eight Oar Crew. He was also Vice-President of the University Chemical Society. After graduation from Columbia, Murphy visited Europe and decided to undertake post-graduate work for a year at the Technische Hochschule at Darmstadt, Germany. After a year at Darmstadt he was advised to seek permission from the German Government to work for the degree of Doktor-Ingenieur in the field of electrochemistry. His application was approved and he worked on titanium and the electro-refining of metals including zinc. He was awarded his

Chemical Effort"; R.W. Challinor (1916), "The War and Our Industrio-Chemical Awakening".

The printing and publication of papers was beyond the Society's financial resources, and the offer of the proprietors of Pharmaceutical Notes and News (Elliott Brothers Ltd) to publish the Society's contributions, was gratefully accepted. Typical contributions to the earlier meetings were as follows: "The Cement Industry of New South Wales" (T. Robertson, 1913); "Grignard Reagents" (R. Bagley, 1913); "Some Products of Wood Distillation" (R.W. Challinor, 1914); "Eucalyptus Oils and Some Methods of Analysis" (H.G. Smith, 1914); "Liquid Crystals" (R. Basden, 1914). Visits to industrial organizations were a feature of the Society's activities for many years, and members who were associated with the firms arranged the visits. A number of overnight excursions were made to works outside the metropolitan area, e.g., Lithgow Iron and Steel and Port Kembla smelting works. At a later date, with the advent of factory visits as part of the Diploma syllabus at the Technical College, the Society's visits were largely curtailed and finally discontinued.

The Society, as the University of New South Wales Chemical Society, continues to the present day (1999). Prominent chemists from the School of Chemistry and outside it have served as President. The Society endows the following lectures: R.K. Murphy Lecture (first lecture 1957); Andrews Lectures (1960); Dwyer Memorial Lecture, with medal (1962); Mellor Lecture, with medal (1972); Jeffrey Lectures (1981). These lectures, usually given annually, have been delivered by eminent chemists, some of whom were Nobel Laureates, mostly from overseas.

THE END OF AN ERA

With the death of Clunies Ross the first era in the history of the School of Chemistry can be said to have come to an end. The School - or Department as it was then known - had been in existence for 36 years and had grown,

albeit slowly, to a moderate size. The first three Lecturer-in-Charge, Dixon, Milne Curran, and Clunies Ross, were outstanding men who did much to establish the reputation of the Department.

The aim of the Department of Chemistry and Metallurgy was stated quite clearly in 1909. It was to produce chemists who would use their theoretical and practical training to work as professionals in mining and chemical industry. The course had a practical bias, as distinct from a more broadly based university course. It was stressed that many alumni of the Chemistry Department were occupying responsible positions in industry in Australia and overseas.

In 1914 the First world War had begun and it was realised that Australian industry needed to expand; the chemical industry was underdeveloped and relied heavily on overseas imports. The Chemistry Diploma course needed to be upgraded in order to train chemists for the needs of an expanding secondary industry. The term chemical engineering was virtually unknown in Australia, yet within the next decade chemical engineers would be in demand. Thus the stage was set for a new breed of chemist with the latest ideas from overseas and he was to make the best of his opportunities.

THE MURPHY ERA (1915 - 1947)

In the long history of the School of Chemistry there has been no more colourful character than Dr Murphy. He was Lecturer-in-Charge for over 32 years: from January 1915 until March 1947. Many stories can be told about Murphy. Probably the best known is the following. He wanted a refrigerator for the industrial chemistry laboratory but his requisition was refused. So he then ordered a "negative hot plate" and his requisition was approved and he got his refrigerator. One of my most vivid impressions of Murphy was of him on the stage of the Sydney Town Hall one Saturday afternoon during the Chemical Exposition in September 1946. The Royal Australian Chemical Institute had engaged the two outstanding

doctorate in July 1913.

At the age of 27 Dr Murphy was appointed Lecturer-in-Charge of the Department of Chemistry and Metallurgy at Sydney Technical College and took up duty on 20 January 1915. Murphy immediately set about raising the standard of the chemistry courses. In 1916 the length of the Diploma course was increased from four part-time years to five, and successful completion of the course led to the award of Associateship of the Sydney Technical College (ASTC). The structure of the courses and numbers for the individual subjects initiated by Murphy in 1916 remained essentially the same - although the subject content was kept up to date - until the courses were taken over by the New South Wales University of Technology in 1952.

Murphy had constructed his courses to cover a wide spectrum of techniques required by industry at the time. It should be borne in mind that these courses were devised during the First World War when it had become evident that Australia's imports of essential chemicals were threatened by German submarines and surface raiders. Consequently, there was an urgent need to establish new chemical plants and to enlarge existing ones. Plants were established for the production of chemicals needed for the war effort, such as sulfuric acid, nitric acid, ammonium sulfate, alkalies, and industrial solvents.

In 1917 Dr Murphy inaugurated the Chemical Engineering Diploma course - the first chemical engineering course in Australia. It was Murphy who established chemical engineering in this country as a discipline in its own right - that is, that chemical engineers are not just engineers with a smattering of chemistry or chemists with spanners. The Chemical Engineering Diploma course was offered in seven Divisions: viz., (a) Ceramic, (b) Chemical Manufacturing, (c) Electrochemical, (d) Engineering, (e) Foodstuffs and Dyeing, (f) Fuel, and (g) Leather and Tanning.

In addition to the Diploma courses in Industrial Chemistry, Organic Chemistry, Chemical Engineering, and Metallurgy, Science Diploma courses were available in Geology, Biology, Physics, and General Science. Stage 1 was common to all these Diploma courses. Fees were three pounds three shillings per annum. Murphy had voiced strong complaints about the acute shortage of accommodation for his Chemistry students. To ease this shortage, temporary buildings were erected close to the Harris Street frontage and were made available to the Chemistry Department on 29 July 1918. Although a new Chemistry building was completed in 1928, these temporary buildings were still being used by the School of Chemistry in December 1961.

In 1920 the Department of Technical Education set up the Chemistry Advisory Committee with the object of securing the active cooperation of industry and the chemical profession. The composition of the committee was as follows: Dr T. Cooksey, BSc, PhD, FIC; Dr J. Elliott; Professor C.E. Fawsitt, PhD, DSc; B.J. Smart, BSc; H.G. Smith, FSTC, FIC; H. Tindale; R.H. Walton. It is of interest to note that it was not until 1969 that the University of New South Wales appointed a School of Chemistry Visiting Committee with essentially the same terms of reference as those of the Advisory Committee of 1920.

