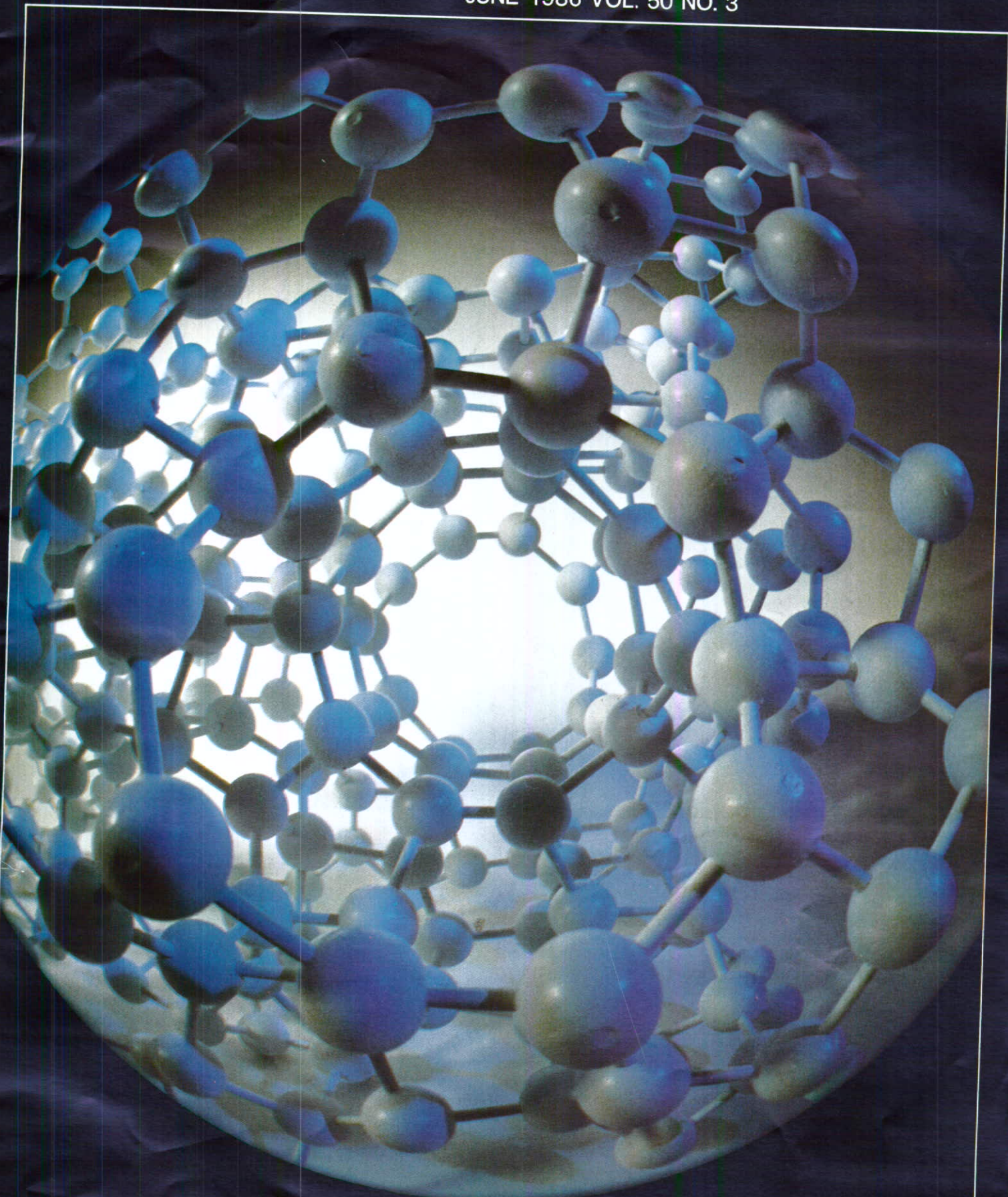




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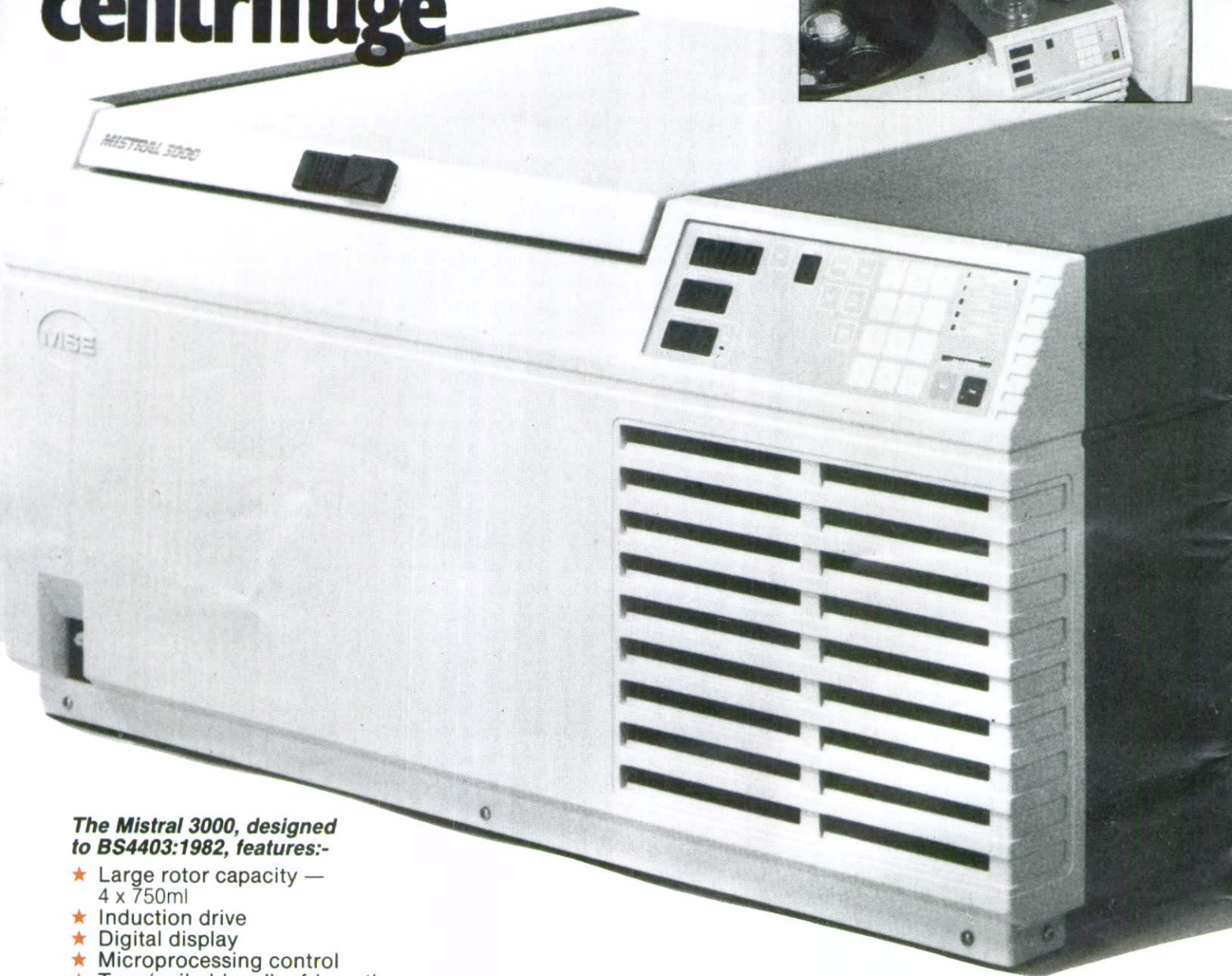
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Front Cover Story



Cover Story: BASF, for quality chemicals and chemical technology see p 86.

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Outline of the Institute

The New Zealand Institute of Chemistry is the primary professional and learned society for chemists, biochemists, chemical engineers, and chemistry technicians in New Zealand. Membership is open to all with appropriate tertiary qualifications in chemistry, biochemistry, or chemical engineering. There is also a student grade of membership, while those persons with a general interest in chemistry, but without the necessary qualifications, may be local members.

Institute activities are many and varied. At the local level, regular Branch meetings, lectures, and social functions provide opportunities for members to meet informally with their colleagues, as well as to keep abreast of developments within the profession. Branches are also active in promoting chemistry in schools with various competitions and participation in science fairs. The Annual Conference of the

Institute is held at a different venue each year. The programme includes invited plenary lectures, specialist lecture sessions and workshops for the presentation of current research findings, trade displays, and social activities. In the public arena the Institute has a number of committees to present members' views on chemical hazards, the environment, chemical education, and public affairs generally. The Institute also has representatives on bodies such as SANZ, AAVA, and the Royal Society of New Zealand.

To assist its members in their profession, the Institute surveys salaries periodically and publishes a Code of Ethics, and Guidelines to Professional Employment. The professional achievements of individual members are recognised each year by the awarding of a number of Institute prizes.

The NZIC has links with the Royal Society of Chemistry, the American Chemical Society,

the Royal Australian Chemical Institute, the Federation of Asian Chemical Societies, and the International Union of Pure and Applied Chemistry. Members may therefore have the opportunity of participating in their activities and meeting chemists who visit this country under the auspices of the Institute. In particular, a visiting speaker scheme is currently operated with the RACI.

Application for membership of the Institute is made on a form available from the Registrar (PO Box 29-183, Christchurch). Current (1985) subscriptions for the main membership grades, including the cost of this Journal, are:

Fellows and Members (less \$5 if paid before 31 Aug.)	\$70 + GST
Associates (less \$5 if paid before 31 Aug.)	\$55 + GST
Graduates and Technicians (less \$5 if paid before 1 Aug.)	\$40 + GST
Students	\$10 + GST

Recruitment

This issue of Chemistry in New Zealand has been designated a "recruitment" issue. Copies are to be distributed to the 500 or so students throughout the country who expect to graduate at the end of this year with either a degree or NZCS in chemistry. Further information about the NZIC will also be distributed, and of course the all important membership application form. If you are one of those students, stop reading this and fill out your application now. Like tax returns, the sooner you send off the forms, the sooner your application will be processed. We do differ from the Inland Revenue in that the form does not provide for a REFUND/TAX TO PAY option, however, but the membership fees are tax deductible.

The contents of this issue have been chosen to reflect some of the activities and interests of the NZIC; as much as one can for such a diverse organisation. There are all the usual news pages, and notices regarding our Annual Conference, and other scientific meetings. The feature article looks at work that was awarded one of the Institute's prizes two years ago; and some would probably see this as one of the NZIC's most important activities — recognition of scientific excellence by one's peers.

Of more immediate relevance for our student readership, is the short article on "Jobs for Chemists", which arises from a survey carried out by members of the Manawatu Branch. Their conclusion is that the prospects look good — and certainly the numbers seem to support that. To further develop this theme we have assembled a careers directory towards the back of the issue.

Finally, we adopt a more controversial line, as Steve de Mora presents some personal views on the nuclear debate (egged on by yours truly, I might add), and questions whether the Institute should be doing more in this respect. This issue has been raised before in these pages, and will no doubt continue to surface from time to time — probably more frequently than unidentified submarines in the South Pacific, but less often than the Cook Strait ferry disputes. The only time all three of these will cease to matter will be in the event of the ultimate nuclear disaster. In the case of the former two there is an alternative — disarmament.

Bruce Graham

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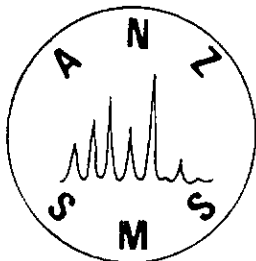
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**Australian and New Zealand
Society for Mass Spectrometry
1986 Conference, Dunedin,
August 26-29**

This biennial conference is usually held in Australia but has been arranged in conjunction with the NZIC/NZBS this year. The 3-day programme covers a very wide range of topics that reflect the increasing diversity of applications of mass spectrometry to chemical research.

An outstanding line-up of invited overseas speakers has been arranged to present the most recent research findings in a rapidly developing field. Topics covered range from fundamentals of ion-chemistry, through new instrumental developments such as fast atom bombardment and Fourier transform ion cyclotron resonance spectroscopy, to analyti-

cal applications in biomedical and food research. The latest addition to the programme is Dr Marvin Vestal from University of Houston, Texas, who will be speaking on his pioneering work in coupling HPLC to MS.

The conference comes at a very opportune time as a number of NZ laboratories have recently installed new generation computer controlled mass spectrometers, ranging from small quadrupole units through to double focussing instruments of extended mass range. The greatly improved analytical power that can be gained from these new instruments will be amply demonstrated at the plenary and poster sessions. There will also be a comprehensive trade display.

A large Australian attendance is anticipated, and it is hoped local chemists will take this excellent opportunity to reacquaint themselves with developments in this technique, and its applications to structural and trace analysis.

Enquiries to Dr John Cutfield, Dept of Biochemistry, University of Otago, P.O. Box 56, Dunedin.

**Current problems in Clinical
and Environmental Toxicology
in New Zealand**

**A Joint NZIC/ASCEP
Symposium
Dunedin, 26th August, 1986
1pm-5.30pm**

The New Zealand Institute of Chemistry and the New Zealand Subcommittee of the Australasian Society of Clinical and Experimental Pharmacologists will be holding a joint symposium on Current Problems in Clinical and Environmental Toxicology in New Zealand, during the Otago Conference week.

Symposium topics —

- Problems of Waste Disposal (O'Grady, Wellington)
- Aluminium in Drinking Water (Hocken, Dunedin)
- Lead in New Zealand: a real hazard? (Edwards, Dunedin)
- 2,4,5-T and other Herbicides (Moffat, New Plymouth)
- Toxicology of the ICI Fire (Glass, Dunedin)
- Occupational Toxicology
- Therapeutics of Poisoning (Trubuhovich, Auckland)

Details Dr J. A. Millar or Dr W. A. Temple, Department of Pharmacology, P.O. Box 913, Dunedin.

THE EVOLUTION OF CELLULOSIC ION EXCHANGERS IN NEW ZEALAND FOR PURIFICATION OF PROTEINS

J. S. Ayers, Chemistry & Biochemistry Department, Massey University, Palmerston North.

John Ayers was awarded the Institutes' Shell Industrial Chemistry Prize in 1984, for his work on cellulosic ion exchangers. This prize is awarded annually "for meritorious achievement in the field of industrial chemistry". The following paper gives an overview of Dr Ayers' work.

Introduction

Between 1967 and 1976 there was a major effort in New Zealand to develop ion exchange derivatives of regenerated cellulose and to use them for the purification or recovery of proteins. Regenerated cellulose is a particularly tough, resilient form of cellulose which gave to the ion exchangers the special properties of long life and high operating flow rates when used in large columns. This allowed them to be investigated for industrial applications on a scale never envisaged before for any ion exchangers suitable for protein adsorption.

The ion exchangers were manufactured and marketed by Tasman Vaccine Laboratories (TVL) Ltd., Upper Hutt (now Coopers Animal Health), under the trade names of PROTION® and GRANTEX®. Their most notable success was, and still is, their use by the N.Z. Co-op Rennet Co. Ltd., Eltham, to purify rennet enzymes by separating them from the mucoproteins whose presence had always contributed a cloudiness to the marketed products¹. Rennet producers in the USA and Italy are also now using the process and others in France may soon adopt it. There were many other applications investigated which did not lead to the success achieved with rennet and TVL abandoned production of PROTION in 1975.

The history of this period and details of the various applications investigated have previously been published in this journal². They are summarized below in tabular form as background for the developments of the last 10 years (1976-85). Contrary to popular belief the industry is not dead but thriving, having risen from the ashes as Phoenix Chemicals Ltd. and the purpose of this article is to outline the events leading to its success.

Phoenix Chemicals Ltd. and INDION® Products

When TVL terminated their interest in the Grant resins in 1976, the ownership of the Grant and PEL patents went to the Development Finance Corporation of NZ (DFC) who had absorbed the role of the NZIDA. Phoenix Chemicals Ltd., a wholly owned subsidiary of Waitaki NZ Refrigerating Ltd., has since been licensed by the DFC to manufacture and sell the DEAE and carboxymethyl (CM) Grant type of ion exchangers from regenerated cellulose under the new trade name of INDION. (INDustrial ION exchangers). However the effluent treatment process using the ion exchange materials has not gone ahead for reasons clearly identified by the PEL and Ecotech trials².

Chemical Structures of Grant Ion Exchangers

Cellulose-0-CH₂CH₂NH⁺(C₂H₅)₂Cl⁻

Diethylaminoethyl (DEAE) INDION A

Cellulose-0-CH₂CO₂⁻Na⁺

Carboxymethyl (CM) INDION C

In some respects the Grant ion exchangers were 10 years ahead of their time. The protein recovered from meatworks effluent was for animal feed, of low economic value, and

unable to pay for the costs of the ion exchange process unless effluent treatment charges were high.

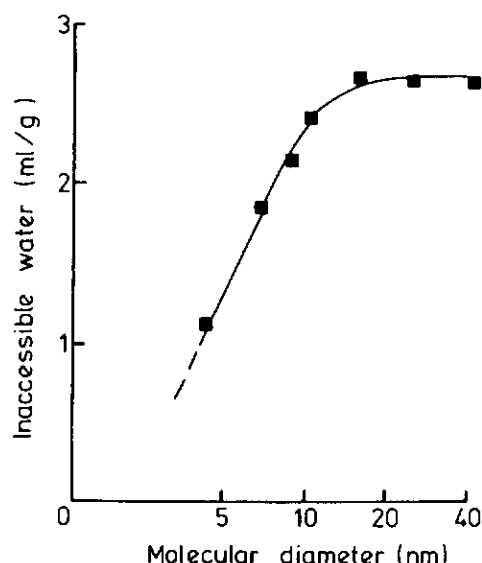
Products being produced in the 1980's as a result of genetic engineering and large scale fermentation are of much greater value and have to be recovered from solutions with some similarities to meat works effluent, e.g. large volumes and low protein concentrations. To meet the challenge of the 1980's Phoenix Chemicals have on hand, in addition to INDION A and C, a whole new range of ion exchange media, the High Capacity INDION range, which were developed at Massey University's Chemistry & Biochemistry Department. They arose out of difficulties experienced with TVL's PROTION.

The Low Protein Capacity of DEAE & CM PROTION

The utility of the Grant resins was severely restricted by their inability to adsorb reasonable amounts of protein. Protein capacities of around 300 mg of protein per dry g of PROTION were typical for proteins like bovine serum albumin (BSA, molecular weight 68,000) but the capacity of the resins for proteins of high molecular weight decreased markedly. One report even quoted it as negligible for a particular enzyme. So in spite of PROTION's attractive features of low cost, long life and high flow rates interest in it was limited.