In 1924 the full-time staff of the Department of Chemistry and Metallurgy was as follows:

R.K. Murphy, Chem. Eng., Dr Ing, AACI, Lecturer-in-Charge

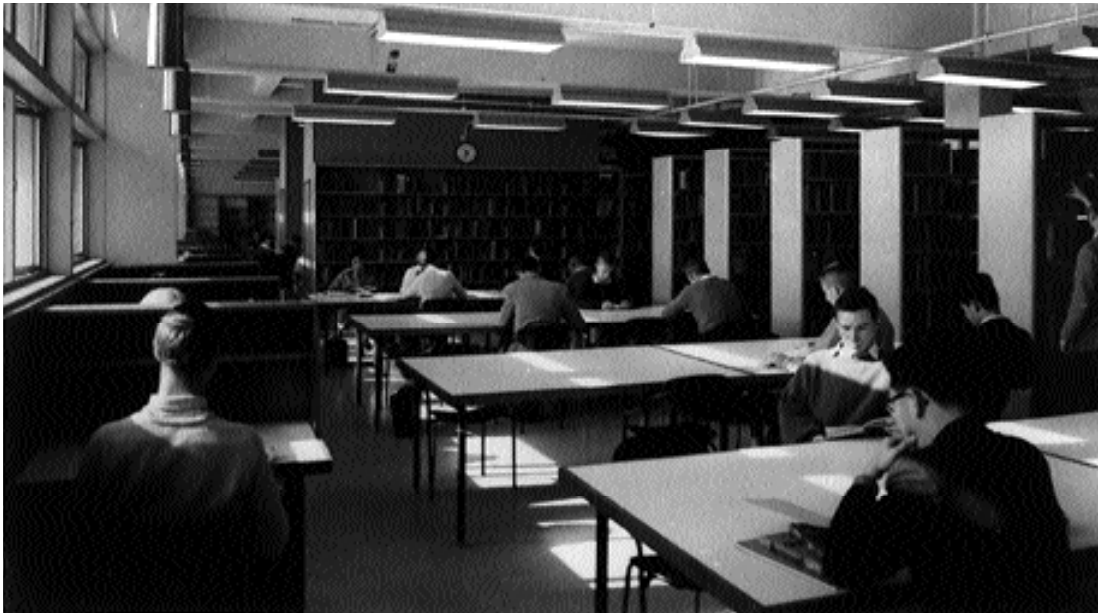
R.W. Challinor, FIC, AACI, Head Teacher of Organic Chemistry

J. Forde, BA, BSc, Head Teacher of Inorganic Chemistry

V.S. Rawson, BSc, Dip Agric, Teacher of Physical Chemistry

J.W. Hogarth, Dip Chem, Teacher of Industrial Chemistry

In 1924 J.W. Hogarth was appointed Teacher in



The University library was a moveable feast in the fifties and sixties, located first in the Dalton and then in the Heffron building. All the tables by the windows in Heffron were always full, reputedly so that the students could watch the races at Randwick, though the finishing post is on the other side of the course from the University and races were usually held only on Wednesdays and Saturdays. It seems more likely that the side tables were sunnier and more conducive to sleeping.





Organic Chemistry Department, Ultimo, early 1950s. Back row: U/K, Errol Watson, John Courtney, Bill Dunstan, Helen Maguire, Ken Cavill, Gordon Shaw, Fritz Reuter, Ted Cole. Front row: U/K, Ernest Challen, Mick O'Brien, John Tetaz, John Makvytis, John Gannon.

Inorganic Chemistry Department, 1985. Front row: Dave Phillips, Harry Goodwin, Stanley Livingstone, Doug Carswell, Nick Roberts, Ian Dance, Mervyn Long. Back: Zafar Abed Ali Miah, Robert Garbutt, Herath Banda, Michael Antolovich, Kristian Sugiyarto, Maureen Prosser, Grace Conn, Joe Antoon, Nilly Ravey, Djulia Onggo, Don Craig, Peter James.





Physical Chemistry Department
1979

Front row: David Alderdice, David Lark, Tristan Findlay, Ruby Foon, Ray Golding, Margaret Pitt, Joanne McConnell, Nerita Jurinario. Second row: Alex Kabakoff, Alan Milcoy, Greg Buchanan, Tat, Helen Bergen, U/K, Mick Withers. Back row: Ross Nobes, Greg Muir, Robert Petersen, Jane Peterson, U/K, Martin Bogaard, Dave Johnson, Chris Lukey, Richard Szczepanski, Jack Garnett, U/K,

Analytical Chemistry Department 1983. Front row centre: Glenn Dillow, others unknown. Middle row: Joseph Ayoub, M.A. Trojanowicz, Paul Haddad, Peter Alexander, Beverley Brownhall, Ian Gregor, Serge Dilli. Third row: U/K, U/K, U/K, Joe Antoon, Doug Graddon, Lloyd Smythe, Jarda Matousek, Andy Rakuns, U/K, U/K. back row: U/K, U/K, U/K, U/K, Pat Morson, Anne Tucker, Dick Finlayson.



dents, all of whom he knew by name; indeed, he often amazed former students by remembering their names after the passage of many years. He often forsook his tea hour in order to give free coaching to any student who required it. Few were the students who, at some time or another, did not go to him for help or advice.

The full-time staff was assisted by part-time teachers, who held senior positions in industry. In 1929 these numbered eight and increased to 23 in 1939. In 1920 the award of a Bronze Medal was introduced. The Medal was awarded annually to the best student in each Diploma course, provided that he attained the standard of Honours.

In 1934 F.P. Dwyer was appointed Head Teacher of Inorganic Chemistry upon Forde's retirement. Dwyer's appointment could be regarded as a turning point in the history of the School. Although previous members of the staff, notably Dixon and Milne Curran, had done some quite significant research, it was Dwyer who began the research tradition which eventually led to the attainment by the School of an international reputation in the field of inorganic chemistry.

In March 1938 Challinor retired and Dr Fritz H. Reuter was appointed Head Teacher of Organic Chemistry. Reuter was born in Vienna in 1905 and had studied Chemistry at Munich University and at the Technische Hochschule in Brno, Czechoslovakia. He subsequently worked with Professor H. Fischer, the famous carbohydrate chemist, then went to the University of London School of Hygiene and Tropical Medicine and worked under Professor Reistrich, FRS. He came to Australia and was Carnegie Research Fellow at the University of Sydney in 1936-7.