We found as early as 1972 that DEAE PROTION's capacity for BSA was dramatically increased by soaking it in aqueous sodium hydroxide solutions, particularly at concentrations above 5%. Figure 1 shows this increase in protein capacity

Figure 1 Increase in the pore volume and protein capacity of DEAE PROTION after soaking in aqueous sodium hydroxide solution.



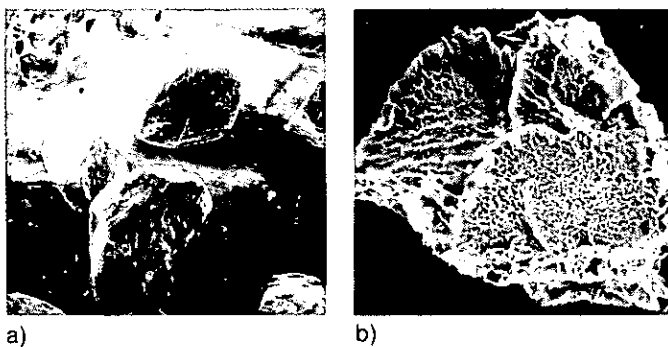


Figure 2 Scanning electron micrograph of DEAE PROTION particles. a) Magnification 33x. b) After soaking in 10% sodium hydroxide. Magnification 200x.

(approx. 10 fold), along with the corresponding increase in the volume of the internal pores of the particles, indicating the irreversible swelling of the cellulose matrix that had occurred.

Practical advantage could not be made of this improved protein capacity because of chemical etching and dissolution of the cellulose matrix. This caused weight losses of up to 50% and reduced the useful life of the residual particles. Figure 2 shows the scanning electron micrographs of DEAE PROTION before and after this caustic treatment.

Initially it had been thought that the interior pore structure of PROTION was completely accessible to all proteins because of the large holes seen with the scanning electron microscope (SEM) (Figure 3). These holes had diameters of 5-10 μ M which is about 1,000 times larger than the diameter of a globular protein such as BSA (diameter = 7 nm). However the micropore structure of the particles was not detected by SEM, possibly because of the 10-20 nm thick gold coating deposited onto the particles after critical point drying. By using a range of high molecular weight soluble dextrans as "feeler gauges" we were able to show⁶ that the maximum pore diameter in the regenerated cellulose used was only around 10 nm (Figure 4). This meant that the pore structure of PROTION was largely inaccessible to proteins and explained its poor protein capacity. Even soaking the DEAE PROTION in 5-12% NaOH solutions did not seem to increase the pore diameter markedly. The large increase in protein capacity observed after caustic treatment can only partly be accounted for in terms of increased porosity. The rest must be due to a large increase in surface area over the outside of the particles (Figure 2) and throughout the large vacuoles penetrating the interior.

High Protein Capacity INDIONS

The results shown in Figure 1, although not directly useful themselves, served to show that the regenerated cellulose particles had the potential for making ion exchangers with

Figure 3 Scanning electron micrograph of DEAE PROTION showing the large (10 μ M) vacuoles present. Magnification 850x.

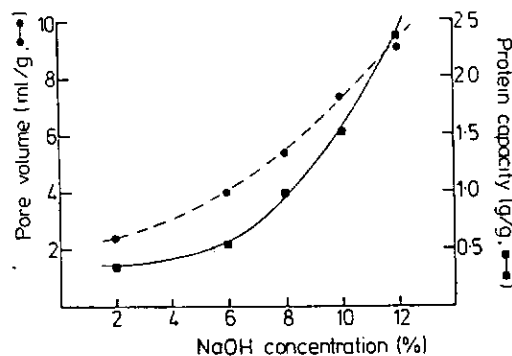
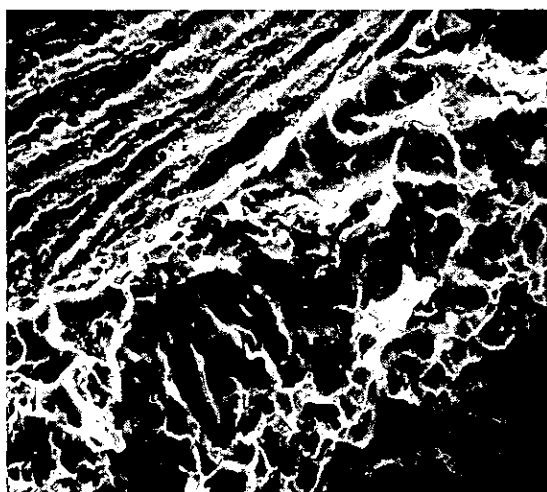


Figure 4 Water within the regenerate cellulose particles inaccessible to different size dextran molecules. (Cellulose washed first with 12% sodium hydroxide and water).

greatly improved protein capacities. Eventually a chemical derivatization method was found for achieving this⁷. The reactions involved are shown in Figure 5.

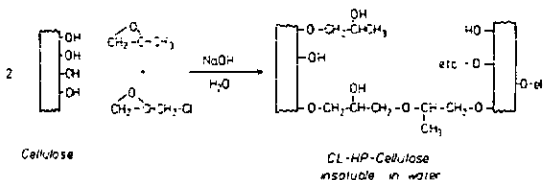


Figure 5 Typical reactions involved in the preparation of cross-linked hydroxypropylated cellulose.

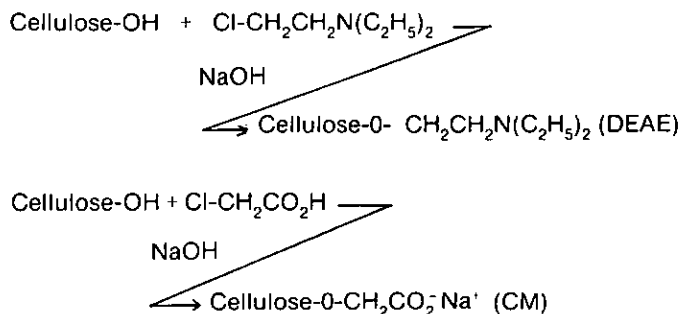
Hydroxypropylation of cellulose with propylene oxide would normally give a water soluble product, but by simultaneously crosslinking with epichlorohydrin insolubility of the regenerated cellulose matrix was retained but with enhanced porosity⁸. It is a chemically modified regenerated cellulose which now serves as the starting material for the range of new ion exchange materials with high protein capacities, produced by Phoenix. These are listed in Table 1.

Table 1
Protein Capacities for Industrial Ion Exchangers from Regenerated Cellulose

Ion Exchange Group	INDION mg/g	High Capacity INDION mg/g
DEAE (Weak base)	350	1500
CM (Weak acid)	350	2000
QAE (Strong base)	NA*	1300
SP (Strong acid)	NA*	1600

*NA — Not available

This chemical modification to the regenerated cellulose matrix was first developed in the laboratory in 1975 to produce a matrix with high chemical reactivity in organic solvents⁹, but its utility for preparing the DEAE and CM ion exchange derivatives was quickly demonstrated¹⁰ using the conventional chemicals 2-chloro-triethylamine and chloroacetic acid shown in the following equations.



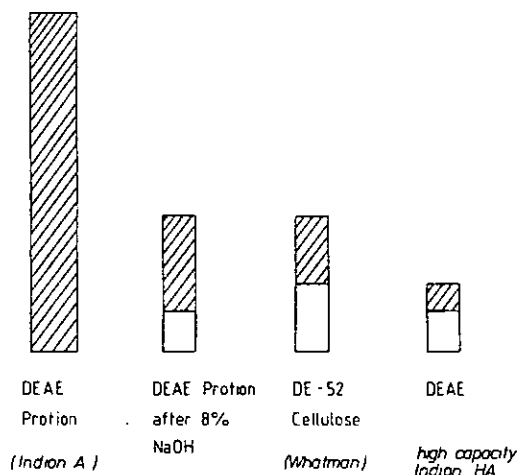


Figure 6 Scale drawing to show the relative column sizes of different DEAE celluloses used to purify aldehyde dehydrogenase. The shaded area represents that part of the column required to bind the crude enzyme.

Figure 6 shows the comparative sizes of chromatography columns for various DEAE celluloses used to purify aldehyde dehydrogenase¹⁰. The Grant resin (now INDION A) has a very low capacity for this high molecular weight enzyme (212,000). Even very large columns allowed some breakthrough of the enzyme. The Rennet Company's process using the Grant resin (DEAE GRANTEX) on the other hand was successful because of the rennin enzyme's low molecular weight of approximately 40,000. This was small enough to penetrate the micropores of the cellulose.

Although the new high capacity ion exchangers (DEAE & CM) were being made in the laboratory in 1977 they were still a long way from commercial success. What remained to be achieved was to find a protein purification application for either the new CM or DEAE derivative; an application that was large enough to make the commercial production of the ion exchangers in New Zealand viable. From the results of the pilot plant trials by PEL and ECOTECH such an application was unlikely, for economic reasons, to be found in the area of protein purification for animal food use.

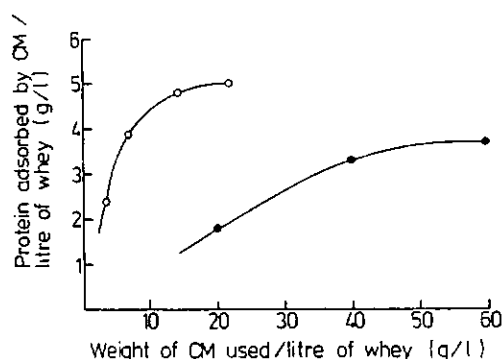
Why Protein Extraction by Ion Exchange

Work published in 1974¹¹ and 1977¹² had shown that 60-70% of the proteins present in whey could be separated from all the other whey components by adsorption onto CM Vistec®, a cellulosic ion exchanger, at pH 3.3, and then eluted again at pH 9.0 in a very high state of purity. (The isoelectric points for nearly all the whey proteins lie between 4.8 and 8.0 and so they can be adsorbed onto a cationic exchanger at low pH and eluted at high pH, where they carry the same negative charge as the CM groups on the ion exchanger.)

Whey is a by-product of the cheese and casein industries. It contains only low concentrations of protein (5-6 g/l), but when this protein is separated from the lactose (50 g/l) and lipids (0.7 g/l) present in whey it has properties and values similar to egg white. Because of the very large volumes of whey produced daily, this seemed an ideal application at which to target the new high capacity ion exchangers.

Figure 7 shows our new CM's superior ability to adsorb protein from whey compared to other CM cellulose suitable for use on a large industrial scale. CM Vistec media was used to recover protein from whey in pilot plant trials (700 l) in Wales reported in 1977¹², and run again on a larger scale (2000 l) by

Figure 7 Removal of protein from 1 l of sulphuric acid casein whey at pH 3.3 by CM celluloses. ● CM VISTEC, PROTION & INDION C. ○ New high capacity CM (INDION HC).



EARLY HISTORY OF CELLULOSIC ION EXCHANGE IN NZ.

- | | | | |
|---------|---|---------|--|
| 1967 | (a) Dr R. Grant came to the Physics and Engineering Laboratories (PEL), DSIR as a visiting Research Fellow. | 1972-76 | PROTEIN ION exchanger. |
| | (b) PEL scientists visited Gear Meat Company's Petone works. Dr Grant suggested that his cellulose ion exchanger (Grant resin) might be able to recover valuable protein from works effluent. | 1972-73 | N. H. Clarke, while undertaking Ph.D. studies at Massey University, developed a process using diethylaminoethyl (DEAE) GRANTEX to purify rennet enzymes and installed a plant at the NZ Co-op Rennet Company. Cawthron Institute developed and patented "Improvements in the Preparation of Albumin" which used PROTION ⁵ . |
| 1968 | (a) PEL developed laboratory scale process for recovery of protein from the effluent using Grant resin. | 1973 | (a) MTC was wound up. |
| | (b) Grant filed the patent application, "Cellulosic Ion Exchange Materials" and assigned it to TVL ³ . | | (b) TVL formed a separate division called Ecotech Systems for effluent treatment and PROTION manufacture. |
| | (c) PEL Filed the patent application, "Protein extraction process for waste effluents." Assigned to the NZ Inventions Development Authority (IDA) and later to TVL ⁴ . | 1974 | (a) Ecotech Systems (UK) was established under Dr Grant in Dorset. |
| 1969 | Meatworks Treatment Consortium (MTC) formed by PEL, TVL, IDA and 6 meat companies. | | (b) Ecotech Systems (NZ) ran a pilot plant at Aotearoa Meatworks for the two stage treatment of effluent. Emphasis was on the first stage chemical flocculation. |
| 1969-71 | TVL took on the Grant resin manufacture and built a plant to produce 20 kg batches. | | (c) Ecotech Systems built facilities at Lower Hutt to produce 100 kg batches of the ion exchangers. |
| 1971-72 | The MTC built and operated a pilot plant at Gear Meat Co. for protein recovery using GRANTEX. | 1975 | (a) A full scale chemical pretreatment plant was installed for chicken processing wastes at St Ives U.K. An ion exchange secondary stage pilot plant was scheduled for later operation. |
| 1972 | TVL marketed the Grant resin briefly in N.Z. under the trade name PROTION from | | (b) Ecotech Systems (UK) closed down. |
| | | | (c) Ecotech Systems (NZ) closed down. |



Independent Service Laboratories Introduces AMDEL to New Zealand

AMDEL (The Australian Mineral Development Laboratories) has appointed ISL as its New Zealand agent for analytical services.

AMDEL was established in 1960 and its expansion to encompass 300 personnel enables it to offer analytical services in mineral, material and environmental sciences well beyond the scope of most laboratories. Their investment for example in ICP (Inductively Coupled Plasma Spectroscopy), enables analytical work to be automated on large samples with detection limits better than those of A.A.

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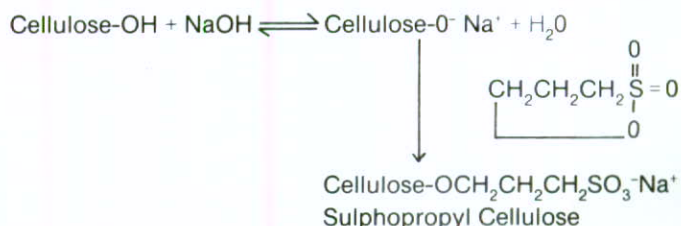
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Bio-Isolated Ltd (UK) in 1979-81. Clearly, from Figure 7 the Massey University-developed CM cellulose would have been the best ion exchanger to use. However, the CM derivative was not the ideal exchange group to be using because of its weak acid properties, $pK_a = 3.4$. As the pH was shifted from pH 3.3 to pH 9 (in order to desorb the protein) and back again for each protein recovery cycle, considerable quantities of alkali and acid respectively were consumed. This contributed significantly to the protein production costs. A strong acid ion exchange group such as sulphonic acid, CH_2SO_3H , $pK_a > 1$, was required for optimum economic performance.

Production of the Sulphonic Acid (SP) Derivative (INDION S)

The chemical reagents reported in the scientific literature for producing sulphonic acid derivatives of hydrophilic chromatography matrices were as follows; $ClCH_2SO_3Na$, $ClCH_2CH_2SO_3Na$, $BrCH_2CH_2SO_3Na$, $ClCH_2CHOHCH_2SO_3Na$ and $OCH_2CH_2CH_2SO_2$. The last one, propane sultone, was the only one which gave satisfactory SP substitution levels on the INDION high capacity cellulose matrix.



This SP derivative with a substitution level of 1.4 milliequivalents per gram gave almost identical results to that shown in Figure 7 for the CM derivative, but the amount of sodium hydroxide required to desorb the whey protein at pH 9.0 was almost negligible in comparison to the CM¹³. It was superior to the CM Vistec ion exchanger for several reasons:

- (1) higher capacity for protein
- (2) small chemical consumption for each cycle of use
- (3) a cycle time of 2 hours was possible with the SP, versus 3 hours with a CM.

However, one major problem remained with the SP derivative which for many months seemed insurmountable; that was

Figure 8 The rotating pressure vessel at the Biochemical Processing Centre (DSIR, P.N.) used to prepare the first batches of high capacity SP cellulose.



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its chemical synthesis. Propane sulfone was increasingly suspect as a carcinogenic reagent and was unacceptable to the INDION manufacturers (Phoenix). All other reported reagents for preparing sulphonate derivatives were unable to give products with the necessary specifications. Eventually a novel synthesis was achieved. The new products were thoroughly investigated in the laboratory for use in recovering protein from whey by batch and column adsorption processes¹³.

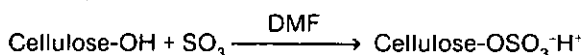
In 1981 the synthesis of the new SP derivative was successfully scaled-up from 100 g laboratory preparations to the 3 kg scale, with the assistance of the DSIR's Biochemical Processing Centre in Palmerston North, using the reaction vessel shown in Figure 8. Phoenix then started production of SP INDION at the end of 1981 under a license from the DFC.

There were several uncertainties still surrounding the new INDION products which required answers. Not least of these was whether the SP INDION could be used to produce protein from whey economically. In light of these uncertainties, the already long history of the cellulosic ion exchangers, and the possible threat from a competing ion exchange process for whey protein recovery developed in France^{14,15}, it was decided not to pursue pilot plant trials in New Zealand for the whey protein application. Instead, 40 kg of the SP produced at the Biochemical Processing Centre was made available to Bio-Isolates to put directly into their semi-commercial whey protein production unit in Wales, to replace 200 kg of the CM Vistec media which they were using at that time. The success of the SP was such that Bio-Isolates, in a joint venture with Ireland's biggest dairy co-operative (Mitchelstown Co-operative Agricultural Society), built a full scale commercial plant capable of producing 300 tonnes/year of protein from waste whey. The 50,000 ℓ ion exchange batch adsorption vessel is shown in Figure 9 ready for delivery to Ireland. Whey protein production started at Mitchelstown in March 1984 and a year later a similar sized plant came on stream in Minnesota, U.S.A. The single charge of SP INDION for each of these plants so extended Phoenix's Indion production facilities in Nelson that they increased production capacity four fold at the end of 1984.

Although there has been some criticism for allowing this application out of New Zealand, it is likely that pilot plant development in New Zealand would have taken a further five years and placed in jeopardy the ion exchange industry in New Zealand that now has a promising future in both laboratory and industrial applications. There are already other applications above the horizon for INDION products, on a scale possibly even larger than the Bio-Isolates one, and this would not be possible if Phoenix were not already viable with production of cellulosic ion exchangers.

Other INDION Products

Besides the products in Table 1 other derivatives have been developed at Massey University. The earliest of these was the attachment of a simple sulphate group (half ester of sulphuric acid). The sulphate group is not normally used as an ion exchange group because of the more expensive and hazardous chemicals required, as well as the labile nature of the sulphate ester linkage. However it was developed especially for the selective adsorption and fractionation of serum lipoproteins^{9,16}, the cholesterol carriers in blood.