Reuter's advent was like a breath of fresh air in the Organic Chemistry Department and the students were aware of it. Challinor, despite his continued interest in chemistry generally, and his personal interest in the students, did not have the background of the new

European appointee, who had had ten years research experience at some of the world's leading centres of research in organic chemistry. Reuter remained Head of the Organic Chemistry Department until 1952, when he was appointed Associate Professor of Food Technology in the newly created School of Chemical Engineering, where he built up a department - which eventually became the School of Food Technology - without peer in Australia. A big man, Reuter had a quiet but persuasive and authoritative manner; he was not always liked but all the staff and students had a great respect for him.

In 1938 Murphy and his students had produced purified alumina from bauxite obtained from Tasmania, and from the electrolysis of his alumina, dissolved in molten cryolite, Murphy produced the first piece of aluminium - a small ingot - ever made in Australia. This ingot is preserved in the Museum of Applied Arts and Sciences at Ultimo. Later Murphy was asked by the Commonwealth Government to report on the feasibility of producing aluminium in Tasmania. He visited Tasmania and in due course submitted his report. Eventually, after the Second World War the Commonwealth Government established the first Australian aluminium smelting works at Bell Bay on the Tamar estuary, north of Launceston.

In 1940 R.S. Nyholm was appointed Teacher of Chemistry. Nyholm and Dwyer developed not only a good research combination but a close personal friendship. With a heavy teaching load and limited resources in the years 1942-44 they published 15 research papers, mainly on the coordination chemistry of rhodium and iridium.

Dwyer received his DSc from the University of Sydney in 1946 and resigned that year to take up an appointment as Senior Lecturer at the University of Sydney. He later became Professor of Biological Inorganic Chemistry at the Australian National University, Canberra, where he died suddenly in 1962, aged 51.

Sir Ronald Nyholm was born in Broken Hill in 1917

Chemistry. Julius William Hogarth was born in 1882 and studied chemistry at Sydney Technical College in 1898-9. He was appointed Laboratory Assistant in the Chemistry Department of the College in 1903 and in 1908 began studying chemistry at Sydney University. Although he completed the BSc course, he did not graduate, since he had not matriculated in Latin, a requirement for a degree at Sydney University - and many other universities - at that time. He was so competent in the subject of Qualitative Analysis in second year that his lecturer gave him an unknown with 26 cations and anions, which Hogarth successfully analyzed at the first attempt. This so impressed the lecturer concerned that he arranged for Hogarth to be appointed Demonstrator in Chemistry.

Hogarth worked as an analyst and one of the tasks he undertook was the analysis of the rock specimens brought back from Antarctica by the noted explorer, Professor (later Sir David) Mawson in 1915. In 1916 Hogarth responded to a call issued by A.E. Leighton - who became President of the Royal Australian Chemical Institute in 1953 - then on secondment to the British Ministry of Munitions, for Australian chemists to work in munitions and chemical factories in England.

In 1929 Hogarth was promoted to Head Teacher of Industrial Chemistry, a position he held until his retirement in January 1948. After his retirement he accepted an offer to work as research assistant to Dr F.P. Dwyer at the University of Sydney, where he carried out research on metal complex compounds and developed a method for the analysis of osmium. He was co-author with Dwyer of several publications in *Inorganic Syntheses* and other journals. In 1952 at the age of 70 Hogarth was awarded the BSc degree by the University of Sydney for his thesis *Osmium Ammines* - one of the rare instances where a bachelor's degree has been awarded for research work. He successfully completed the MSc Qualifying course with the intention of obtaining a mas-

ter's degree, but he did not ever submit an MSc thesis. When Dwyer accepted the position of Reader in the John Curtin School of Medicine at the Australian National University, Hogarth accompanied him to Canberra, where he continued his research collaboration with Dwyer until he was 80 years of age. He retired when Professor Dwyer died suddenly in 1962. He died in 1974, aged 92.

Another appointee of the staff in 1924 was V.S. Rawson. Valentin Stratford Rawson was born in Bradford, Yorkshire in 1887. He was the son of Christopher Rawson, who was a chemist in the dye industry in Britain and a relative of Sir Harry Rawson, Governor of New South Wales (1902-9). Rawson obtained a Diploma of Agriculture from the Agricultural College at Wye, Kent. He migrated to Australia in 1912 and settled in Perth, where he was an assistant to the Western Australian Government Analyst. In 1919 he obtained a teaching position at Brisbane Technical College and gained his BSc from the University by part-time study. In 1921 he was appointed Assistant Teacher of Chemistry at Broken Hill Technical College and was promoted to Teacher the following year. He applied for a transfer to Sydney on the grounds that there was insufficient work to keep him fully occupied at Broken Hill.

Rawson soon formed a close association with Murphy and always remained intensely loyal to him. He lectured in Physical Chemistry and Quantitative Analysis and inaugurated a course in Applied Chemical Mathematics which was to remain an essential part of the Diploma courses in Chemistry and Chemical Engineering. He was promoted to Head Teacher in 1928 and was awarded the ASTC (*ad eundem gradum*) in 1929.

Murphy, even in his later years, was athletic and extremely handsome, with a charming personality. On the other hand, Rawson was small, slight, and crippled, and in no way could he have been described as good looking. Yet he was immensely popular with his stu-

CHEMISTRY BUILDINGS AT KENSINGTON FROM A BARE SITE



The Dalton building is shown approaching completion but with the library already installed on the first floor. Note the old racecourse building in the background which became the Old Tote Theatre, which is still there but is now used by the Law School. The awning projecting from the Dalton building was to suffer so severely from passing trucks that it is now



Photo by Max Dupain





Photo by Max Dupain

The completed Heffron building is shown brand spanking new and awaiting the onslaught of the student hordes. The egg crate structures on the outside of the building work efficiently to exclude the sun in summer and let it in in winter. Most of the windows were not sealed in place and wind and rain entered virtually unimpeded to the acute discomfort of staff, particularly those on the southern side. The Heffron, a flat roofed building, was prone to leaks of all kinds perhaps because it was named after a politician, and few laboratories, offices or lecture theatres escaped the occasional deluge. Due to clever design the drains on any floor were invariably the highest point of the floor. The lifts were a rare breed with independent personalities. They displayed a lordly disdain for instructions, passing by patiently waiting customers to deposit passengers on floors to which they did not wish to go. Their most notable characteristic, however, was to sulk on the fifth floor with the directional arrow showing up and to refuse to move until the mechanic was summoned. Despite expensive refurbishment, nothing has changed! The



The aerial photograph shows the campus in the mid sixties with the chemistry buildings as they are now. Note the solar furnace at the western end of the Heffron building. It belonged to Physics and is clearly an early attempt to take us over. It was taken down and dismantled about the time the importance of solar energy was being widely recognised. The rails, however, can still be seen in the carpark. Perhaps the most interesting feature is the almost complete absence of cars in High St. and Barker St.

and was awarded a Public Exhibition which enabled him to enter Sydney University, whence he graduated BSc (Hons) in 1938. In 1947 he was awarded an ICI Fellowship to work with Professor Ingold at University College London and graduated PhD in 1950. He returned to Sydney in 1952 and was appointed associate Professor in 1953. He resigned in 1955 to become Professor of Chemistry at University College London.