More recently a boronate derivative was developed for both laboratory¹⁷ and industrial purification of certain carbohydrates and diols.

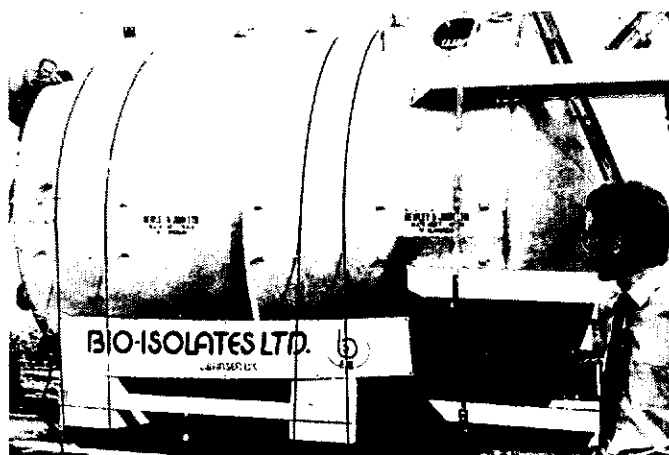
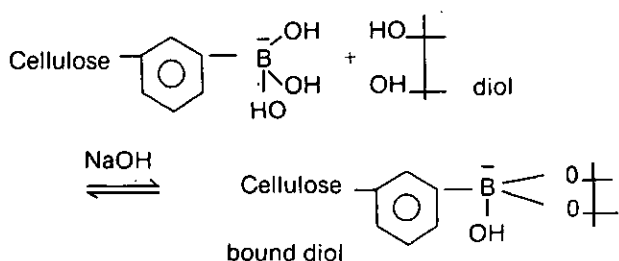


Figure 9 Bio-Isolates' 50,000 ℓ batch adsorption tank being prepared for delivery to Ireland. SP INDION is now used inside this vessel to recover protein from whey.

The variety of INDION products and applications for them is increasing all the time. Table 2 shows those that have been developed and that are already available from Phoenix, or soon will be, to meet the demands of the biotechnology revolution of the 1980's.

Table 2
Phoenix Cellulosic Products based on the High Capacity Matrix

Chemical Group	Name	Applications
$-\text{OCH}_2\text{CH}_2\text{'NH}(\text{C}_2\text{H}_5)_2$	DEAE INDION	Ion exchange chromatography of proteins, enzymes & polyelectrolytes
$-\text{OCH}_2\text{CO}_2\text{'Na}^+$	CM INDION	Ion exchange chromatography of proteins, enzymes & polyelectrolytes
$-\text{OCH}_2\text{CH}_2\text{'NR}_3$	QAE INDION	Ion exchange chromatography of proteins, enzymes & polyelectrolytes
$-\text{O}(\text{CH}_2)_3\text{SO}_3\text{'Na}^+$	SP INDION	Ion exchange chromatography of proteins, enzymes & polyelectrolytes. Especially whey proteins
$-\text{OSO}_3\text{'Na}^+$	SA INDION	Separation of lipoproteins
$-\text{C}_6\text{H}_4\text{B}(\text{OH})_2$	PB INDION	Separation of low molecular weight carbohydrates
$\begin{array}{c} \text{O} \\ \diagup \quad \diagdown \\ \text{---CH} \quad \text{---CH}_2 \end{array}$	Epoxide matrix	Affinity chromatography of low molecular weight enzymes
$-\text{OH}$	HP Gel matrix	Industrial gel chromatography, protein desalting or buffer exchange

Acknowledgements

I wish to acknowledge the assistance of the many students and staff who have worked with me over the years to bring this chemical development to a successful conclusion, or should I say, successful beginning.

I am also grateful to the DSIR, University Grants Committee,

TVL Ltd, Waitaki NZ Refrigerating Ltd and Massey University for their financial and/or expert contribution to the project. Particular thanks go to the Development Finance Corporation of NZ for their financial and professional support over many years.

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SHELL IN NEW ZEALAND

Shell's involvement with the NZIC through the Shell Industrial Chemistry Prize dates back to 1981. However, as members will no doubt be aware, the company's involvement with chemistry in this country is considerably more extensive than that.

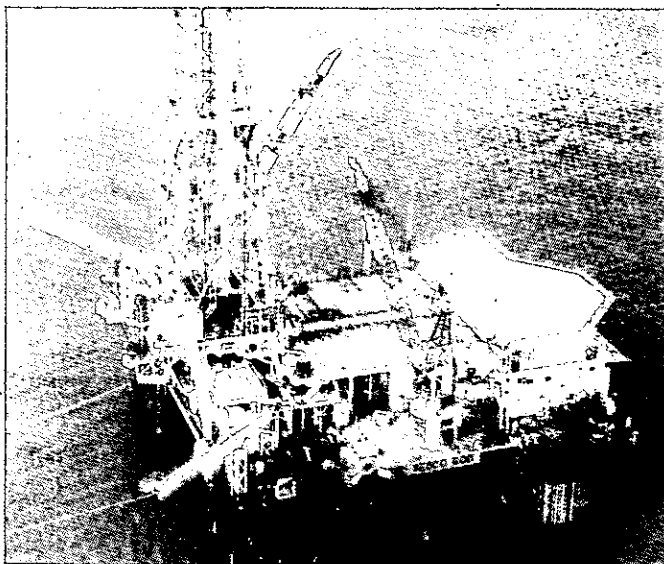
Shell in New Zealand is a wholly-owned subsidiary of the world-wide Royal Dutch/Shell Group of some 500 companies operating in over 100 countries.

The Shell Companies can trace their origins back to 1830, when an Englishman named Marcus Samuel started a small trading concern in London. His trade with the Orient included the importing of decorative sea shells — hence the now famous Shell trademark. The business grew steadily and in the early 1890's, now headed by Marcus Samuel's son, young Marcus, entered the petroleum business. This venture prospered so well that in 1897 Samuel decided to form a separate company for oil operations, The 'Shell' Transport and Trading Company.

Meanwhile in 1890, another new oil company had been formed at the Hague, in the Netherlands — 'The Royal Dutch Company for the Working of Petroleum Wells in the Netherlands Indies', commonly known as Royal Dutch. This company prospered too, under Henri Deterding, and soon Royal Dutch and 'Shell' Transport and Trading had so many mutual interests in the Far East that an alliance of some kind became increasingly desirable, to help them meet severe competition. In 1903 a joint company, The Asiatic Petroleum Company Limited, was formed to combine the sales and distribution organisations of Royal Dutch and Shell for their East Indies production. In 1907 complete integration of the two companies took place and it was from this merger that the present world-wide Royal Dutch/Shell Group of Companies came into being.

On August 7, 1912, the British Imperial Oil Company (NZ) Limited was registered in Wellington. This was the start of Shell operations in New Zealand and, using the agency of Gollin and Company, motor spirit and motor oils were imported in tins. By December 1927 the business had grown so that the agency agreement was terminated and the Company's name was changed to Shell Company of New Zealand Limited (which later became Shell Oil New Zealand Limited). In 1923 the Company purchased 25 acres for the construction of the first bulk oil installation in New Zealand, at Mirimar in Wellington. In 1926, the first bulk road wagon, with a capacity of 600 gallons, was put on the road and the first coastal tanker 'Paua' was introduced. In 1935 Shell took over the marketing of 'Big Tree' petrol from A. S. Paterson and Company. Apart from two dry wells drilled in 1911 and 1912, the first major Shell participation in petroleum exploration took place in 1938, but the search was unsuccessful until in 1959, when the Kapuni gasfield was discovered. In 1969 the Maui gasfield was discovered off the coast of Taranaki.

In 1979, the various activities performed by Shell Oil New Zealand Limited were restructured and Shell New Zealand Holding Company was formed which owns the shares of the main Shell interests in New Zealand, including Shell (Petro-



leum Mining) Company Limited, Shell Oil New Zealand Limited and Shell Chemicals New Zealand Limited.

Present day Shell operations in New Zealand are fully integrated. There are marketing companies for both oil and chemical products together with a number of related step-out activities. Distribution and marketing are co-ordinated from Branch offices throughout the country.

Shell with other oil marketers has a share in the country's only oil refinery at Marsden Point and plays a key role in the expansion and operation of the refinery. Exploration and natural gas production is operated in the Maui and Kapuni gasfields by the Shell-managed company Shell BP and Todd Oil Services Limited, which provides an increasing proportion of the country's energy needs.

Departures from traditional activities include forestry. Shell Forestry New Zealand Limited, formed in 1982, looks after substantial investments, a joint venture with New Zealand Forest Products Limited to establish a new forest resource in Northland, and a 50 per cent equity with Baigent Forest Industries Limited which recently completed a new sawmill development at Eves Valley, Nelson.

Another departure from tradition is Shell's 100 per cent owned subsidiary, Kent Heating Limited, which since 1964 has become leader in the solid-fuel heater market and exports to Australia, the United States, Chile and Europe. Kent's Tile Fire was voted the 1984 American Spaceheater of the Year, and Shell also has a 75 per cent equity interest in Davin Industries Limited, Christchurch, which manufactures heaters for Kent Heating.

Recognising its responsibilities as a corporate citizen within the New Zealand community, Shell maintains a Public Affairs programme which supports a wide range of community activities, with emphasis on sport, the performing arts, education, youth development and welfare.

QUIET REFLECTIONS ON "THE THREAT OF NUCLEAR WAR: A NEW ZEALAND PERSPECTIVE."

S. J. de Mora, Chemistry Department, University of Auckland.

About a year ago an *ad hoc* committee of the Royal Society of New Zealand published the report entitled "The Threat of Nuclear War: a New Zealand Perspective". Regarding the ensuing debate — the silence was deafening. The report aims firstly to present an overview of the widespread effects of nuclear war and the political stalemate, called nuclear deterrence, responsible for maintaining the peace. To this end, the report is objective and a noble attempt has been made to use non-technical language and translate the politico-military jargon (semantic sanitation as a countermeasure to "semantic satiation"?). The second and underlying theme is the role in the nuclear weapons debate of scientists, both as individuals (a word recently redefined in the New Zealand lexicon) and in collective groups. This aspect is necessarily more subjective in nature. A brief synopsis of the objective items in the report are presented here and followed by a critique of the subjective aspects.

The report consists of 8 chapters, 7 appendices and a reasonable bibliography. Chapter 1 justifies and encourages scientists to voice their opinions on matters relating to the threat posed by nuclear weapons. Both individual scientists and professional associations may be involved in such discussions. While specialists may have knowledge of particular relevance to the nuclear weapon debate, the report acknowledges that "scientists will hold views on technological issues not within their range of specialism". They can therefore exert their rights as citizens and express political points of view.

The nuclear arsenals are described in chapter 2; the USA is credited with 4,500 Mt of weapons, while the USSR has a 7000 Mt stockpile. Fission bombs, using U^{235} or Pu^{239} , have an upper limit to the explosive yield of a few kt of TNT. Fusion weapons (H-bomb) have been tested with yields as high as 50 Mt. The global total for strategic weapons is 17,000 (yield of 8,000 Mt) and for tactical weapons — 35,000 (4,500 Mt). The mass difference between the inventory systems was not explained. The energy released from a nuclear explosion would take the form of blast (50%), heat (35%), radiation (15%) and an electromagnetic pulse that could damage electronic and electrical equipment within a radius of several hundred kilometres. Death and destruction from a global nuclear war would be unimaginable — one estimate of the effect of a 10,000 Mt event would cause one billion deaths and leave a further one billion people injured.

Chapter 3 outlines possible climatic effects noting that the scale of the nuclear exchange, the distribution of small and large blasts, the number of ground or air bursts and wind patterns would influence the atmospheric response. Of particular importance to New Zealand is the amount of debris predicted to be injected into the stratosphere and thereby undergo global dispersion. Environmental perturbations would be widespread and longterm. Smoke and dust would cause a substantial decrease in the incident solar radiation and lead to low temperatures — an effect now known as nuclear winter. Wind circulation patterns would be influenced, espe-

cially interhemispheric mixing rates, thereby ensuring that the southern hemisphere was not immune to a war predominantly in the northern hemisphere. The generation of nitrogen oxides followed by injection into the stratosphere could cause a depletion of the ozone layer. Radioactive debris is not expected to be immediately lethal but would have unknown longterm effects on the biosphere.

Medical effects, both immediate from nuclear explosions and in the initial aftermath, are presented in chapter 4. Death in the immediate vicinity of an explosion would result from blast effects (ruptures, crushing from masonry, or lacerations from flying glass) or heat effects (vaporization, flash burns, or asphyxiation in a fire storm). Radiation damage would be significant at great distances from the blast site. Rapidly dividing cells (bone marrow and lining of gastro-intestinal tract) are especially susceptible to radiation effects. Higher doses affect the central nervous system. On the not-unreasonable assumption that major population centres would be targeted, the disruption of medical services would be total. Communicable diseases, rampant due to poor sanitation, lack of immunization and plentiful insects, would kill 20 to 25% of the survivors within a few months. Pyschic numbing would diminish the will to survive. Regarding anticipated refugees, the committee suggests "strict quarantine regulations would have to be enforced".



Economic considerations are covered in chapter 5. This speculative discussion outlines New Zealand's reliance upon imports to maintain the present standard of living. International trade and the market economy would need to be replaced with a pastoral, pioneer-type way of life in which "dieting pills might no longer be necessary at all". In chapter 6, the emphasis changes to the political arena and the scientific/military interaction manifest in the nuclear arms race. The Orwellian use (abuse) of language in defence posturing is discussed. Deterrence, while possibly accepted as a policy of bluff, was generally acceptable when a nuclear war was considered to be unwinnable. Defense language such as "limited

nuclear war" and "restore peace on favourable terms" suggest a belief that a nuclear war may be winnable. Present peace is suggested to be fragile, being reliant upon the warning and intelligence systems of both super-powers. The military forces are seen to be coupled due to the requirements of an instantaneous response in modern warfare. Warning is given of a nuclear Sarajevo — that is, an incident which upon starting unleashes a series of predetermined but essentially uncontrolled responses in a complex political-military system. The chapter concludes with a cautionary note about acts of terrorism. In comparison with the previously discussed wholesale destruction of a nuclear war, this paragraph is out of context and appears to be an afterthought.

Chapter 7 considers possible disengagement (disarmament) strategies. Most of the appendices relate to this section as they deal with the pleas of scientists and concerned, eminent individuals to the super-powers to exercise restraint in weapons research and stockpiling. While scientists have initiated peace studies, written articles and where applicable advised as experts, the physicians have issued a health warning — "There could be no adequate medical response to a nuclear war. The only cure is prevention".

Chapter 8 outlines the New Zealand position. The report endorses the action of civil defence authorities in suggesting that efforts to prevent a nuclear war are better spent than those in preparing to survive a nuclear war. New Zealand's role in this is seen as a catalyst to discussion between nuclear-armed nations.

Thus, the report follows a transition from scientific fact through economic fiction to political reality. The report is sensible and could serve as a source of information to the layman (i.e. most scientists and politicians). However, the treatment is patchy. While nuclear winter is accepted as inevitable, the consequent medical and economic effects are not adequately addressed. To speculate on quarantining refugees and defending against invasion must be attempts to introduce black humour, and show a complete lack of comprehension as to what New Zealand's role might be in a devastated world in which 4 out of 5 people alive today would be dead. This suggests to me that such mind games are futile. It is dangerous to consider nuclear war as even survivable, let alone winnable. I endorse actions to prevent such a war but consider any expenditure on developing survival strategies, such as building shelters and stockpiling food and medicines (and armaments?), as wasted money. Crash barriers on Auckland's northwest motorway would be a far wiser investment.

The report is also bland, an inevitable consequence of trying to be apolitical. The committee obviously feel that nuclear weapons are dangerous and should be eliminated. This hopefully is the view of realists and not just idealists. However, no disarmament strategies are offered or even endorsed (although the proposals of two American 'individuals' are included as appendices), probably because discussions of weapons restrictions must be political.

What is the role of scientists as seen by the report? I was left with the distinct impression that scientists had been urged to speak out against nuclear weapons. This may pose a moral dilemma for the half million employed in defense-related research. Even for the remainder, individual scientists must speak out with care. While some scientists may have specialist knowledge that is relevant to the nuclear debate, most are likely to be of the well-informed layman variety. Some will be just laymen. Accordingly, in the absence of specific scientific expertise the scientist must couch his support or opposition to political activity with honesty. Scientists should acknowledge when a judgement is subjective (or emotive) rather than objective, and in this way avoid the label of elitism. As with all citizens, scientists have the right to express a view, political or otherwise, about which they may know nothing. Well-meaning politically-motivated individuals can join SANA (Scientists Against Nuclear Arms), support the concept of a nuclear-free South Pacific and write articles for Scientific American on the merits of a Comprehensive Test Ban Treaty.

Actions have also been taken by professional associations in the scientific community and are heartily endorsed by the Royal Society report. The New Zealand Ecological Society,

issued a statement of concern regarding the environmental consequences of nuclear war. This seems to have prompted the Royal Society of New Zealand to produce this report. As noted in the appendices, the concern of scientists has been expressed at international level by the International Council of Scientific Unions and by the Pontifical Academy of Sciences. Clearly chemists have had much said on their behalf, although there seems to have been little discussion at the grassroots level. Is there a role for NZIC in acting as a collective voice for chemists in New Zealand concerned with the threat of nuclear war? Within NZIC there are likely to be few 'experts', although more than a few members are likely to hold the view that nuclear war is deleterious to your health regardless of where you live and work.

There is another *modus operandi* that scientists, either individually or collectively, can adopt — to plead ignorance. This has the benefit that one is not pressed into voicing political preferences, and can also request substantial research funds. For instance, the report notes that the model for Nuclear Winter incorporates many assumptions which influence the severity of this climatic change. The concept of a cold, dark aftermath is generally accepted (except by Edward Teller), but funds up to \$US50 million have been requested to fine-tune the simulations. Can we afford to worry just how bad the weather would be after a nuclear war? This form of opportunism cannot cast a favourable public image of concerned scientists.

It is unlikely that the Royal Society report has done much to change political views. Individual scientists will continue to act according to their conscience and political persuasion. Some will have spent the paltry sum of \$10 to buy the report. The role of collective organisations, like NZIC, needs examination. Will the silence continue?

Steve de Mora lectures in analytical and environmental chemistry at the University of Auckland. His research interests are in speciation and trace analysis of chemicals in the environment. Steve is also currently secretary of the Auckland branch of the NZIC.

SYDNEY/AUSTRALIA

THE UNIVERSITY OF NEW SOUTH WALES

SCHOOL OF CHEMISTRY LECTURERS (REF1062) (TWO POSITIONS)

(FIXED TERM APPOINTMENTS)

Applications are invited for appointment as Lecturer in the Department of Inorganic and Nuclear Chemistry. Duties will include participation in the teaching of general chemistry, and teaching in the Department at undergraduate and postgraduate levels. The appointee(s) will be expected to initiate and undertake research programmes in inorganic chemistry. The School is well equipped, especially in the areas of NMR spectroscopy (300 MHz multinuclear, 500 MHz on order), mass spectroscopy (FTICR), and crystal structure determination. Existing research in the Department includes synthetic, magnetic, spectroscopic and structural investigations of co-ordination and organometallic compounds, catalysis by zeolites, and nuclear techniques.

The positions are available in 1987 and appointments will be for a fixed term of three years.

Further information from Professor I. G. Dance, (02) 697-4703.

Applications close 22 August 1986.

Salary: \$A27,233 range \$A35,777

Commencing salary according to qualifications and experience.

Applicants should forward two copies of their curriculum vitae, including telephone number during business hours, transcripts of academic record and the names and addresses of two referees, to the Academic Staff Office, PO Box 1, Kensington, NSW 2033 Australia.

Equality of employment opportunity is University policy.

JOBS FOR CHEMISTS

I. D. Watson & C. R. Southward, Massey University, Palmerston North.

Introduction

The Manawatu Branch of the Institute of Chemistry has long had an interest in Career opportunities in Chemistry. Some years ago it produced a tape/slide programme on the topic, and more recently some of its members produced a film on Chemistry in Agriculture. A similar interest has also been obvious in the Department of Chemistry and Biochemistry at Massey University, where much of its teaching and research activity has been, to quote Professor Batt, "target and vocationally orientated". It was the merging of this common interest between these two groups by Dr Sylvia Rumball which has resulted in this survey. Dr Rumball suggested that the Manawatu Branch Committee monitor the advertisements in the papers of Auckland, Wellington, Christchurch and Dunedin, as well as the Palmerston North newspaper, for a year. This task was collectively taken up by the family of one of us (C.R.S.) who, over the twelve months commencing 1/3/84, carefully scanned the Saturday editions of the New Zealand Herald, Evening Post, Christchurch Press, Otago Daily Times, and Evening Standard, for advertisements related to chemistry or positions likely to be of interest to chemists. Each was carefully cut out, and pasted into what turned out to be a three-volume scrap book.

In all over 600 advertisements featuring nearly 700 jobs were collected, and subjected to scrutiny. From that total were excluded all jobs that specifically asked for qualifications other than a B.Sc. or NZCS, all jobs that were temporary or part time in nature, and all jobs that were not based in New Zealand. This left 513 jobs, all New Zealand based, all involving chemical skills or chemistry, all requiring some form of qualification in chemistry. It included jobs where holders of chemistry qualifications might be in competition with other qualifications such as B.E., B.Tech., N.Z.C.E. and a B.Sc. or higher in another subject.

The survey only selected from jobs advertised in the Saturday editions of the five papers mentioned. It cannot therefore claim to be exhaustive of the actual number of jobs available in a year. It is clear that the advertisements are regional, often only appearing in one paper, and seldom appearing on consecutive Saturdays. Occasionally the same job appeared after a 3-6 month interval. All advertisements for secondary school teachers were also excluded. These appear in the education Gazette. This important area of employment should not be overlooked. It is seldom, however, that such posts are advertised in newspapers.

General

(i) Location

Given the limitations of the survey, there are nonetheless a number of interesting factors which emerge. Firstly, and perhaps not surprisingly, over a third of all the jobs were in Auckland (189) and about a fifth (101) were in Wellington. Next on the list was Palmerston North (55) (possibly a reflection of the inclusion of the Evening Standard) followed by Christchurch (51), Hamilton (18) (almost certainly a reflection of not including the Waikato Times), Nelson (15), Dunedin (14) and New

Plymouth (11). If you prefer a quieter pace of life, there are jobs for chemists at Stirling, Clyde, Karamea, Te Kuiti, Maungaturoto, and Te Aroha. The combined pull of the Dairy and Petrochemical industry has provided about 10 jobs in South Taranaki, and about the same number in Whangarei and beyond. The Kiwifruit industry appears to be responsible for about 10 jobs around Tauranga. The remaining jobs are scattered in ones and twos (or sevens in the case of Invercargill) throughout the country.

(ii) Types of Employers

By far the greatest employer is the industrial sector from where 330 advertisements emanated. About a quarter of these were placed by Personnel companies, and it was not always easy to see what type of industry was involved. We shall consider this group in some detail later. Next greatest seekers of chemical skills were the Research Institutes (73)*, followed by Academia (32), Government Departments (21)*, Chemical and other Consultants (20), and Commerce (20). Nearly all the positions in Commerce (15) were in the Sales/Marketing area. (*"Research Institutes" includes DSIR and other identifiable Government research groups.)

(iii) Qualifications

Of the 513 jobs advertised, 175 required a university degree in chemistry (or, in competition, other degrees), 123 either a B.Sc. or NZCS in chemistry, 100 an NZCS in chemistry, 73 university entrance in chemistry, and 20 did not specify any qualifications. 17 of the positions were specified for trainee NZCS students, whilst 5 could be for either a B.Sc. or an NZCS or a UE person.

(iv) Kinds of Jobs

There were in all 14 kinds of jobs mentioned. The most frequent was the Laboratory Technician (213), followed by Scientist (79), Quality Control person (64), Manager/Supervisor (60), Sales Marketing (46), Analytical Chemist (32) and Product Development person (11). Only 5 academic positions were advertised and a further two were for a Science Editor. A further 5 positions were advertised by the Patent Office.

(v) Which Papers to Read

Over half the advertisements, 276, were placed in the New Zealand Herald. Of these, 210 appeared solely in that paper. Similar figures for the others with the sole figures in brackets are: Evening Post 145 (102), Christchurch Press 120 (78), Otago Daily Times 84 (19), Evening Standard 65 (37). It is clearly advisable to search beyond the local newspaper job columns. Only 21 of the advertisements appeared in four of the newspapers, and only one in the five.

(vi) Which Month to Peruse

The two highest months for advertisements were January (65) and March (62), and the two lowest December (24) and

September (27). The remaining months were within 5 of the mean (43) except November (32) and April (34).

(vii) How Much?

Advertisements were remarkably coy on this point. The lowest salary quoting in 1986 dollars was \$20,000, the highest \$60,000. Nearly all, however, did not say.

Jobs in Industry

Jobs in the industrial sector were advertised mainly (about 90%) from Manufacturing Processes. Within that subgroup about a quarter came from biological processing (dairy and meat). The remaining positions were providing some kind of

Table 1: Jobs in Industry

Type of Job	Number	University Degree	Degree or NZCS	NZCS	UE	None Specified
Technician	108	1	11	41	43	12
Quality Control Person	61	19	17	12	13	
Manager/Supervisor	54	32	13	9		
Scientist/Researcher	51	32	15	4		
Sales/Marketing Person	30	12	12	6		
Analyst	14	6	5	3		
Product Development Person	10	5	2	3		
Other	2	2				
Totals	330	109	75	78	56	12

secondary service to industry, management, or research and development. A complete breakdown of the jobs advertised together with the qualifications is given in Table 1. In broad terms the Polytech trainee or trained student has the edge for technician type jobs whilst the University trained person appears to have the advantage for the scientific and managerial posts. For Sales Persons, Analysts, and Production Development people, both qualifications seem to be in demand to about the same extent. It was something of a surprise to see the high number of trainees in the Quality Control category.

Table 2: Jobs in Non-Industrial Employment

Research Institutes

Type	Number	University Degree	Degree or NZCS	NZCS	UE
Technician	48	2	17	19	10
Scientist/Researcher	17	17	—	—	—
Analyst	4	3	1		
Manager	3	2	1		
Editor	1	1	—		
Total	73	25	19	19	10

Academic

Technician	26	4	10	9	3
Researcher	2	2			
Lecturer	4	4			
Total	32	10	10	9	3

Government Departments

Technician	10	1	5	2	2
Scientist	6	6	—		
Quality Control	2	1	1		
Analyst	1		1		
Editor	1	1			
Patent Officer	1	1			
Total	21	10	7	2	2

Local Bodies

Technician	9	1	3	1	3
Scientist	4	4			
Analyst	3	3			
Manager/Supervisor	2	2			
Total	18	10	3	1	3

Jobs in Non-Industrial Employment

The number of advertisements for positions in Research Institutes, Government Departments and Academia are given in Table 2. Research Institutes include all divisions of DSIR, and those funded in part from Government and in part from Industry. Identifiable groups from other Government departments such as the MAF unit at Wallaceville were also included. Government Departments do not include Petrocorp or Petrogas. Local Bodies include Hospital Boards, Catchment Boards as well as Councils and Boroughs. It is again clear that the NZCS or NZCS trainee is sought for the technical positions. The graduates are favoured for the research scientist positions. It should be noted that for most of these an honours masterate or Ph.D. was the preferred degree. Few were offered for B.Sc. only.

Conclusions

Every so often a scare occurs as to whether or not we are producing the required number of chemically trained people to meet the country's needs. The fact that both industry and non-industrial employers seek not insignificant numbers of pre-tertiary education people does not indicate an over production. It is true that certain positions such as academic posts are scarcer now than they once were. However industry is now seeking again, in not insignificant numbers, graduates who have completed a Ph.D. But for all who enjoy chemistry, at whatever level, the jobs are there. The secret is to look widely, be prepared to travel, and be prepared to accept the challenges placed before you.

Good Luck!

Acknowledgement

The assistance of Robert, David and Rochelle Southward in gathering this information and the enthusiasm and drive of Dr Sylvia Rumball is much appreciated.

RESEARCH CHEMIST

Ivon Watkins-Dow Ltd, a leading international agricultural chemicals company with substantial manufacturing facilities at New Plymouth wishes to appoint a Research Chemist.

The successful applicant will be responsible for the design and execution of chemical research projects related to process improvements and new products from laboratory via pilot plant to full scale production.

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We are looking for someone with a PhD or M Sc in organic chemistry and several years post graduate experience, preferably in industry or some position which had a reasonable level of independence. The successful applicant must have initiative and ability to work with a minimum of supervision.

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DSIR: Applied Biochemistry Division

Dr Graeme Russell returned from a visit to Colorado, U.S.A., where he attended and presented a paper at a conference on Molecular Entomology. This was part of the U.C.L.A. Symposia on Molecular Biology. Of particular interest to his work in the Division, were the sessions on plant-insect interactions dealing with induced plant defences, chemical deterrence of plants and olfaction and gestation in insects. The work that aroused considerable interest was that describing the development of genetically engineered insect resistant plants using the crystal protein toxin gene from *Bacillus thuringiensis*. Tobacco plants have now been developed that are insect resistant by this new technology.

NZ Soil Bureau, DSIR

Lee Searle has just returned from a private visit to Washington D.C. where he visited The Sulphur Institute and laboratories at the University of Maryland and the United States Department of Agriculture station at Bettsville. Whilst at Bettsville he used the USDA central library's 'AGRICOLA' computer system to complete a literature search. This system has access to 200 million citations relating to the agricultural sciences and calculates the cost of the search as it proceeds.

Kevin Tate attended an International Workshop in April on C, N, P and S Interactions in Different Ecosystems. The meeting was held in Sapelo Island, Georgia (U.S.A.), and was funded by the National Science Foundation.

Institute of Nuclear Sciences, DSIR

Between 7-11 April 1986, **Dr Peter Roberts** attended a seminar for Asia and the Pacific on the Practical Applications of Food Irradiation. The seminar was organised by the International Atomic Energy Agency and World Health Organisation. China's Science and Technology Committee co-hosted the meeting. A visit to one of China's new food irradiation facilities was organised and progress in the technology throughout the region was discussed.

Dr Dave Lowe attended and delivered a paper at an international symposium on "Biosphere-Atmosphere Exchange" held at Mainz, West Germany, from 16-21 March 1986. The symposium concentrated on man's impact on the atmosphere and changes to the biosphere. While in Europe Dave Lowe visited tandem accelerator laboratories at Utrecht, Holland, and Oxford, England. Both these laboratories have accelerator mass spectrometry projects with environmental applications of interest to New Zealand.

N.Z. Dairy Research Institute

Following the recent expansion in staffing at the Institute, which included the appointment of several specialists in food applications technology (eg. bakery, confectionery, dairy analogues, beverages, meats), the R&D administration was reorganised with the appointment of two new Assistant Directors — **Dr Terry Fryer** and **Mr Peter Hobman**. They, together with the present Assistant Directors, **Drs Bob Lawrence** and **Wayne Sanderson**, and the Director **Dr Peter Robertson**, form the Institute's new Directorate.

Mr John Higgins of the Casein Products Section was promoted to Head of the Whey Products Section earlier this year. **Mrs Rosemary Cleland** has rejoined the Whey Products Section. **Dr Lee Huffman**, who came to the Institute as a Fulbright Scholar and worked in the Cheese Technology Section, has now been appointed to the permanent staff in the Whey Products Section.

Miss Nikki Hough has been appointed as Confectionery Technologist in the Product use and Evaluation Section, while other recent Research Officer appointments include **Miss Mandy Armstrong** and **Mr Kim Bergerson** to Casein Products, and Milk Powders and Drying Sections, respectively.

Dr Mark Brimble has joined the Milkfat and Butter Section to undertake fundamental studies on the properties of milkfat. **Dr Brimble** is a graduate in chemistry from the University of Auckland who has undertaken post-doctoral studies at the University of Southampton and also worked briefly at Applied Biochemistry Division, DSIR in a temporary position before joining the Institute.

Dr Agnes Delacroix, a visiting research fellow from France, is spending a post-doctoral period of 12 months working in the Cheese Technology Section at the Institute.

Mr John Aston, a research scientist from the Otto Madsen Laboratories in Queensland, spent a year in the Protein Chemistry Section investigating the contribution of small peptides to cheese flavour.

Dr Jim Harper, a visiting

Research Fellow and acting Section Head of Whey Products, has returned home to the United States after a period of five years with the Whey Products Section.

Dr Bob Lawrence will be a guest speaker at the American Dairy Science Association's Annual Meeting in June.

Dr Euan Cant leaves in June to spend 18 months with Anchor Foods at Swindon, near London. **Mr Charles Towler**, Head of the Institute's Product Use and Evaluation Section, is currently working there too.

Dr Kevin Pearce leaves in June to spend his sabbatical at the Western Regional Research Laboratories of the U.S.D.A. at Albany in California, working with **Dr Mendel Friedman** on the effects of processing on the nutritional quality of proteins.

Building Research Assn.

Dr W. R. Sharman of the Building Science Group will be travelling to Europe in July and August. He will present a paper "Durability studies on wood fibre reinforced cement sheet" at the Third International Conference on Developments in Fibre Reinforced Cement to be held in Sheffield July 13-17, and visit building research and related establishments in England and Sweden.

Dr J. R. Duncan recently attended an ASTM symposium on "Degradation of metals in the atmosphere" in Philadelphia, where he presented a paper on the correlation between deposited chloride and metal corrosion rates. While in North America he also

visited several building related materials research establishments.

Dr R. S. Whitney recently presented a paper on "Expert systems applications in building research", to a seminar on Information Technology and Economic Growth run by the Institute of Policy Studies.

Fertiliser Manufacturers' Research Assn.

Staff at NZFMRA have recently been advised that their organisation will cease to function in its present form at the end of September. Various alternatives for restructuring are currently being assessed.

MAF, Invermay

At the Invermay Agricultural Research Centre in Mosgiel, **Dr Jock Allison**, who has been Director of the Centre and also of the Southern South Island Region for the last seven years, will be leaving the MAF in July to join Animal Enterprises Ltd in Dunedin. **Dr Allison** has been interested in animal husbandry and the zoology of exotic breeds of sheep for some time, and will now be developing interests in the live sheep export trade.

Health Dept

Dr David Rogers has joined the staff at NECAL, in Auckland. **Dave** graduated from Auckland University in 1983, having worked with **Graham Bower** and **Mike Taylor**, and for the last three years has been in the physical chemistry section of NZFMRA.

INDUSTRIAL NEWS

Mr H. R. Bott has retired from Gamlen Chemical Co Ltd and is now living in Port Ohope.

David H. Andrew, Production Supervisor at the Kiwitahi Fertilizer Co Ltd in Morrinsville, retired in April, after working for 38 years in the industry.

Jim Robb retired from his position as Technical Manager with Fur Dressers and Dyers in Dunedin in March, and at the Alliance Freezing Company in Invercargill. **Arthur Ballantyne** has been promoted within the Company to Technical Manager and a new appointment has been made to the position of Works Chemist.

The consulting firm, W. Grayson and Associates, based primarily in Auckland and Wellington, have recently opened an agency in Invercargill with **Geoff Miles** as Chemist. They

are currently working closely with the local timber industry.

The laboratories of Southland Co-operative Phosphate Co. are now taking on work from outside the Company following a downturn in demand for fertilizers. Twenty percent of the work force has recently been laid off for this reason, although the Company's secondary interest — the extraction of oil from rape seed — is currently buoyant and may expect to have a bumper production season.

Dr Ian Devereaux of Rocklabs gave a paper and seminar at a symposium organised by the RACI West Australian Branch in February. The symposium was on sampling and sample preparation in mining. **Ian's** address was entitled

Contd. on page 79.

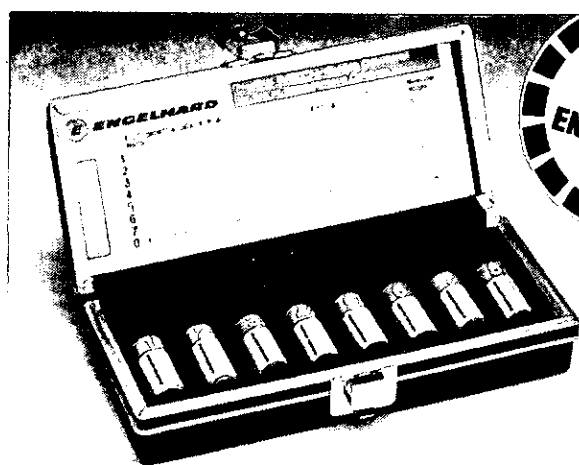
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UNIVERSITY NEWS

Auckland

Dr M. Banwell left the University of Auckland on 30th April to take up a position at the University of Melbourne Department of Organic Chemistry.

Assoc. Prof. G. A. Wright will be on leave from June to December 1986.

Dr T. Brittain will be on leave from May to December 1986.

Dr R. H. Swisher of Oregon Institute of Technology will be visiting the department until June. He is attached to the Geophysical Institute and also working with Assoc. Prof. G. A. Wright.