Nyholm was more than a good scientist, a good teacher, a good administrator: his influence on the School of Chemistry was considerable. He had a dynamic and engaging personality; as Lord Annan, Provost of University College, observed: "Ron Nyholm never entered a room; he bubbled into it and exploded into good fellowship, mirth, and happiness". His achievements were legion and his influence was very wide indeed. The Chemical Society (London) was founded in 1847 but it was not until Nyholm became President in 1968 that a sovereign paid a visit to its headquarters in Burlington House, when Queen Elizabeth II spent some time there. He was killed in a car accident in 1971.

Ron Nyholm represented different things to different people. To me he epitomized the ideal scientist: someone genuinely interested in research, a dedicated teacher, and a person interested in people and the welfare of humanity. Professor David Craig said of him: "He could have excelled in any field of activity calling for leadership, political skills, warmth and sympathy and boundless energy." I think that he was the noblest person associated with the School of Chemistry and he always maintained a close relationship with it.

In 1946 the School had attained a significant size and a substantial increase in enrolments. The staff consisted of a Lecturer-in-Charge (Murphy); three Senior Lecturers (Rawson, Reuter, and Nyholm); ten Lecturers; and three Teachers - 17 in all.

Murphy's long reign of 32 years as Head of School came to an end in March 1947, when, against the advice of

Dwyer and Nyholm, he accepted the position of Principal of Sydney Technical College. He had done much for the development of chemical education and chemical industry in New South Wales and had built up the School of Chemistry which was to become the largest in Australia.

THE PERIOD OF TRANSITION (1 9 4 7 - 1 9 5 7)

As early as 1921 Dr Murphy had advocated that his diploma students should be awarded degrees and in 1931 the Sydney Technical College Chemical Society called a meeting to discuss the granting of degrees to diplomates. In 1937 a group of diplomates, with Murphy's strong support, formed a committee, under the chairmanship of Mr Frank Bradhurst, to press the government for degree status for diplomates. In 1940 the state government passed the Technical Education Act providing for the establishment of an Institute of Technology in 1941; but this did not occur. However, this is not the place to detail the events which led to the establishment of the University of Technology in July 1949.

Following Murphy's resignation, Rawson was appointed Acting Head of School, a position which he held until his retirement in 1952. During his term 27 new academic staff were appointed to handle the significant increase in enrolments. Research in all areas of the School increased markedly, particularly in organic chemistry and inorganic chemistry.

In December 1949 Professor A.E. Alexander arrived to take up his appointment as Professor of Applied Chemistry and in January 1950 Professor J.P. Baxter entered on duty as Professor of Chemical Engineering. Their arrival created an anomalous situation, since they alone were on the University staff, while Rawson and rest of the staff were employed by the Department of Technical Education. Rawson continued as Head of School and occupied the large office, designed by Murphy, in the middle of the first floor. The professors



Formal photos are usually uninspiring but these two show a lighter side. The photo of R.K. Murphy shows him at the time of his engagement to Gladys Gray, whereas the dapper young gentleman with the hat is David Mellor, seemingly in his twenties when this was taken.

were accommodated in quite modest offices at each end of the first floor. Baxter and Alexander treated Rawson with the utmost deference and courtesy but gradually and inexorably they began to make their presence felt, so that Rawson once confided to the writer. "... they have so cut the ground from under my feet, that they have left me with nothing to do."

Professor Alexander was a gregarious man with a hearty laugh and one of his first acts was to establish a Tea Club in a laboratory on the first floor, where staff could meet and chat at morning and afternoon tea. In contrast, Professor Baxter was reserved, almost to the point of shyness, but to his great credit, throughout his

career he remained approachable and was always ready to give a hearing to a member of staff.

In 1950 it became possible to do the conversion course to qualify for the BSc degree. For holders of the ASTC diploma in Chemistry or Chemical Engineering no further studies in chemistry were required but additional mathematics and physics, together with several humanities subjects were mandatory.

On 15 March 1952 the University held its first graduation ceremony in the Great Hall of the University of Sydney. There were 14 graduates in Applied Chemistry and 10 in Chemical Engineering.

Upon Rawson's retirement as Lecturer-in-Charge in

1952, the School was divided into the School of Applied Chemistry under Professor Alexander and the School of Chemical Engineering under Professor Baxter. Upon the arrival of Rupert H. Myers as Foundation Professor of Metallurgy later in 1952, Metallurgy was separated from Chemistry as a separate school. At this time these three schools, together with the School of Applied Physics and the School of Mathematics, made up the Faculty of Applied Science. To those who were quick to criticize, the University became facetiously known as "Wurth's Circus" and the School of Applied Chemistry as "Alexander's ragtime band." However, within a year or two carping criticism of this kind faded away.

On 16 April 1955 the first graduation ceremony was held on the Kensington campus in front of the main building. The degree of Doctor of Philosophy was awarded for the first time; seven PhD's were awarded: two in the School of Applied Chemistry and four in the

School of Chemical Engineering.

In 1955 Dr David Mellor was appointed to the second Chair of Applied Chemistry and Professor Alexander resigned in November 1956 to accept the Chair of Physical Chemistry at the University of Sydney. In 1956 the Department of Biological Sciences severed its link with the School of Chemistry and became a separate school, and later a faculty, under the headship of Dr Bernhard Ralph, who was soon after promoted to Associate Professor. In 1957, there were 18 senior lecturers in the School. By 1958 19 PhD's and 30 MSc's had been awarded in the School of Applied Chemistry.

Thus the groundwork had been laid for expansion of the research function of the School. The sacrifices had been burnt, the oracles were propitious, and a new age was opening in which in the next 12 years the School was to experience one of the most exciting and productive periods in its history.

Table 1. Research publications School of Chemistry

Period	Number	Average per annum
1950-57	235	29
1958-70	873	67
1971-85	980	65

Table 2 lists the higher degrees conferred.

Table 2. Higher degrees conferred School of Chemistry

Period	Degree	Number	Average per annum
1953-57:	MSc	23	4.6 (3.0)
	PhD (55-57)	15	5.0 (2.7)
1958-70:	MSc	94	7.2
	PhD	107	8.2
1971-85:	MSc	78	5.2

THE YEARS OF PLENTY (1958 - 1970)

The Prime Ministership of the Hon. Robert Gordon Menzies lasted from 1949 to 1967; it was an era of unprecedented prosperity for Australia. Even Menzies' most ardent supporters would admit that this prosperity was not entirely due to Menzies or his government. All the developed nations experienced full employment and rising standards of living during his period.