Mr R. S. Smythe of James Cook University, Australia will be visiting the department until July. He is on sabbatical, working with **Prof. W. R. Roper** in synthetic transition metal chemistry.

Dr D. C. Ware is working with Prof. W. R. Roper as a post-doctoral fellow until March 1987. He is from Stanford University, California where he worked under Prof. Taube. Here he is working in transition metal phosphorus chemistry.

Dr F. Sumera from the University of the Philippines will be working with **Prof. R. C. Cambie** until June.

Open day at the University of Auckland was held on May 3rd and proved very popular with 13,000 visitors. Exhibits were put on by all departments, including chemistry.

Waikato

Recent visitors to the Chemistry department came from far and wide. **Dr Bill Qualls** (formerly of the University of Indiana) and now resident in Christchurch gave a seminar on "Aspects of Fourier Transform Infrared Spectroscopy". **Professor Jack Lunsford** (Texas A & M University), currently on sabbatical leave at the University of Auckland, addressed the staff and research students on "Acid Catalysis by De-Aluminated Zeolites". **Professor Yehuda Mazur**, Chairperson of the Organic Chemistry Section at the Weismann Institute of Science in Israel, spoke at a seminar and an NZIC meeting. **Professor Bernard Shaw** from Leeds University, presently visiting lecturer at the University of Auckland, gave a seminar on "Steric Effects in Large Chelate Ring Stabilisation and Cyclo-metallation Reactions". **Dr Bob Murray** from Glasgow University had extensive discussions in the department and addressed an NZIC meeting.

Professor Ralph K. Birdwhistell from the University of West Florida, Pensacola is visiting

the Science Education Research Unit and the Chemistry Department. Ralph has been involved in many facets of Chemical Education in the U.S.A., from involvement with the introduction of CHEM STUDY and CHEM BOND through to the Education Committee of ACS. Two columns are about to appear in *J. Chem. Ed.* under his editorship.

Dr Malcolm Carr will attend two conferences in Adelaide in May, the RACI Chemical Education Division Conference and the Australian Science Education Research Association Conference.

Massey

Dr Margaret Brimble has been appointed as lecturer in organic chemistry in the Department of Chemistry and Biochemistry. She replaces **Dr Len Blackwell** who is on leave at the University of Melbourne for three years. Dr Brimble graduated with an MSc (first class honours) from Auckland University in 1983 and was awarded a U.K. Commonwealth Scholarship to study for a PhD at Southampton University. Her PhD research was directed towards the synthesis of the polyether antibiotic salinomycin, in collaboration with **Professor Ray Baker**. Her current research interests are in the synthesis of other natural products, in particular the antiparasitic agents, the avermectins, and a fish anti-feedant.

Dr Ted Baker recently returned to Massey, following a year's study leave spent in the United States and Britain. In the United States he was based at the University of Oregon, Eugene, working with **Professor Brian Matthews** on temperature-sensitive mutants of the enzyme lysozyme (aimed at understanding heat stability in proteins) and gaining some experience in the use of computer graphics. In Britain he worked with **Professors Guy Dodson** and **Dorothy Hodgkin**, at the University of York, on the structure of insulin, in particular its interactions with water. Ted reports that protein crystallography is experiencing a dramatic boom in North America and Europe, through its combination with computer graphics and molecular biology in drug design and protein engineering. Since his return he has also visited Australia to give a Plenary Lecture, on "Iron-binding proteins: structure and function", at the Inorganic Chemistry Conference of the RACI, in January.

Dr David Officer has been

appointed lecturer in organic chemistry in the Department of Chemistry and Biochemistry, replacing **Dr Bill Hancock** who last year joined the American biotechnology company Genentech. Dr Officer, a Victoria University graduate (1981), spent 1985 as a Research Officer at Massey following 18 months working with **Professor E. Vogel** at the Institute for Organic Chemistry, Cologne, West Germany as an Alexander von Humboldt Fellow.

Otago

The appointee to the chair of Pharmacy is **Dr Michael S. Roberts**, an Australian, teaching at present at the School of Pharmacy in Hobart. Dr Roberts graduated from the Universities of Adelaide and Sydney and his research interests are in biopharmaceutics and clinical pharmacokinetics. He takes up his appointment in August. Also in the Pharmacy Department, **Dr John Lim**, a graduate of Otago University who has returned recently from study in Kentucky, has been appointed to a lectureship in the Department. Dr Lim's speciality is in clinical pharmacy.

In the Chemistry Department, **Professor John Ridd's** visit from University College, London, was particularly significant and valuable to **Prof. D. A. Buckingham** and **Assoc. Prof. M. R. Grimmitt** who share with him interests in inorganic imidazole chemistry. Prof. Ridd pioneered work in this field, and lectured during his visit on "The Evidence for Radical Intermediates in Aromatic Nitration".

Dr Mel Carr will be on leave in Australia during the Winter term. He will visit universities, CSIRO establishments, and industries in the Melbourne and Sydney areas which have interests in the liquefaction of brown coal. He hopes to visit a pilot liquefaction plant in the La Trobe Valley which has been set up jointly by Australian and Japanese interests. **Dr Wayne Webley** will be returning to Prof. D. A. Buckingham's Group for three months to further work initiated there while working for his PhD. Dr Webley spent three months recently working as a post-doctoral fellow with **Prof. Fred Anson** at Caltech in the U.S.A. **Mrs Sue Carpenter**, a graduate of the University of Melbourne, is working in the Department for Westchem Ltd on the commercialisation of manool derivatives under the direction of **Profs. P. K. Grant** and **B. H. Robinson**. Twelve people will be travelling to Massey University in May for the meeting of the Specialist Inor-

ganic Group of the NZIC. **Professor Bill Cullen** from the University of British Columbia will be the principal speaker at this meeting.

From the Department of Biochemistry, **Dr Ian Forrester** is currently in Japan on a Lincoln College Foundation Award as a member of the DSIR biotechnology delegation of senior scientists. Before returning, Ian will also visit Korea to discuss the supply of trypsin, the production and marketing of which has occupied him for the last two years. **Dr Berthold Kastner**, a holder of a Feodor Lynen Fellowship from the Humboldt Foundation in Berlin, has been able to extend his stay with the Tate/Trotman Research Group to complete work on mapping the binding site of the release factors on the ribosome by immunoelectronmicroscopy. **Tony Manning**, a PhD student in the Tate/Trotman Group, was awarded a J.B.S. Roberts Foundation prize to speak at the Australian and New Zealand Association of Cell Biology Conference in Sydney. He also attended a workshop on recombinant DNA technology at CSIRO and hit the Sydney sales. He is now by far the best dressed member of the Group. **Paul Jones**, a PhD student working with **Dr Murray Grigor**, is to spend some time with **Professor Funder** of St Mary's Hospital, Melbourne, to acquire the skills of organ culture of mammary explants. He will combine this with attendance at the A.B.S. meeting where he will present his work on the fatty acid binding protein from the mammary gland.

INDUST. NEWS

Cont. from pg. 77

Design and Manufacture of Sample Preparation Equipment: Meeting the Analysts Needs.

He reports that the symposium was very successful with 120 registrations and 6 overseas speakers.

The AHI Technical Centre in Auckland has been closed down. A spokesman for Carter Holt Harvey, **Mr Nankeville**, stated that the work carried out by the centre had been transferred into the subsidiary companies. The staff had also been offered positions in the subsidiaries, with the alternative of voluntary redundancy.

Bruce Gunn has transferred to Printpak Plastic Film, and **Jane Buckman** is now with the University of Auckland, School of Medicine. At the time of writing other staff had yet to be placed.

COUNCIL NEWS

Prizes. At a telephone meeting of Council's Standing Committee on 8th May the 1985 prize for the student gaining best marks in Chemistry (and/or Biochemistry) for NZCS Chemistry V was awarded to **Miss Verily L. MacMillan** of Whangarei, who studied at the Central Institute of Technology. This prize now has a value of \$100.

It was noted with satisfaction that 6 entries had been received for the Shell Industrial Chemistry Prize. Entries close on the 30th June for the Student Essay Prize and for the new Award for Chemical Education. Applications for the A. C. Kennett Memorial Award close on 31st July with the New Zealand Branch, Australasian Corrosion Association, P.O. Box 5961, Wellesley Street, Auckland.

Nominations of members of the RACI for the 1987 NZIC-RACI Visiting Speaker Award will be considered by Council in August. **Professor Barry Welch**, who received the 1986 award is recovering from surgery and plans to visit Australia in August and October/November.

RSNZ Prince and Princess of Wales Awards. The next closing date for these awards is 31st of August.

Salary Survey. Because of delays in determining the salary scales in the State Services for scientists and teachers, circulation of the salary survey questionnaire was deferred. The results of this survey therefore will not appear in "Chemistry in New Zealand" until the October or December issue.

Conferences. The President reported to Standing Committee that registrations for the symposium on "Genetic Manipulation: Its Application and Potential", to be held at Hanmer Springs 19/22 August, had reached the break-even point. Dr Petersen said an attendance of 150 is expected.

An all day meeting arranged by the Oils and Fats Group in Auckland in March was attended by 70 people. Another meeting is planned for 12 August, with the theme "The Nutritive Value of NZ Animal Products — Their Vital Importance to the Economy".

The Chromatography Group arranged a workshop on Quantitative Chromatography, which was attended by 120, at the Auckland University School of Medicine, 20/21 May.

A joint meeting of the Inorganic/Crystallography Specialist Groups is expected to attract 50/60 participants at Massey University 25/27 May. **Professor W. R. Cullen** of the University of British Columbia (an Otago

graduate) is to be a guest speaker, sponsored in part by NZIC's Overseas Visitors' Fund, at this discussion of current synthetic and structural inorganic chemistry in New Zealand. "Recent Applications of Modern NMR Techniques to Synthetic Problems" is the title of his address to the meeting. He will also address Branch meetings.

At its August meeting Council plans to consider the views of organisers of the NZIC-NZBS Annual Conference and of Specialist Groups, which also arrange meetings for their members, on possible improvements in co-ordination of these occasions.

Annual General Meeting. The Annual General Meeting of the Institute will be held on the afternoon of Tuesday, 26th August at the University of Otago. Material for inclusion in the Agenda should be sent to the undersigned by 30th June to meet the deadline for the August issue of "Chemistry in New Zealand", in which the 1985/86 Annual Report and Balance Sheet will also be published.

Immediately prior to the AGM a meeting of Branch representatives with Council, the Registrar, Administrative Secretary and Editor will discuss ways in which better service can be provided for members.

IUPAC Recommendations. Comments are invited on synopses of IUPAC recommendations for "Nomenclature of Inorganic Chemistry, Revised edn. Chapter 1-6: Solids"; on "Nomenclature of Inorganic Chemistry (The Red Book): Revision of 2nd edn. (1970) Chapter 1-2: Grammar"; and "Definitions of Basic Terms relating to Individual Macromolecules, their Assemblies, and Dilute Polymer Solutions", before the end of December 1986.

Copies of these recommendations and the address to which comments should be sent are available from the General Secretary, P.O. Box 29-183, Christchurch.

Science Plan 1987. Following discussions with **Dr Bruce Miller**, Director, Science Plan, National Research Advisory Council, the NZIC Council at its meeting in August will consider suggestions for a NZIC contribution to the 1987 Science Plan, as the first step in an ongoing input from the chemistry profession to the planning of science in New Zealand. The "Science and Technology Reviews 1985" published recently contains items "Providing Technicians for Research and

Development" by AAVA and "The Wool Industry" by **R. G. Stewart**, FNZIC, of WRONZ.

Council Committees.

Standing Committee discussed a letter received from the Chemistry Syllabus Committee. The President undertook to ask its Chairman, **Mr Mark Cosgrove**, to follow up with the Department of Education, the Authority for Advanced Vocational Awards, and the Royal Society of New Zealand, several matters raised by the Committee, which were designed to improve the teaching of Chemistry in schools.

In response to a suggestion from **Dr G. S. Hartley** that NZIC assist the media in factual, accurate reporting of matters involving chemicals, and particularly hazards associated with chemicals, Council recommended that Branches offer assistance through their Chairmen. Reference as required can be made by telephone to the Chairmen of the Environment and Hazardous Chemicals Committees in Dunedin.

Dr S. J. de Mora has been nominated by the Auckland Branch as a corresponding member of the Environment Committee.

Honorary Librarian. The Manawatu Branch advises that **Dr Eric Ainscough** has accepted appointment as Honorary Librarian to liaise with the Serials Librarian at Massey University, where the NZIC library and exchange collection is housed.

Antarctic Research Proposals. Proposals for research projects for inclusion in the 1987/88 NZ Antarctic Research Programme should be sent before 31st July to the Secretary, RDRC, c/o DSIR Head Office, Private Bag, Wellington, from whom information is available on the directions of current research, facilities available, and how to prepare a proposal.

International Chemistry.

Professor A. Kuksis, a lipid chemist at the University of Toronto's Banting and Best Department of Medical Research, is to be sponsored by the Overseas Visitors' Fund for visits to Branches prior to the NZIC-NZBS Annual Conference in Dunedin, at which he is an NZIC official plenary speaker.

Professor James McCloskey of the University of Utah is expected to visit Branches after the Conference, at which he will contribute to a joint symposium with the ANZSMS on "Applications of Mass Spectrometry".

Council Meeting. Council plans to meet in Dunedin on 23/24

August prior to the NZIC-NZBS Annual Conference.

Membership:

The following applications and changes in status were approved:

Fellow:

Butchard, Joseph Anthony, MSc (Cantuar). Canterbury Frozen Meat Co Ltd, Christchurch. (Production Manager — By-products)

McCapra, Ronald, LRSC AASC FNZIP. Coates Bros. (NZ) Ltd. Penrose. (Managing Director). McSweeney, Garry, BSc. NZ Fertiliser Manuf. Res. Assn. Papatoetoe (Chemist).

Graduate to Member:

Adams, Adrienne, BSc (Hons) (Well) PhD (Melb). Dept of Medicine, University of Melbourne, Australia (Research Fellow). Davenport, Sally Jane, BSc (Hons) PhD (Well). University of Oxford, U.K. (Post-doctoral Fellow).

Leonard, Margaret Mary, MSc (Otago). (Overseas).

Loong, Paul Chin, BSc (Hons) (Well). Dept of Biochemistry, Victoria University of Wellington. (PhD Student).

White, Jonathan Michael, BSc (Hons) Phd (Cantuar). School of Chemistry, Bristol University U.K. (Post-doctoral Fellow).

Sutton, Paul Alan, BSc (Hons) (Otago). Chemistry Dept, University of Otago. (PhD Student).

Graduate:

Brown, Helen Margaret, BSc Building Research Assn. of NZ. (Research Scientist).

Curnow, Owen John, BSc (Tech). Chemistry Dept, University of Waikato, Hamilton. (MSc Student) — from Student member.

Rhodes, Jannine, BSc. Chemistry Dept, University of Waikato (MSc Student).

Service, Miranda, BSc (Hons) (Heriott Watt). Chemistry Dept, University of Waikato. (D. Phil Student).

Van Horik, Edward Theodor, BSc (Hons) (Otago). Southland Catchment Board, Invercargill. (Water Resources Officer).

Resignations:

N K McCallum, G J Schafer (Wgtn), R K McArthur (Ak.), L Stevenson (Otago).

Death:

J H Goodey (Auckland), O K Sewell (Man), G I McIntosh (Wgtn).

Life Membership:

P M Nottingham (Waikato), A D Wilson (ex-Otago, now Wgtn), C B Peacock (Wgtn).

J. Rogers
Honorary General Secretary.
June, 1986.

MEETINGS

Fats & Oils Group — One day meeting to discuss the theme of:

"The Nutritive Value of NZ Animal Products — Their Vital Importance to the Economy". Auckland University Conference Centre, 12 August, 1986. Contact: Diana Fenton, Abels Limited, Private Bag, Newmarket, Auckland, 1.

Australasian Corrosion Association — One day symposium: **"Industrial Corrosion Monitoring"**.

Auckland Airport Travelodge, 28 August, 1986. Contact: Dennis Prescott (09) 836-5450 or Les Boulton (09) 590-329.

Institute of Dangerous Goods Inspectors — **Inaugural Conference**, THC Wairakei, 7-9 July, 1986.

This conference is intended to establish an institute for Dangerous Goods Inspectors, and to discuss their training.

All enquiries: Mrs P. K. Anscombe, (09) 792-020 (ext 885), or to P.O. Box 6515, Wellesley St, Auckland, 1.

International Conference on Methods and Applications of Radioanalytical Chemistry, Hawaii, April 5-10, 1987.

This conference will focus on

recent developments in radio-analytical chemistry techniques. It is intended to promote the interchange of information among scientists from the United States and other countries, particularly those of the Pacific Basin. To that end, sponsoring organisations include the American Nuclear Society, ACS, Atomic Energy Society of Japan, Chinese Nuclear Society, and the RACI. The NZ representative on the International Programme Committee is W. J. McCabe, Institute of Nuclear Sciences, DSIR, Private Bag, Lower Hutt.

The Queensland Branch and Polymer Division, RACI, are holding a symposium on Controlled Release Technology at the University of Queensland 1/2 September 1986. Further information from Dr D. J. Hill, Department of Chemistry, University of Queensland, St Lucia, Queensland 4067.

The RACI Polymer Division calls for papers before September 1st for the 16th Australian Polymer Symposium to be held 8/12 February 1987 at Cowes, Phillip Island, Victoria. Enquiries to: Dr R. A. Shanks, Applied Chemistry, RMIT, P.O. Box 2476 VGPO, Melbourne, Victoria, 3001, Australia.

NZIC CHEMICAL EDUCATION COMMITTEE

Submission to Parliamentary Select Committee

The Chemical Education Committee of NZIC has been active in recent months — first with a questionnaire to all members, and more recently with a submission to the Parliamentary Select Committee on "Quality of Teaching". According to Graeme Valpy, convenor, the committee were given a "sympathetic" hearing, and particular aspects of their presentation were much appreciated.

Abstract of Submission

Professional qualities for teaching rely on there being very thorough Recruitment and Selection procedures to begin with, an emphasis on dealing with individuals, support systems of several kinds, a challenge to measure up to, and rewards or incentives which recognise those who are self-motivated, and dedicated to professional standards.

Assessment of teachers must be in terms of agreed criteria, which are accepted as determining future progress. Those who carry out the assessment must have regular contact with

the teacher, and will therefore have supporting evidence.

Teaching quality is related to teacher morale and community attitudes can shape both of these. Unless teacher quality is recognised and rewarded, those with superior qualifications or performance will be the first to leave the service, since they have other options. The provision of science technicians is vital, as is insistence on an appropriate allocation of the school finances to ensure that practical work, required by the curriculum, can be funded.

Pupil performance and examination results, while reflecting quality of teaching "outcome", do not necessarily measure the quality of teaching "delivery". To ensure high quality teaching, those chosen for training must have certain essential qualities.

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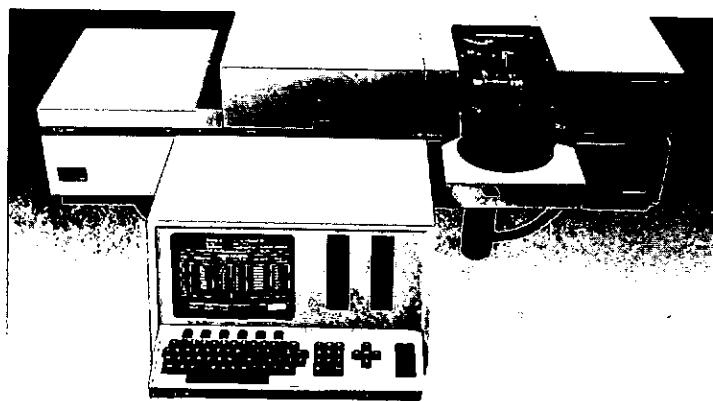
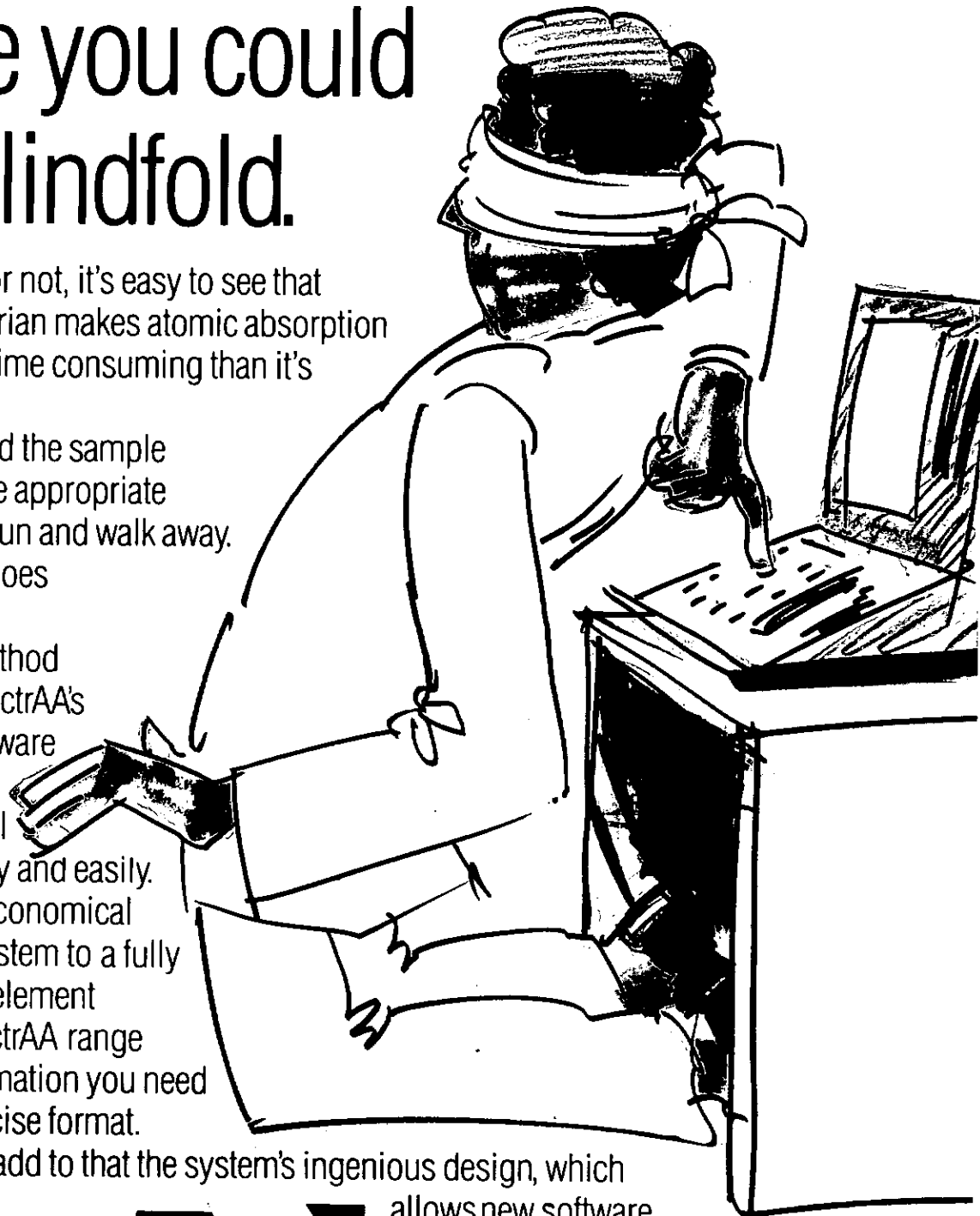
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WILTONS

WN50

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OBITUARIES

Walter (Wattie) G Whittlestone
1914-1985
M.Sc, D.Sc, FNZIAS, FNZIC,
FRSNZ



A recent notable death was that of Wattie Whittlestone, Fellow of the Institute. A man of diverse interests and a strong conviction in the social nature of science, his achievements were many.

He graduated with 1st class Honours in Chemistry from Otago University in 1936 and was winner of the Sir George Gray scholarship and Duffus Lubecki Scholarship. He was awarded the NZ Association of Scientists Research Medal, a D.Sc from the University of New Zealand, Fellowships of the NZ Institute of Agricultural Science, NZ Institute of Chemistry and the Royal Society of NZ. He was President of the NZ Society of Animal Production in 1969.

His scientific achievements concentrated on improving the dairy industry, both locally and internationally in diverse ways.

His first position with the NZ Co-operative Rennet Company improved rennet production and linked mastitis in dairy cattle with the milking machine.

In 1939 he moved to the Wallaceville Animal Research Station with the task of improving the durability of rubber in milking machines. During this period and later when he moved in 1945 to Ruakura, his interests developed in the physiology of milk production including milk ejection and hormonal control of lactation.

He was a significant contributor to the development of the Ruakura milking machine and in 1962 published the "Principles of Mechanical Milking" which was an important milestone in understanding milk harvesting.

In 1958 Wattie moved to Australia as Reader in Dairy Husbandry at the University of Sydney. He became a well-known contributor to the NSW dairy industry and was awarded the gold medal of the Australian Association of Dairy Technologists.

In 1964 he returned to Ruakura to continue working on cleaning systems, mastitis and lactation physiology until he retired in 1979. He achieved international recognition for his work and was a frequent visitor to the US and Europe.

His interests expanded into aid programmes, especially in Asia and was directed towards improving nutrition and applying appropriate technology to

village problems. His expertise in lactational physiology benefited La Leche League to which he became technical advisor. He wrote on aid and development issues, on nuclear disarmament, peace studies and human behaviour.

Wattie developed a personal style of working which did not always fit easily into the public service system. For several years at Ruakura, our offices were adjacent and his "systems" of achieving results were willingly shared with more junior scientists such as myself. For these "gems" I will always be grateful.

He is survived by his wife and three children.

(Douglas E. Wright)

Owen K. Sewell 1926-1986
M.Sc, Ph.D, FNZIC, MRSC



Owen Keith Sewell died in New Plymouth on March 15, 1986, after a long illness.

Born in Christchurch in 1926, he was educated at Christchurch Boys High School and Canterbury University College where he graduated M.Sc.

After working for two years as

a Research Chemist at the Ruakura Animal Research Centre he carried out research at the University of Birmingham under Dr W. Wilson and Professor M. Stacey F.R.S. on steroidal peroxides as potential cortisone precursors. He graduated Ph.D from Birmingham in 1954. Keith was employed for several years as a Research Chemist by I.C.I. in England and Australia.

He returned to New Zealand in 1958 to become Chief Chemist for Ivon Watkins-Dow, New Plymouth, a position he held until early retirement, due to ill health, in 1985. During his employment with I.W.D. he was largely responsible for the establishment of new laboratory facilities, recruitment of staff during a period of company expansion and the introduction and maintenance of strict quality standards for raw materials and products. He fostered the tertiary education of company technicians, served on several school committees and in recent years was a member of the New Plymouth High Schools Board.

He became a Fellow of the Institute in 1964, a Life Fellow in 1985 and acted as Taranaki representative for the Institute for some 15 years.

Keith Sewell was a very active member of the New Plymouth Baptist Church, being a deacon and Sunday School Secretary for 25 years.

The high esteem which the community held for Keith was shown by the very large number of friends and colleagues who attended his funeral service.

He is survived by his wife, Margaret, a son and two daughters.

CONSULTANTS

Dr Laurence Eyres has resigned from Abels Ltd after almost 12 years. Dr Eyres was Technical Services Manager for Abels Industries when he resigned.

Laurence has spent the majority of those years at Abels building up a wide knowledge of oil and fat technology and the application of fats in foods. He recently graduated MBA from Auckland University.

His new venture "Eyres Commercial Group" is a multi-facet organisation embracing Food Processing Consultants, R&D Formulations, Q.A. Procedures, Executive Seminars and organising outdoor trips with a difference.

To retain his profile in the oils and fats world Laurence will present a paper at the American Oil Chemists Conference in May, entitled "Marine Waxes — A New Zealand Resource".

As Chairman of the NZIC Oils and Fats Group he is busy

planning for an International Conference in February 1989 — in Auckland entitled "Fats and Oils in the 90's — A New Zealand Perspective".

He is a member of the Pork Industry Board Nutrition Advisory Council, A Fellow of the New Zealand Institute of Chemistry and a Member of the New Zealand Institute of Food Science and Technology.

Chemical Service Laboratories Limited, Wellington.

Chemical Service Laboratories Limited is involved in all aspects of analytical chemistry, a significant amount of which is on behalf of the Insurance Industry. One of the most interesting problems that this industry presents is the examination of fire samples for residual accelerants.

In a recent address to the N.Z. Chapter of the International Association of Arson Investiga-

tors, **Murray Friar** explained how the problem could be broken down into three sections:

1. Extraction of residual traces of accelerant from the sample.
2. Analysis of the extract.
3. Identification of the accelerant from the analytical result.

The traditional approach, adopted initially by the laboratory, involves Brackett, or steam, distillation, followed by packed column GC with flame ionisation detection.

This technique has a number of drawbacks, 1. Other volatile materials not associated with the accelerant may be extracted, 2. Insufficient detail may be provided by the analysis for easy identification, or significant detail can be missed by recording the chromatograms at only one or two instrument sensitivity settings, 3. Difficulty in recognising accelerant chromatograms where one or more solvents have been used. More commonly, the accelerant has been modified by the pas-

sage of the fire or weathering, with loss of the low boiling components.

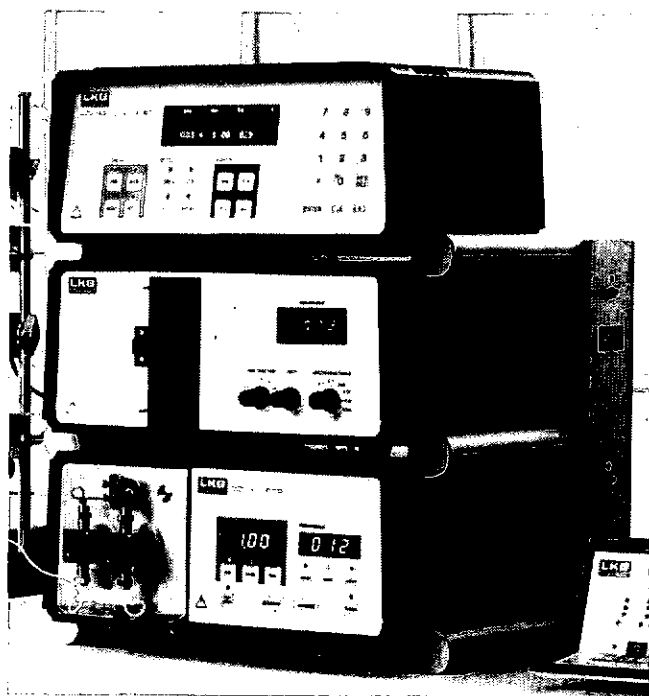
To overcome these problems the laboratory has investigated a number of alternative approaches: Headspace sampling provides a cleaner extract but has a much lower efficiency. This can be improved in part by concentrating the headspace vapours on an adsorbent, such as charcoal, Poropak, Tenax GC, or XAD resin.

Capillary GC offers considerable improvements in the analysis, although at times the increased amount of detail can be confusing. The use of a sophisticated integrator, such as the Shimadzu CR3A, can be of assistance here, in extracting "background" peaks from the sample chromatograms.

Finally, Murray has investigated the use of GC/MS, which offers enormous advantages in identification capability, but has the disadvantage of its much greater cost, and the limitations on equipment availability.



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For further information please circle no.10 on reader reply card.

BRANCH NEWS

Auckland

On 22 April the branch held a joint meeting with the Australasian Corrosion Association. The meeting was addressed by **Geoff Page** of DSIR, who spoke on corrosion problems in power stations. In a talk fully illustrated from his extensive collection of slides, Geoff covered the range from thermal, and hydroelectric, through geothermal, and finally to the (now topical) nuclear generation systems, in each case describing "problems that engineers did not anticipate".

The meeting was well attended, and it was particularly pleasing to see people from as far afield as Huntly and Whangarei.

Waikato

Professor Yehuda Mazur, Weismann Institute of Science, Israel, gave a joint NZIC/Waikato University sponsored lecture on "Oxidations of Unsaturated Compounds by Electron Transfer" on 3 April. The late afternoon lecture by this enthusiastic speaker was of interest to many members.

Dr Bob Murray, Reader in Organic Chemistry, University of Glasgow, who is currently on leave at the University of Otago, visited the branch on 17 April and gave a talk on the "Structural Elucidation and Synthesis of Natural Coumarins". He reviewed the early history of coumarins, some of which have two or three trivial names which are not related. Dr Murray discussed the chemistry of coumarins and described some of his own research in this field. He noted that practical uses for coumarins have not been investigated in any detail up to now. However, it is known that they can inhibit or encourage germination in seeds, depending on their concentrations, and can have antifungal properties.

Nat Pritchard, Station Chemist, together with three of his colleagues, hosted a highly informative and successful evening visit to the Huntly Power Station on 7 May, by approximately 45 branch members and associates. Various laboratory tests were described and a tour was made around the power generating facilities.

Manawatu

At a joint meeting of the Branch and the Department of Chemistry and Biochemistry of Massey University on 2 May, **Professor Bernard L. Shaw**, a well known inorganic chemist from the University of Leeds, and currently on leave at Auck-

land University, discussed his recent work on the chemistry of bimetallic compounds. Professor Shaw described the development of synthetic strategies for the preparation of bimetallic complexes of bis (diphenylphosphino) methane that contain two different transition metals in the ring structures. He showed how NMR could be used to follow the reactions and to characterise the products. Professor Shaw concluded his most interesting presentation with a description of methodology that was developed for the one-pot synthesis, without isolation of the intermediates, of some of the compounds.

Otago

Dr Alan F. Thomas, a senior research chemist with Firmenich S.A. in Switzerland and author of the book "Deuterium Labelling in Organic Chemistry", lectured to the Branch in March. He had also addressed the University Chemistry Department earlier in the day, both lectures being concerned with aspects of the chemistry and industrial exploitation of terpenes, their derivatives and other natural oils of significance in the manufacture of perfumes. He was a refreshingly relaxed but informative speaker, who however set what could be a precedent with unpredictable consequences

when, after unsuccessfully challenging the olfactory perceptiveness of his audience, presented the only lady present with the intended prize — a sample of Chanel No. 5.

The Branch was addressed twice in April, firstly by **Professor Yehuda Mazur** from the Weismann Institute in Israel, whose talk was entitled "Oxidation of Unsaturated Compounds by Electron Transfer", then in the evening of the same day, by **Assoc. Prof. M. R. Grimm** who returned to the University Chemistry Department recently from leave in the U.K. **Ross Grimm** lectured on "Nucleophilic Substitution Reactions of Imidazoles".

BOOK REVIEWS

Sorbent Extraction Technology Handbook

Edited by K. C. Van Horne with an editorial committee of D. D. Blevins, M. F. Burke, T. J. Goode, P. A. Harris, K. C. Van Horne and L. S. Yago.

Published by Analytichem International Inc, 24201 Framp-ton Ave, Harbor City, CA 90710 USA, 1985.

Analytical chemistry/biochemistry has undergone substantial changes in the last 15 years, due largely to the development of gas and liquid chromatographic equipment and methodology. Increased sophistication, particularly of liquid chromatography (high performance lc) has led to the development of new methods of sample preparation and/or purification prior to analysis, including the use of modified silica sorbents similar to those used as hplc column packings.

Prepacked as small columns, these have been available in New Zealand from a number of sources for several years. This 120-page spiral-bound book has been written and published by one manufacturer of these columns, but it is without reference to specific brand names (apart from the introduction and a small appendix). It is to be available free of charge to purchasers of introductory Application Development Kits of columns of this brand or, on its own, at a price of \$39.00.

The handbook explains in clear terms (there is not a single equilibrium equation in the entire volume), the chemical interactions between analytes (called isolates), their matrix, the sorbent and solvents. It does not neglect to mention that in many cases this may be multifactorial, eg many biochemicals interact with the bonded C-8 or C-18 moieties in

a nonpolar way, while simultaneously hydroxyl, cyano or amine substituents form ionic-type bonds with the silica substructure. Comprehension is facilitated by the multi-coloured graphics facing most pages.

The authors then explain how to select and evaluate a system for extracting different classes of analyte, concluding with some worked examples. It includes appendices with lists of functional group pKa's, suitable retention and elution solvents for each type of bonded phase, suitable treatment for sample matrices, with specific examples of difficult matrices (eg tomatoes, blood, soil), and a glossary of chromatographic terms for non-chromatographers using the technique for

sample preparation for other methods of analysis.

The text would be applicable to columns from other manufacturers, although the authors do not mention that quite large variations in specificity are sometimes found within the same sorbent type from different sources. The system for selection of a sorbent extraction method could also be usefully applied to the rational design of an hplc method if reference to the literature did not yield an analysis of a similar compound. It is a book to read before working up a method, or for reference during the process (it contains a section on trouble-shooting), and would find a place in many laboratories which measure compounds in complex matrices.

IUPAC NEWS

Launch of Affiliate Scheme

Last year the IUPAC invited 67 countries to operate its Affiliate Membership Scheme. These included IUPAC's member countries, observer countries and developing countries which have expressed interest in developing links with IUPAC. Thirty-five countries agreed to implement the scheme in 1986. Some of these countries are operating the scheme through the membership organizations of their Chemical Societies or Institutes of Chemistry whilst others are advertising the scheme in their national chemistry journals and inviting chemists to apply.