Following a request by the vice-chancellors of all the Australian universities for more financial assistance from the Commonwealth, the Prime Minister in 1957 announced the appointment of a Committee of Inquiry into the Future of Australian Universities. This action proved to be a watershed for all the universities in Australia, and in particular the New South Wales University of Technology. And indirectly it was to bring about a better deal for universities in Britain. The chairman of the committee was Sir Keith Murray, Chairman



Chemistry departments depend heavily on glassblowing and mechanical workshops and, more recently, electronic workshops. Costs have forced consolidations and contractions throughout the university but chemistry still retains its own facilities though staff numbers have declined. The school's (1956 - 1987) glassblower was John Wyllie but we are unable to identify with certainty the

removed from the aims of the School, which became like any other large university chemistry school. Thus from this time (ca. 1958) the School regarded itself as an important centre of an international discipline.

In 1959 the diploma course (ASTC) was withdrawn. The diploma course in Chemistry was replaced by a six-year part-time degree course in either Pure and Applied Chemistry or in Science.

In 1968 the attention of the School Executive was drawn to the decline in the number of students enter-

PIGEONS AND THE WIND.

No history of the School would be complete without an outline of the great pigeon saga. The fenestration on the north side of the building provided ideally sheltered conditions for the profiferation of pigeons and the lice which came with them and which rapidly made their presence felt. Initially this invasion was countered with pesticides but the rampant fecundity of the birds and their parasites was too much and, presumably after much deliberation, Property (now known as Facilities) arranged to have the nests removed and the sites decorated with a strange grey semi-liquid which, it turned out, the pigeons rather liked, though stories that they actually ate it are probably exaggerated. Facilities next move in this mini-war was a tour-de-force; they bought a large number of plastic snakes (!!), reputedly from someone who subsequently made a fortune selling sand in the Sahara. These were supposed to frighten the birds away but the pigeons were indifferent to this threat and in a fairly short time the snakes were degraded by the sunlight into small sticky piles of plastic waste. Finally the

ing the Pure and Applied Chemistry course. The number of part-time enrolments fell steadily from 225 in 1965 to 100 in 1970. The reasons for this decline can be attributed to: (a) the increase in the number of Commonwealth Scholarships for undergraduate study, as recommended by the Murray Report; (b) the concept of employing trainee chemists while they gained their academic qualification became less attractive to employers, probably because graduates were becoming available in increasing numbers; (c) in an atmosphere of full employment the idea of working and studying part-time became to be considered too arduous; in less prosperous times, i.e., before 1945, people were more prepared to make the sacrifices necessary to acquire their Chemistry Diploma (ASTC) at night while working during the day.

The decrease in part-time enrolments was not compensated by an increase in full-time enrolments, which remained relatively constant (65 to 97) over the period 1965-70. The reasons for this could be attributed to: (a) the creation of new tertiary institutions, e.g., Macquarie University; (b) the competition for students by the School of Industrial Chemistry within the Faculty of Applied Science at Kensington; this situation was rather anomalous in that effectively there were two schools of chemistry within the same university; (c) the worldwide disillusionment with science as a career, which had its beginning around this time.

The period 1958-70 could be said to have been the most exciting and productive in the School's history. The numbers of research publications by members of staff of the School for the three periods, 1950 - 57, 1958 - 70, and 1971 - 85 are shown in Table 1.

In regard to the period 1953-57, 7 PhD and 5 MSc graduates were members of staff and not research students in the usually accepted sense. If these are deleted from the total, the averages are 3.0 for MSc's and 2.7 for PhD's. So there was a substantial increase during 1958-



Inno Salasoo receives his B.Sc. from Chancellor Clancy at a ceremony on the steps of the Main Building (now Physics) in 1957. He went on to obtain his PhD in 1963 and joined the staff in 1968, staying on until 1992. In its fifty years the School has had 650 higher degrees awarded. It has always been and remains an active centre of chemical research. The first graduation ceremony was held in the Great Hall of Sydney University in 1952. two chemistry staff members, Clive Harris (1950 - 1973) and Stanley Livingstone (1945 - 1985)

of the University Grants Committee in Great Britain. The Committee completed its investigations in the short space of three months - a remarkable achievement - and submitted its report in September 1957. In its report the Committee stated that universities were inadequately staffed, had a high failure rate, which was considered disturbing, and displayed a general weakness in honours work and postgraduate training and research, which also was seen as disquieting. Inter alia the committee recommended increased capital grants for classrooms, laboratories, and residential colleges, increased academic salaries, more student scholarships, and more funds for equipment for teaching and research. It also advocated the establishment of an Australian Universities Grants Committee to advise the Commonwealth Government on the needs of universities. Two other recommendations were to have a marked effect on the development of the University of Technology. It was suggested that the University should assume many of the features of a traditional university and establish Faculties of Medicine and Arts. In such an event a change of name to the University of New South

Wales would be desirable.

The Commonwealth Government accepted the recommendations of the Murray Committee and proceeded to put them into effect. Australian universities have had no greater political friend than Menzies; subsequent Prime Ministers have shown scant interest in universities.

In 1957 the name of the School was changed from School of Applied Chemistry to School of Chemistry. This made de jure that which had been de facto for some years. However, the idea went deeper than that; it was, in view of the School's previous history, a highly symbolic act. The feeling, never explicitly stated, was that the School wanted to identify itself with the discipline of chemistry. The Murray Report negated the idea of a technical university and its implementation made the New South Wales University of Technology, the same as the other Australian universities, which were all upgraded by the terms of the Murray Report. The School took advantage of this boost to establish all those features of a fully-fledged member of the discipline of chemistry. The essentially practical bias was

70, whereas thereafter the averages continued at much the same level.

From 1965 the Australian Research Grants Committee (ARGC) awarded research grants to proven researchers. A total of \$3,545,000 was awarded in research grants to members of the School in the period 1965-85.

The Department of Analytical Chemistry moved from Ultimo to the Dalton building on the Kensington campus in 1959 and the rest of the School moved into the much larger Heffron building at Kensington in 1962. Since that time the School has never really been short of space.