By mid-March this year almost 5000 chemists from 22 countries had enrolled as Affiliates. This number is expected to increase to over 6000 by July. By far the greatest contingent

comes from USA where over 4000 have enrolled. Almost 300 chemists enrolled as Affiliates in Japan and just over 270 in the UK. The figures for some other major industrialized countries have been disappointing. For example, only 35 chemists have enrolled in the Federal Republic of Germany. (New Zealand enrolment: 20 — Ed.)

The response from developing countries has been particularly encouraging. Full Affiliate Membership in 1986 for a nominal membership fee of US-\$1.00 has been offered to 500 young chemists in developing countries. This has been possible because of grants totalling US-\$15,000 from UNESCO and the ICSU. The invitations were sent to 35 developing countries during August last year. By the end of the year 13 had already agreed to operate this part of the scheme.

BASF - FOR QUALITY CHEMICALS AND CHEMICAL TECHNOLOGY

No reader of this journal would be unaware of the major role that German chemists have played in the development of modern industrial chemistry, and one of the key companies in this area has been BASF. From its origins in the 1860's, as a manufacturer of dyes and pigments, the company has developed to the stage where it now has manufacturing plants and distribution centres throughout the world, and offers a range of chemicals and chemical products that find their way into most aspects of everyday life.

BASF is probably best known for its invention in the 1930s of the first magnetic recording tape, and in the same era it also pioneered the development of plastics based on polystyrene. The invention of expandable polystyrene was another landmark, in the 1950s, and nowadays BASF supplies the raw materials for more than 300 different plastics formulations.

In the area of information technology BASF also continues to lead the way, with its range of audio and video tapes, and computer tapes, discs and hardware; while in print media its Nyloprint plates are now the mainstay of commercial letterpress printing —including in the production of this journal.

BASF are represented in this country by BASF New Zealand Limited. Established in 1981, the company recently moved to new headquarters in Mangere, Auckland, built at a cost of \$4.5 million. Branch offices are located in Wellington and Christchurch, and in addition the company maintains direct regional representation in the Bay of Plenty, Hawkes Bay, and Nelson. The New Zealand subsidiary employs 70 people and has an annual turnover in excess of \$55 million.

BASF places great emphasis on being represented by a team of specialists familiar with the technical properties of its products and their processes. The New Zealand expertise is backed up by the skills of visiting technicians, and supported by the product and application R & D resources available within the group.

The divisional structure of BASF New Zealand Limited is designed to accommodate the

product/industry basis of its products and customers. The local divisions and their product ranges are briefly summarised below.

Chemicals

This section traces the length and breadth of BASF's diverse range of chemical products, from industrial chemicals, through the intermediate compounds, down to such delicate expressions of the modern alchemist's art as vitamins, synthetic flavourings and fragrances.

Chemicals for industry

From its earliest days, BASF

tion.

Plasticisers for PVC, speciality products for oil exploration, recovery and refining, chemicals for water treatment and rubber production, adhesive raw materials and resins complete the range.

Intermediate chemicals

The BASF range of organic intermediates includes simple and multifunctional acids, amines, alcohols and heterocyclic compounds, together with complex downstream derivatives. All are taken for further chemical processing by a wide range of manufacturing industries. End uses include the



set out to produce not only end products such as synthetic dye stuffs, but also the principal raw materials required for their production. These included aniline and soda, the A and S of the name BASF.

There is now a comprehensive range of in-house feedstocks available to New Zealand, imported from highly integrated plants at Ludwigshafen in West Germany and other BASF manufacturing plants worldwide.

The industrial chemicals range also includes such substances as solvents, coalescents, binders and dispersing agents, to name but a few, used for surface coatings, acids, acrylates and other intermediates for custom resin production. Close technical cooperation with the automotive and aeronautical industries keeps the development of our hydraulic fluids, coolants and de-icers in line with innovations in engine design and construc-

tion and formulation of pharmaceuticals, plant protection compounds, detergents, electronic components, dye-stuffs and numerous types of synthetic resins, including polyesters and polyurethanes.

On the inorganic side, the company provides sulphur, ammonia and aluminium compounds, industrial gases, magnetic iron powders and many specialised catalysts for use in a similarly wide range of industries.

Fine chemicals

Materials from the fine chemicals range are used in the preparation of pharmaceuticals and cosmetics, including skin and hair care products. This range also includes synthetic fragrance and flavour raw materials, which also occur in natural products such as linalool and citral. These are employed in the production of many materials around the home and workplace, including soap, detergents and toiletries.

Vitamins

BASF has one of the most comprehensive ranges of synthetic vitamins available including A, B1, B2, B6, C and E.

Paper coatings

On the paper coatings side, BASF is renowned for its Acronal paper coating binders. We have received worldwide acknowledgement as leaders in the field of both pigmented paper coating and protective PVDC — Kurofan coatings.

Chemical resins

Chemical resins are available through BASF range from the classical Luwipal and Laropal, melamine and urea formaldehyde resins to the latest development of Luhydran resins for the production of electro deposition paints. Of particular significance is the unique range of Laroflex resins for high build and anticorrosive finishes.

BASF also offers a range of styrene/acrylate aqueous dispersions suitable for producing emulsion paints. These types of dispersions were specifically developed by BASF to provide improved wash fastness and reduce yellowing found in earlier polymer dispersions.

Adhesives, building auxiliaries, non woven fabrics

BASF first introduced polymer dispersions in the 1930s and has since become one of the largest producers of these compounds in the world. Today, a wide range of polymer dispersions is available as adhesive raw materials. These are backed up by considerable expertise in the formulation of adhesives, particularly pressure sensitive adhesives.

Plastics

The highly sophisticated and diversified range of plastic materials BASF offers embraces general purpose products, specialities, and products with special additives. They are modified by reinforcement and fillers, special colourants, fire retardants, slip agents, elastomers, etc, in order to attain the required properties.

Producing plastic raw materials with more than 300 different grades, many of them unique, BASF serves New Zealand industries with plastics raw materials and technical know-how.



BASF leather technician, Kurt Becker (left) examines leather dyed with BASF dyestuffs at E. Astley and Sons Ltd's tannery, with the tannery's technical development manager, Gary Hine. BASF chemicals and dyestuffs are used in all stages of converting raw hides to finished leather.

Some of the product ranges currently produced by BASF include:

- Polyurethanes — hard, soft, semi-rigid and elastic foams, coating materials and thermoplastic granules
- Nylon 66 and Nylon 6
- Polyacetal
- Polybutylene Tetraphthalate
- Polystyrene, Styrene copolymers, and expandable polystyrene
- Unsaturated polyester resins
- Polyethylene — high, medium, and low densities
- Polypropylene
- PVC
- Palusol.

Agricultural chemicals

BASF has an excellent reputation for providing plant protection products and fertilisers in New Zealand, and is in fact the largest single supplier of horticultural chemicals.

BASF has long pioneered the quest for higher yields and lower losses for farmers and horticulturists through producing chemicals to combat pests and diseases. Trial work is continually underway to introduce new and better products, and to 'fine tune' those already on the market to keep pace with new technology and techniques.

Trade names such as Pallinal, Polyram, Ronilan, Basamid Granular, Citowett and Alicep, are among the well-known products BASF produces to aid horticulturalists, while farmers carrying out larger-scale cropping are familiar with such names as Nitrophoska, Bavistin and Corbel.

BASF is synonymous with improving cropping in New Zealand — be it arable or horticultural — and will continue to operate in this area to benefit New Zealand producers in the future. Chemicals and fertilisers to assist cereal production

is an area into which BASF is expanding, and new products are currently being tested in this field.

Paper and surface coatings

BASF is involved in virtually every area of New Zealand industry where colour is used, and through its Paper and Surface Coatings Division, it covers paint pigments and colourants for plastics through to pigments and dyes for printing inks and carbonless copying papers.

In addition, BASF supplies highly light-fast and weather-resistant pigments for original automotive finishes and refinishes, as well as colourants used for identifying fertiliser and agricultural sprays.

This versatile section of the company also markets a comprehensive range of specialised products for paper making, the detergent and cleansing industries, and animal health products, as well as supplying ceramic colours for bench and wall tiles, and crockery production.

BASF New Zealand also acts on behalf of the subsidiaries Dr Beck (suppliers of wire enamel coatings) and Dr Wolman (suppliers of chemicals for preserving timber).

BASF's early involvement with colour can be traced back to the early synthetic dyes it pioneered in the 19th century. Today, the company still carries out comprehensive research and development in West Germany, the U.S.A. and Australia to keep the properties of its colourants abreast of today's exacting requirements. This work is supplemented in New Zealand by an expert team of sales technicians who are fully conversant with the needs of the various industries they serve.

BASF's close connection with colour-using industries, both as an innovator and supplier, has inevitably led to a growing involvement with the non-coloured auxiliaries, and chemical products used by those industries. These range from waxes for floor and car polishes to water treatment chemicals. As a result, BASF has become one of the few chemical companies able to offer a full range of products in these complex fields.

As can be seen, the division offers a full range of pigments, pigment preparations, dyestuffs and a range of chemical products servicing the following industries/applications:

- Pulp and Paper
- Printing Inks
- Paints
- Ceramics
- Plastics
- Food
- Special Dyes
- Special Chemicals

Textiles and leather

BASF is one of the few companies involved with products for the whole range of textile processes, offering a complete service to the textile industry. Products include textile dyestuffs, and a range of finishing resins providing the easy care properties of many of the modern textiles used in our homes.

As with textiles, BASF's involvement in the leather industry covers all stages of converting raw hides to finished leather in the tannery, from tanning agents through to specialist leather dyestuffs for the finished product.

Magnetic media

Information technology can trace its origins back 50 years to when BASF produced the first magnetic recording tape in Germany. It is for this product that the group has become best known.

Since those early years, BASF has continued to improve the overall performance of its magnetic tape and has gained a reputation for its high standards. The company supplies a comprehensive range of audio and video cassette tapes, with modern-day emphasis moving to BASF Chromdioxid tape, which gives the most advanced recording quality — essential today as the public becomes more critical about the quality of tapes that they use. Video users in particular are beginning to recognise that chrome is the ultimate in recorder quality and this is having a strong influence on their buying patterns. Computer tape and floppy disk data storage modules are also marketed.

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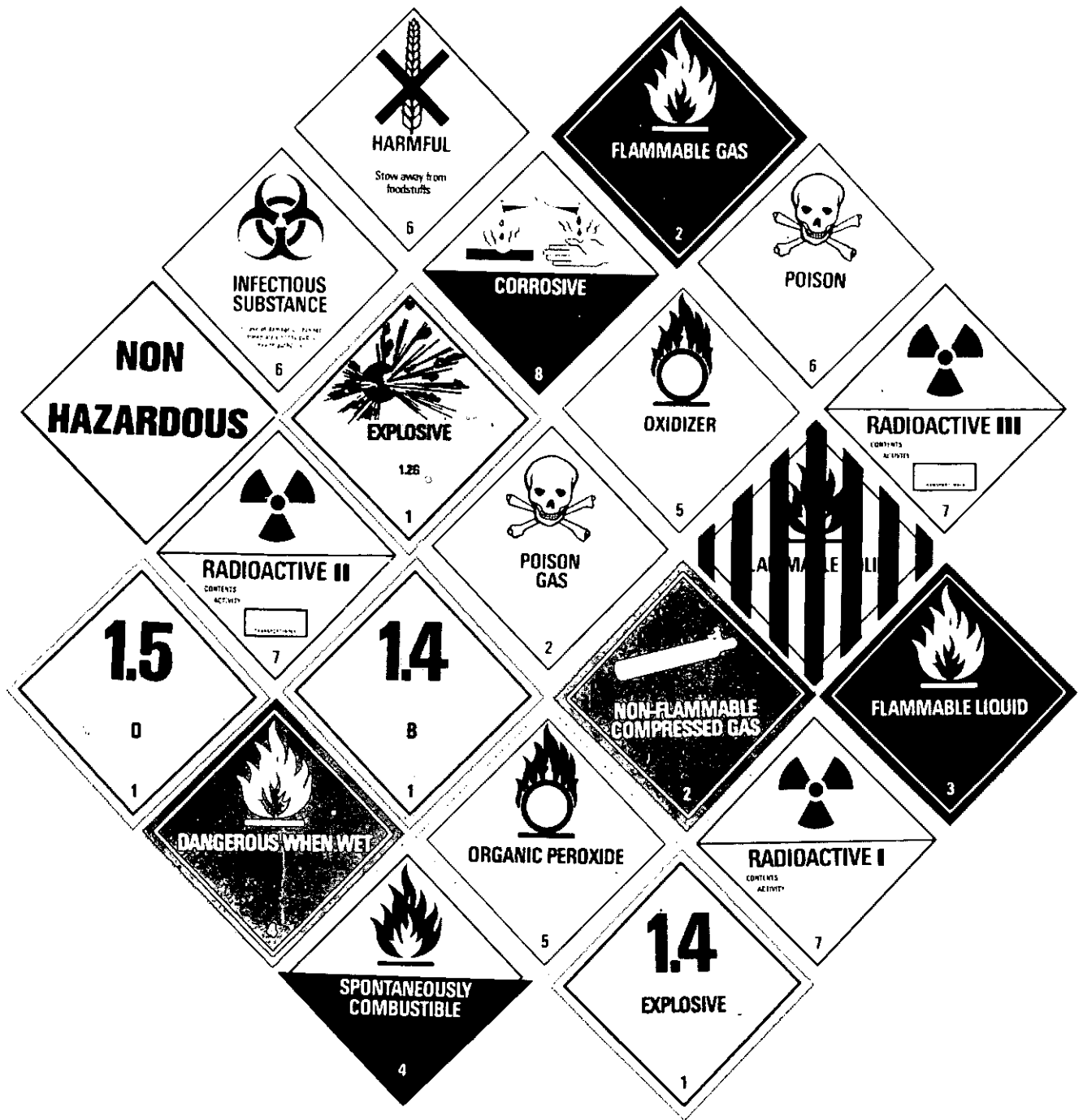
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CAREERS DIRECTORY

This directory has been compiled on the basis of a letter sent to known employers of chemists, and also included in a previous issue of *Chemistry in New Zealand*. Quite clearly the coverage is far from complete, but hopefully it will provide an indication of the types of companies to contact, and the range of jobs available.

The directory lists **potential** employers of people graduating with NZCS, BSc, or a higher degree, in chemistry. In some instances a related qualification

(e.g. BTech, BE) would also be acceptable, and many employers of NZCS graduates would also employ NZCS trainees. The qualification divisions given below should not be seen as entirely rigid.

As noted above, the coverage of the directory is far from complete. Government Departments are poorly represented — possibly because of the slowness of the bureaucratic machinery in responding to our letter. Departments that employ chem-

ists would include DSIR, MAF, MOWD, Energy, Health, Trade & Industry, and of course Education. Contact addresses for any of these can be found in the front of your local phone book. Territorial local authorities should also not be forgotten. Water quality, sewage treatment, health, and dangerous goods-inspectors are just some of the possible work areas. And speaking of the telephone book, don't forget that for listings of Chemist-Analytical & Consulting, Chemists — Indus-

trial & Technical, and Chemists Manufacturing — you'll find it all, in the Yellow Pages!

Notice to Employers. It is planned to make this Directory an annual event. If you are not listed here, and would like to be included in future issues (at no charge), contact the Publisher, at P.O. Box 9072, Newmarket, Auckland. Companies and organisations already listed will be contacted early next year, to update their entry.

NZCS, BSc, or similar

Analytical Services Ltd, Private Bag, Cambridge. Commercial Analytical Testing.

Auckland City Council, P/B Wellesley Street, Auckland, Trainee Health Inspectors & Dangerous Goods Inspectors.

BP Oil New Zealand Limited, P.O. Box 892 Wellington, Quality Assurance, Analytical.

Caltex Oil (N.Z.) Limited, P.O. Box 2297, Wellington, Primarily Q/A.

Carboline Coatings Ltd, P.O. Box 76-104 Manukau City, Auckland, Q/A, Product Development.

Colgate-Palmolive Ltd, P.O. Box 38-077 Petone, Q/A, Product Development.

Coopers Animal Health Ltd, Private Bag, Upper Hutt.

Danco (NZ) Ltd, P.O. Box 21475 Henderson, Auckland, Q/A and Product Development (Manufacturers of adhesive tapes).

Food-tech Ingredients Ltd, Private Bag, Manukau City, Auckland, Q/A, Product Development.

W. Grayson & Assoc. Ltd, P.O. Box 12-545 Auckland, ph. 590-329, Analytical Laboratory & Development Laboratory.

Ireland Group, P.O. Box 4183, Chch, atten: Mr Cowles, Q/A, Product Development, R & D.

N.Z. Dairy Industry (representing: Manufacturing Dairy Co-operatives, NZ Dairy Board), c/- NZ Dairy Industry Training Council, P.O. Box 417, Wellington, Q/A, Q/C, Production

areas, laboratory duties.

Rohm and Haas (N.Z.) Ltd, P.O. Box 22-220 Otahuhu, Q/A, product development, R & D.

Shell Oil New Zealand Ltd, P.O. Box 2091 Wellington, atten: Personnel Services Manager, Q/A, Product Development.

Stevens Chem Industries (NZ) Ltd, P.O. Box 51-095 Pakuranga, Q/A, Q/C.

Wellcome NZ Ltd, P.O. Box 22-258 Otahuhu, Production Q/A sales.

BSc, and/or higher degrees

Dulux New Zealand Limited, 526 Ellerslie-Panmure Highway, Auckland or P.O. Box 1009 Auckland, ph. 577-159, Q/A, R & D, Technical Service.

A. C. Hatrick (NZ) Ltd, 22 York St, Parnell — P.O. Box 2359 Auckland, Q/A, Product Development, production.

Kiwi Co-op Dairies Ltd, Mr G. D. Bennett, Laboratory Manager, P.O. Box 444 Hawera (87-087), Laboratory (largest Dairy Lab in NZ with 40 staff).

Personnel Professionals Consulting Group, 76 Symond St, 7th Floor Securities House, Auckland, ph. 796-910, Personnel Consultants.

Taubmans International NZ Ltd, P.O. Box 14-064 Kilbirnie, Wellington, various.

The New Zealand Patent Office, Commissioner of Patents, Private Bag, Lower Hutt, Patent Examination.

All Qualifications

Applied Biochemistry Division, DSIR, Private Bag, Palmerston North, Biochemical Research.

Aspak Industries Ltd, The Chief Chemist, P.O. Box 51213 Pakuranga, Analysis & Testing of Fats & Oils, Product Development, Process Development, Quality Assurance.