In 1969 Visiting Committees were set up in the larger applied schools, including Chemistry. It has been mentioned that the School had a Visiting Committee in the 1920's but it lapsed sometime in the late 1930's. The first chairman was Dr Doug Ford. At its first meeting on 4 August 1969 the Visiting Committee endorsed Professor Smythe's proposal to establish a Master of Chemistry degree, involving a formal post-graduate course in Analytical Chemistry. The first award of this degree (MChem) was made to three students in 1973 and by 1985 28 MChem degrees had been awarded.

In January 1960 the School organized its first Summer School for chemistry school teachers, the first conducted in this state. It was held over two weeks: i.e., 10 days. The mornings were devoted to lectures and the afternoons were given over to practical sessions. These Summer Schools were abandoned after 1975 but they were very popular for a number of years. The lectures and workshop reports of these summer schools were published each year under the title Approach to Chemistry and copies of the book were sent to all science teachers in the state.

As a consequence of the Summer Schools and the Approach to Chemistry series, an editorial committee under the chairmanship of Dr T.J.V. Findlay published Chemical Data Book in 1964, which contained a large collection of data useful for teaching chemistry at sec-

ondary and tertiary level. This book was revised in 1971 as SI Chemical Data by G.H. Aylward and T.J.V. Findlay and is now used in virtually every high school in New South Wales and indeed throughout Australia. It has been revised several times and is sold throughout the world.

Largely due to the efforts of Associate Professor D.P. Graddon, who became the first Director, the UNESCO Postgraduate Training Course in Research Techniques in Chemistry was offered by the School in 1970. Financial support was received from the Commonwealth Department of External Affairs. The course was offered to selected staff members of tertiary institutions in developing countries. In 1970 the twelve participants came from Indonesia, Taiwan, Thailand, the Philippines, Korea, and Burma. Some of the participants later completed a PhD degree in the School.

During the period 1958-70 several professors were appointed, viz.:

Stephen Angyal, Foundation Professor of Organic Chemistry (1959)

G.W.K. (Ken) Cavill, Personal Chair (1964), later Professor of Organic Chemistry

Raymund Golding, Foundation Professor Physical Chemistry (1968)

Stanley Livingstone, Personal Chair (1968), later Foundation Professor of Inorganic Chemistry

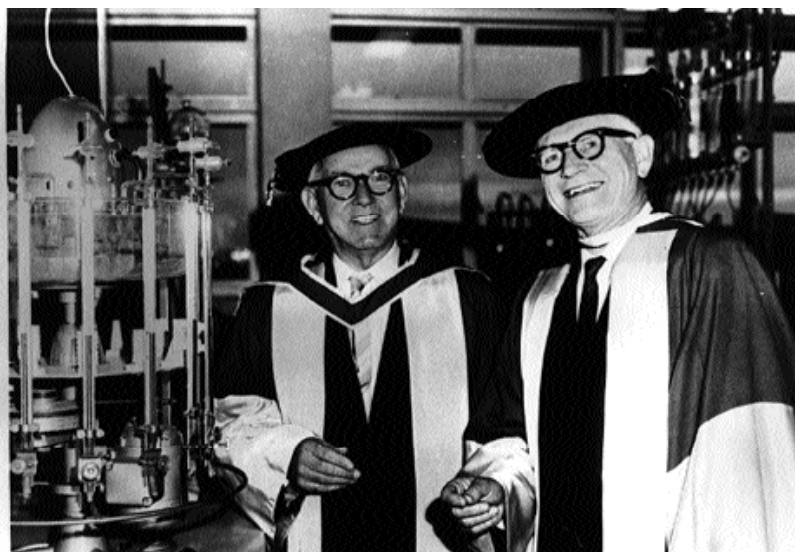
Lloyd Smythe, Foundation Professor of Analytical Chemistry (1968)

James Shannon, Professor of Chemistry (1969).

Mention must be made of an outstanding diplomate of the School, Associate Professor Ronald Werner, who resigned in October 1967 to take up the position of Deputy Director of the newly established New South Wales Institute of Technology - later to become the University of Technology Sydney - where he became Director in 1968 and President in 1974. Dr Werner received his ASTC (with medal) in 1946 and was appoint-



The formal opening of the Heffron building by the then Premier of New South Wales, R.J. Heffron, after whom the building is named, watched by the Chancellor Justice Clancy. The plaque is still there on the ground floor just above the lift button at the western end of the building. It isn't recorded if the lifts were any more reliable than they are now when they provide semi-permanent employment for a lift company technician. After the opening the Head of School, Professor David Mellor, showed the Premier what chemists actually do in



ed Lecturer in 1948 and was the first recipient of the University Medal for Applied Chemistry in 1952. In 1963 he became Head of the Department of Physical Chemistry. He had pioneered the introduction of infrared spectroscopy into the School and had actually designed and built his own infrared spectrometer. The departure of this dynamic and clear-thinking man was a great loss to the School.

The School had experienced over a decade of growth during which it had made a name for itself in the discipline of chemistry. But early in 1970 storm clouds were on the horizon and the long Indian summer of the 1960's was passing. The Head of School, Professor Angyal, wrote in his Report to the Visiting Committee, dated 9 October 1970:

"1970 is a year of austerity for the University and the School of Chemistry. The Government's financial provisions for the 1970-2 triennium forced many unexpected economies upon us. No funds are available this year for the purchase of major plant, and the allocations for materials, minor plant, and books have been reduced. Cuts in staff were necessary: the School lost three teaching fellowships and five non-academic positions. The result of these losses is felt in the workshops; maintenance of instruments and construction of new equipment is not proceeding satisfactorily now... It is confidently expected that the situation will improve in 1971."

The situation did improve but not as much as expected. Henceforth the School was always on the defensive, having to justify even the maintenance of the status quo and expansion was out of the question.

THE YEARS OF AUSTERITY (1971 - 85)

The situation in the 1970's has been summed up by the former Vice-Chancellor, Sir Rupert Myers, in his interview with Sue Knights in 1990:

"They were momentous times for the Government

and indirectly for the universities. It meant a change of approach. I suppose it represented the end of the Menzies era, an era of about ten or even 20 years, during which the universities saw great developments, a growth in expenditure and an expansion in student numbers. It was an era which will stand out this century as that in which the universities 'had their run'. Having spent most of the century in penury, they returned to it fairly quickly - for the rest of this century, by the look of it. They were (the Menzies years) important times for the universities."

Myers went on to say: "The universities have the Whitlam and succeeding Governments to thank for failing to fully compensate them for the effects of the inflation they created."

The School had now attained virtually its maximum size - in 1971 it had 46 permanent members of staff, including six professors, and 2336 students, including 108 postgraduate students - and during the decade 1970 - 79 it did not expand. There was a slight increase in student numbers during the period 1980 - 85 but this was due to an increase in the numbers doing Chemistry I. In 1985 the total enrolment was 2720, of whom 102 were postgraduate, while the permanent academic staff numbered 43, including six professors.

The School continued in its role as a typical, although the largest, chemistry school in Australia. A visitor from overseas would notice little difference, in terms of curricula, teaching or research, between the chemistry schools at the large universities: New South Wales, Sydney, Melbourne, Queensland, and Adelaide and towards the end of the 70's Monash could be added to the list.

However, there were some differences at Kensington. Firstly, the existence of the School Visiting Committee maintained a rapport between the School and industry. Secondly, the introduction in 1973 of intensive post-graduate extension courses in specific chemical tech-

Dr. June Griffith (1966 -1978), Director of First Year Studies in Chemistry and the first woman to graduate from the University (B.Sc. Hons 1952), a cheerful, enthusiastic, and popular teacher here brings enlightenment to a first year class in the Smith Theatre. Sadly for the School she died relatively young.

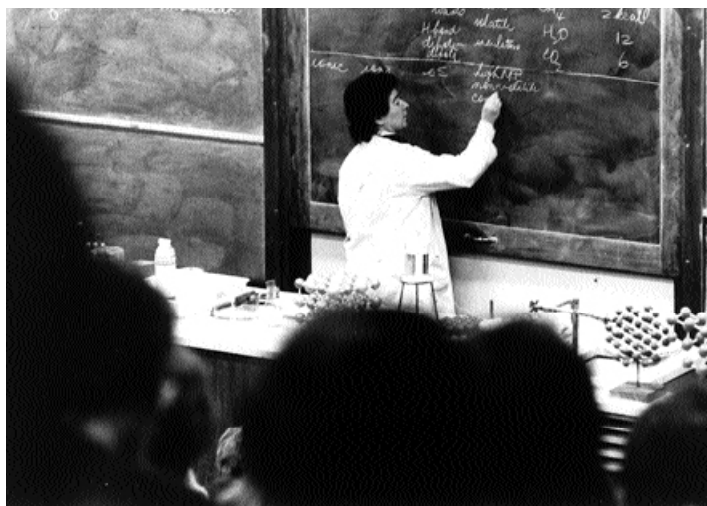


Photo by Max Dupain

Dr Roy Backhouse (1949 - 1985) lecturing in the Murphy Theatre to an improbably attentive audience, almost entirely male, hence probably engineers. This makes the attentiveness of the audience even more improbable. It seems likely that the photographer has just asked them to watch the lecturer and not the camera, however, the fact that they have done so argues against the engineer theory.

niques, e.g., gas chromatography, applicable to industry proved popular. Although the cost to the student was around \$100, often paid by the employer, the courses were well attended and forged closer links with practising chemists. Thirdly, the Summer Schools for Secondary Science Teachers provided an important chain of communication between the School and secondary education. Fourthly, the UNESCO Postgraduate Training Course in Research Techniques was unique in Australia and had the support of UNESCO and the Australian Department of Foreign Affairs; it operated until 1992, i.e., for 23 years. Finally, the School since its early days in the nineteenth century always placed a particular emphasis on analytical chemistry, which was taught in a separate department. This continued emphasis was manifested by the establishment in 1968 of the first Chair of Analytical Chemistry in Australia. The Foundation Professor, Lloyd Smythe, upgraded the undergraduate course in the subject and established a flourishing research group. His introduction of the MChem course in analytical chemistry has already been mentioned.

During the Winter Recess 1976 groups of Year 11 and 12 science students visited the University and attended

lectures and demonstrations in the Schools of Mathematics, Physics, and Chemistry. Six groups, totalling some 450 students from 14 schools, visited the School of Chemistry and were given an informal lecture-demonstration by Dr Dance, followed by a short lecture by Dr Southwell-Keely. However, this was not repeated in subsequent years, although sporadic visits from one school were arranged on an ad hoc basis.

In 1978 the Head of School, Professor Livingstone, decided to put these visits on a formal basis and sought the cooperation of the Registrar and the School of Physics. He wrote to 46 high schools, GPS, Associated, Roman Catholic, and State, inviting them to send up to 20 year 11 and 12 students to visit the Schools of Chemistry and Physics on one of four mornings in early July. In all, 419 students from 17 schools attended. Professor Livingstone spoke about careers in chemistry, followed by Mr Gannon, Associate Registrar, who spoke on enrolment and distributed brochures on careers in chemistry and enrolment. They were then given two lecture/demonstrations on inorganic/physical chemistry by Dr Dance and Dr Bogaard and on organic chemistry by Dr Bishop or Dr Baddeley. The students then paid a visit to the School of Physics.

The visits were considered a success and favourable comments were received from science teachers. In 1979 the School of Physics declined an invitation to cooperate, so the time spent in the School of Chemistry was extended to about two and a half hours. The attendance was 320 students from 14 schools. The programme followed the same pattern. These organized visits were allowed to lapse in 1980 but were repeated in 1982 but not in subsequent years, which was a pity since these visits were very good public relations for the School.

In 1977 the U-Committee of the University, as a means of raising funds, inaugurated the Kensington Lectures, which were for Year 12 students who paid a small fee. The Lectures were given at night in the

Table 3: Enrolments in the School of Chemistry

Course	1995	1998
1st Year	2307	2023
Level 2 and 3	546	482
Level 4	144	75
Servicing Level 2 and 3	279	271
Total undergraduate (excl. Honours)	3276	2851
Honours	23	10
Dip. Food & Drug analysis	10	2
MChem	10	18
MSc	8	13

Photo by Max Dupain



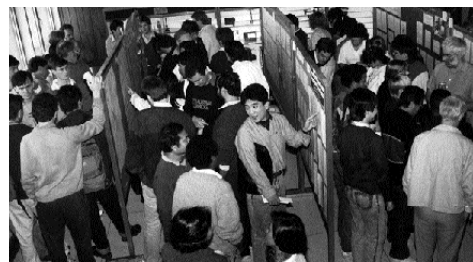
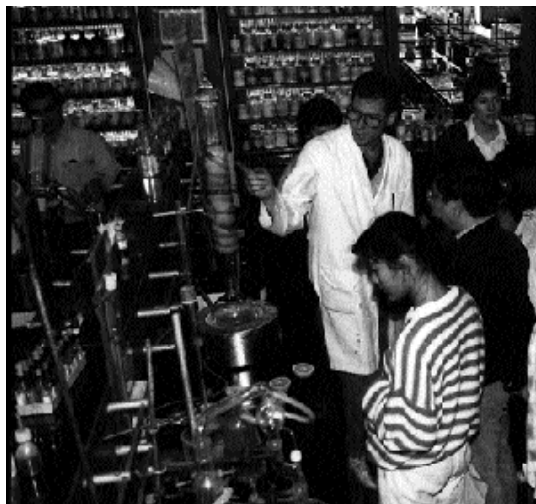
A first year class in laboratory B, Heffron, taken in the mid sixties; Note the number not wearing safety glasses, including the staff. At this time their use was recommended and later became compulsory but most demonstrators eventually tired of telling students to put them on as they were invariably removed when the demonstrator moved away. The labs have recently been extensively refurbished and safety precautions are now strictly enforced. During the refurbishments lab A has been converted completely to a computer laboratory, reflecting the changing nature of

Photo by Max Dupain



The tea room in the early 1960s. Front table: Doug Graddon (right) is talking to two visitors; Left table: Charlie Death (left), Clare Ryan (right, facing camera), the others are not identified; Right table clockwise from left: unidentified, Bill Dunstan, Blue Barclay, Lilly Neinhaus, Ewan Martin, Ben Morris, Tony Funnell. back-ground: Mrs Smith (seated), Lila Price (serving behind the counter), Ellice Swinbourne (standing). The staff tea room is also used as a lunch room, seminar room, reading room, and occasional staff meeting room. The hot water urn has gone but

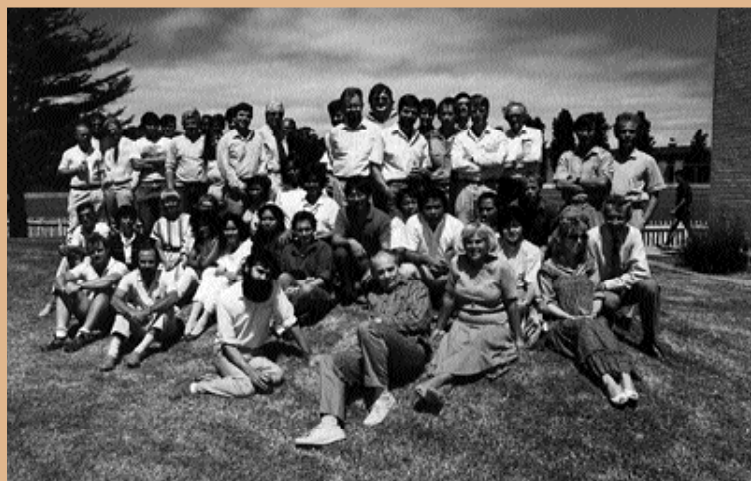
Every second year the University has an open day when the public can view the activities of the various schools. The Chemistry School has always participated in these, mounting displays of research activities and equipment with graduate students as willing guides. A highly popular feature of the day is always the lecture-demonstration of spectacular chemistry.



The School research day 1991 provided Graduate students with an opportunity to present posters describing their research work for the university at large. This proved to be a very popular function, provoking lively discussion of the more than 70 posters presented. A jury chaired by the Dean of Science, Professor Gavin Brown, now Vice-Chancellor of Sydney University, awarded

SOCIAL ACTIVITIES

The time of the staff and students in the school is not always devoted solely to the discipline of chemistry. Many ways have been found to distract attention towards more social pursuits. Often the presence of a distinguished visitor in the school has provided the necessity to develop an appraisal of local eateries. Regular gatherings have been held either in the school itself or in the neighbouring grounds. Up until the last few years the annual Christmas party of the Chemical society was a major event that attracted large numbers. For these the School even had access to a piano which was wheeled into the tearoom and the highly professional playing of Professor Neville Stephenson was a highlight. The Chemical Society function seems to have given way to the School annual Christmas Luncheon which has grown from the beer, chips and peanuts



session on Christmas eve (or as close to it as possible) provided by the members of the School Executive (in the days when that body included only the most senior members of the school) to a sit-down meal in a restaurant or a barbecue in the grounds. Farewell functions for retiring staff have always been well supported too, and some rather grand occasions of this



FRANK WOODS worked as a cleaner at the University for more than thirty years and saw most of it built. For much of this time he worked in the School of Chemistry. To create a bit of fun and to break the early morning stillness, Frank would often make loud kookaburra sounds which would resonate throughout the building. One morning Frank was up to his usual form while cleaning the outside

landing at the rear of the lecture theatres on the second floor. A male resident of nearby Baxter College heard Frank and came out on to his balcony, climbed on to a chair and with a sheet across his shoulders proceeded to flap his arms and replied in the style of a crowing rooster. This challenge was immediately taken up by our Frank, resulting in an early morning (about 6.15 a.m.) duel between the two bird callers

ANNE TUCKER (1951 - 1991) applied for a position as secretary at the university in 1959 and started work as secretary to Dr. Alex Bryson, Head of the department of Analytical Chemistry. At that time the school did not have enough money to buy a new typewriter and Anne was forced to make do with a portable typewriter borrowed from Dr. Bryson. She soon tired of this and eventually persuaded her boss to borrow a typewriter from physics and it has remained in chemistry ever since.

Today typewriters have all-but vanished, replaced by the desk-top computer. Anne was in fact the first of the School's secretaries to embrace the new technology and her word-processing skills were sought after by a wide range of staff members right up to her retirement in 1991. Ironically, the advent of word processing has resulted in most staff now preparing their own typescripts with the result that the number of secretaries in the school has declined and their duties have drastically changed, involving among other things use of quite sophisticated computer applications.

The photograph, taken in 1979, shows (l. to r.): seated Marion Brockman, Joan Mills, Jackie Petherick, Gwen Ferris; standing: Natalie Tatarinoff, Pat Morson, Betty Chambers, Nancy Farrelly, Anne Tucker, Irene Owens.

TONY FUNNELL (1949 - 1980), the School Clerk, ran the front office for many years with an iron hand. For many students, undergraduate and postgraduate alike, he was the first point with the school administration and sometimes, it must be said, a rather formidable one. He lived on Sydney's upper north shore and was the pillar of the local volunteer fire-

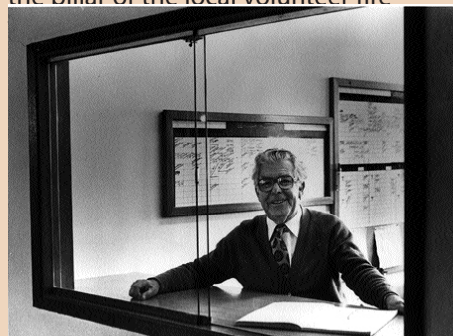


Photo by Max Dupain





Staff and postgraduate students of the School of Chemistry in 1995.