Allan Aspell & Associates Ltd, Constellation Dr, Mairangi Bay, Auckland, Public Analysts, Environmental & Industrial Consultants.

Bay Milk Products, Private Bag, Edgecumbe, ph. (076) 49-011, Q/A, Product Development, R & D, Engineering.

Building Research Association of NZ, Private Bag, Porirua, Research & Testing.

Cawthron Institute, P.O. Box 175 Nelson, Analytical Chemistry, Research & Development, Product Development, Research.

Chemistry Division, DSIR, Auckland, P.O. Box 2224 Auckland. Forensic Science including Toxicology, Illicit Drugs, Physical evidence, serology. Food Chemistry including regulatory analyses, product and processing development. Chemical Information.

Chemistry Division DSIR, P.O. Box 29-181 Christchurch. Analytical chemistry of food, water, drugs, Toxicology, police science.

Coal Research Association of New Zealand (Inc), P.O. Box 3041 Wellington. Q/A, and Research.

Industrial Processing Division, DSIR, Private Bag, Petone, Wel-

lington. Research and consulting in process development and evaluation, materials science, metallurgy and corrosion technology, biotechnology, biochemistry, applied microbiology and chemical engineering. New Zealand Dairy Research Institute, Private Bag, Palmerston North. Product Development and Research into existing products, their manufacture, analyses, etc. in the dairy manufacturing industry.

N.Z. Forest Products Ltd, Private Bag, Auckland. R & D, Industrial applied chemistry. New Zealand Pharmaceuticals Ltd, P.O. Box 1869 Palmerston North. Q/A, Product Development, R & D, (Fine chemical, biochemical extraction and purification).

New Zealand Steel, Glenbrook, Sth Auckland, Private Bag, Auckland 1. Product & Process development.

Pulp and Paper Research Organisation of New Zealand, Forest Research Institute, Private Bag, Rotorua. Organic Chemistry Research, Pulp and Paper Technology.

Sci-Med (NZ) Ltd, P.O. Box 68232, Newton, Auckland. Analytical instrumentation sales and support.

Unilever New Zealand Limited, Private Bag, Petone, atten: Training & Recruitment Manager, Q/A or Product Development, leading to Technical Management, or Production Management.

Wool Research Organisation of N.Z. (Inc.), Private Bag, Christchurch. R & D in Wool Processing Industry (i.e. Textile Chemistry).

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(New-Nylon Membranes, Disposable Filtration Units – Vacuflo)

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Phone (09) 578-068
Telex 2338.

For further information please
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card.

PRODUCT NEWS

NYTRAN — MEMBRANES



Illustrated above are the Nytran-Membranes from the story on page 63 of the April issue: Vol. 50 No. 2.

For further information please circle no.14 on reader reply card.

VACUFLO S&S DISPOSABLE VACUUM FILTRATION UNIT

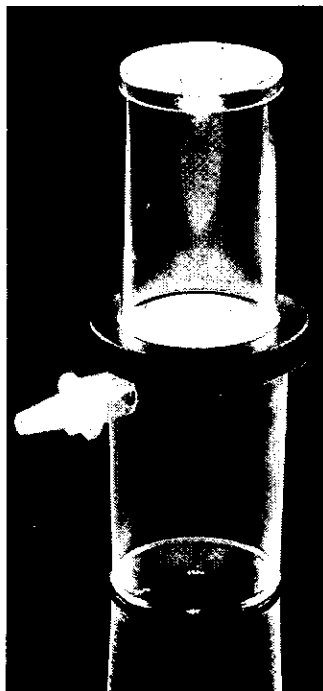
Vacuflo is a versatile vacuum filtration unit, ready-to-use, pre-

sterilized and individually packed. The removable membrane filter is triton-free.

Vacuflo is suitable for the clarification and sterile filtration of culture media, protein and buffer solutions as well as other aqueous solutions up to 125 ml. The time required for sterile filtration is reduced to a minimum: no time consuming processes such as inserting the membrane filter in the filter holder, autoclaving with the collecting vessel, wrapping in sterilization paper, etc. is necessary. Simply remove the Vacuflo unit from its container prior to use, attach it to the vacuum line and the filtration can begin. Disposable vacuum filtration units are especially favoured in laboratories where sterile filtration is not carried out on regular basis or when sample volumes are less than 125 ml.

Vacuflo is available with membrane filters of two different pore sizes. The colour coding of the screw-cap prevents confusion (blue: 0.2 μ m pore size, white: 0.45 μ m pore size). The membrane filters are made of mixed cellulose esters, they contain no Triton. Each box of 10 Vacuflo units contains 10 glass fibre pre-filters for the fil-

tration of turbid solutions, separately packed for individual application.



For further information please circle no.15 on reader reply card.

Scientific Glass Engineering (S.G.E.), of Melbourne, announce two new products for the Gas Chromatographer.

Pyrolysis has been used to identify or fingerprint material by GC analysis of volatile compounds formed by thermal decomposition of the sample. Now S.G.E. offers a system capable of pyrolysing samples in an isothermal furnace, which can be interfaced to most gas chromatographs, using a range of specially designed adaptors. The **S.G.E. PYROJECTOR** provides a system ensuring constant flow through the pyrolysis chamber, giving reproducible conditions from sample to sample, regardless of GC operating conditions.

The new **S.G.E. UNIVAP** high precision gas sampling system is based on the pressure switching system described by Deans (*J. Chromatography*, **289** (1984) 43-51) and can be fitted to any GC to offer high precision, variable sample volumes, and linearity.

Full details, including new, full-colour brochures, are available from **ALLTECH N.Z.**, distributors of S.G.E. products.

For further information please circle no.16 on reader reply card.

NEW PULPING PILOT PLANT AT PAPRO

The export of high quality newsprint, magazine papers, absorbent and tissue grades and food packaging boards offers an exciting expansion opportunity for the New Zealand paper industry. Such an expansion is possible as the country's wood supply increases in the 1990's.

A major thrust of the PAPRO research programme will be to ensure that the necessary technology for the manufacture of these grades is available. As all of the above grades may contain large proportions of mechanical pulp, a massive \$2.5 million investment in a new mechanical pulping pilot plant is being made. The availability of this equipment will initiate a new generation in research on the refining of radiata pine and the production of high performance products from it.

Scheduled for start-up in mid-1986, the new plant will accurately simulate all forms of the thermomechanical (TMP) and the chemi-thermomechanical (CTMP) process. It will also allow inter-stage and post-refining chemical treatments of pulp and semi-chemical and chemical vapour phase cooking.

The flexible research plant is

based on a Jylha SD 52/36 refiner of advanced design. This refiner will be run in either single stage, continuous or multi-stage, batch operation. Alternatively, continuous multi-stage operation will be achieved using PAPRO's existing Bauer 410 atmospheric refiner in the second stage.

Major process items and the main refiner are being delivered by Jylhavaara, Finland. A Bailey Network 90 distributed control system will allow flexible plant operation and accurate recording of experimental data from a central computer console.

Plant engineer for the installation is Charles Akers, Tasman Pulp and Paper Co. Ltd., who has been seconded to the project. He is being assisted by Stuart Corson and John Richardson, scientists within PAPRO's Mechanical Pulping Group. The main machinery will be installed by the F.R.I. Services Section. Beca Simons are the Engineering Consultants.

The plant is being installed on the Forest Research Institute campus, adjacent to the PAPRO research laboratories.

For further information please circle no.17 on reader reply card.

papro New Zealand EMPLOYMENT OPPORTUNITIES

The Pulp and Paper Research Organisation of New Zealand is a newly formed organisation funded by both industry and government. The main research effort is in mechanical and chemical pulping, bleaching, fibre properties, papersheet structure and performance.

We have 3 Technician vacancies at NZCS/B.Sc level, 3 Scholarships available for higher degree students (Masters and Doctoral studies), 4 vacancies for student summer vacation work and we can take suitably qualified post-doctoral research fellows for a 1-year period.

If you are interested please supply your academic and career details to:

Dr Geoff Duffy Director
papro New Zealand
FRI Rotorua

For further information please circle no. 18 on reader reply card.



**SHIMADZU
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UV-160

FEATURES

UNITIZED COMPACT DESIGN

The monochromator, the operation unit, the CRT, and the graphic printer are integrated into a compact body.

HIGH SPEED SCANNING

It takes only 25 seconds to scan the entire spectral range of 1100 to 200nm with the spectrum displayed on the CRT, including lamp change. Wavelength setting is made at the high rate of 60nm/sec.

A LARGE VARIETY OF QUANTITATIVE FUNCTIONS

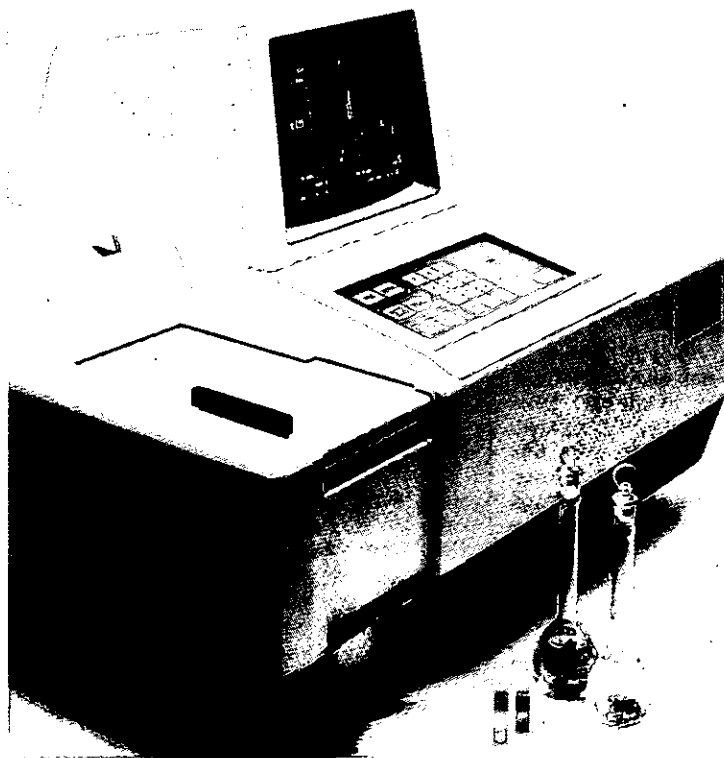
The standard programs include: (1) quantitation by the least square calibration method using single wavelength, two/three wavelengths, or derivative values, (2) kinetic assay, and (3) multi-component analysis.

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The UV-160 has only 24 keys, which are all single-function type. High-level data processing can be easily carried out through dialog with the CRT.

HIGHEST SPECTRUM DATA PROCESSING CAPABILITY IN THIS CLASS

Expansion and compression of spectra, peak picking, differentiation of spectra, smoothing of spectra, data memory, arithmetic calculation between spectra, etc. are all available.



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card.

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& MEDICAL



A DIVISION OF AWA NEW ZEALAND LIMITED

PRODUCT NEWS

News from ALLTECH

A new 80-page brochure, 'A Guide to the Use of Non-Pakd® GC Columns', is available on request, from **ALLTECH N.Z.** This technical literature background and outlines the development and advantages of the use of 0.53 mm "wide-bore" capillary columns, and includes an Applications and Retention Library, as well as the usual wide range of sample chromatograms, particularly for Pesticides, Low Boiling Compounds and Drug separations.

With inexpensive split injection installation now available, Non-Pakd® GC Columns have gained wide acceptance already — this new book gives an unparalleled range of applications available to the GC user.

For full details, contact **ALLTECH N.Z.**

Leading U.K. suppliers of Electron and Light Microscope consumables, **AGAR AIDS LTD**, of Stansted, Essex, have published their 1986 Catalogue #5. This 220 page, fully illustrated and indexed publication is claimed to have the most extensive range of products available of EM and, now, LM products. Copies of the **AGAR** Catalogue are available from their sole New Zealand distributor, **ALLTECH**.

New Catalogue from WESCAN INSTRUMENTS

Wescan Instruments Inc was founded in 1969 by several individuals experienced in the design, manufacture, and mar-

keting of specialized analytical instruments. Their first products included an automatic viscosity timer, osmometers for molecular weight determination, and a direct reading conductivity meter with small volume flow cell for monitoring the effluent from liquid chromatography columns. Updated versions of those products are still available today.

Because of their long experience in conductivity measurement, **WESCAN** was able to introduce the first commercial single column ion chromatograph in 1979. The columns available at that time limited the instrument to the analysis of anions. Succeeding generations of instrumentation have expanded the range, which now offers complete systems for analysis of inorganic anions and cations, including transition metals, organic acids, surfactants, and amino acids. More recently, **WESCAN** have introduced a continuous flow analyzer for ammonium, and by sample treatment, for other nitrogen containing ions.

A completely new, 56-page **WESCAN** catalogue, showing their whole product range, as well as over 100 sample chromatographs, has been published by Chromad, of Deerfield, Illinois, and is available, on request, from **ALLTECH NEW ZEALAND**, P.O. Box 33-527, Auckland 9 (Phone **TOLL-FREE (09) 444-3230**).

For further information please circle no. 20 on reader reply card.

NEW PRODUCTS FROM SKC

Constant high-flow pump, for air sampling

Northrop Instruments & Systems Limited has expanded its line of high-flow sample pumps with the introduction of the AIRCHECK VIII from SKC Inc, USA. This is a high performance, constant flow, pump at moderate cost. It has a flow range of 500-3500 ml/min and handles all high-flow applications, including dust and particulates by filter sampling, chemicals and aerosols by filter sampling, and impinger sampling with liquid media.

AIRCHECK VIII includes battery pack, see-through pump filter housing, built-in flowmeter calibrator and heavy duty belt clip. It is available as pump only or as a single or five pump air sample kit.

The AIRCHECK series is intrinsically safe and UL listed for the following locations: Class I, Groups A, B, C and D;

Class II and Class III, Groups E, F and G.

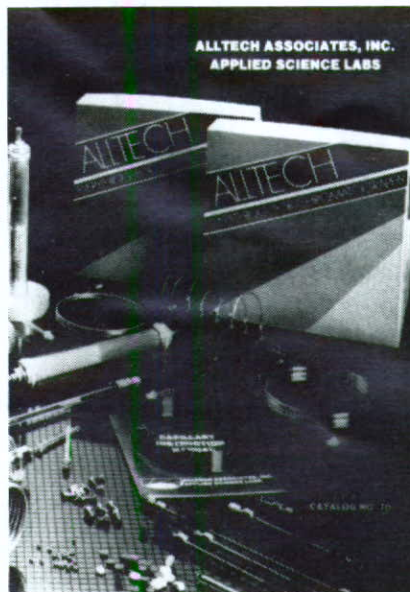
Low ash filter for silica analysis

A low ash filter for interference-free silica determination is now available from SKC Inc. The GLA-5000 is a 37 mm membrane of polyvinyl chloride designed for cost-effective measurement of silica and dust using air monitoring filter cassettes. Its low moisture pickup and light tare weight make it well suited for gravimetric analysis of particles collected in atmospheric air sampling.

The filter is available in packages of 50, which include 50 support pads. Its 5 micron pore size meets NIOSH, OSHA and MSHA requirements for silica and dust.

For further information please circle no. 21 on reader reply card.

CHROMATOGRAPHY SPECIALISTS SPECIFY ALLTECH



You're a specialist, and so are we. It takes a specialist to keep up with the changes and advancements in the field, and it takes a specialist to pioneer those changes. Alltech does both. For 30 years, Alltech Associates, Inc./Applied Science Labs has been the leader in innovative chromatography products. Our Gas Chrom Q is an industry standard; we pioneered the use of Vespel ferrules; we developed the Microbore HPLC column; and our new NON-PAKD GC columns are fast replacing Packed GC columns in labs around the world; and on and on and on; product after product, innovation after innovation.

It takes a specialist to understand what another specialist needs, both now, and in the future. At Alltech, we understand.

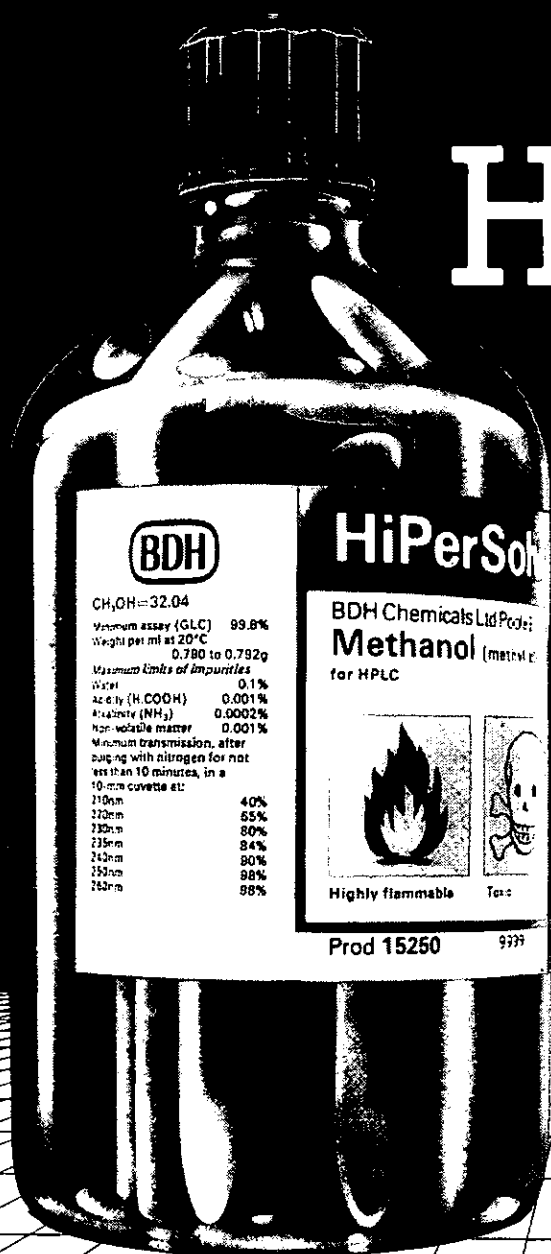
For your free copy of our catalog, please contact us at:

ALLTECH ASSOCIATES Applied Science Labs

P.O. Box 33-527, Takapuna, Auckland 9
Phone Toll-free (09) 444-3230

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HiPerSolv





High performance solvents for HPLC.

This range of solvents with improved and up-to-date specifications is named HiPerSolv for HPLC and replaces the grade 'for liquid chromatography'.

In addition to solvents the range includes Ion-Pair reagents.

Descriptive brochures on HiPerSolv detailing its application and benefits are available from:—

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PRODUCT NEWS

New chromatography data station features IBM PC and fast, easy operation

A new chromatography data station that allows fast, easy chromatographic data acquisition and processing is being introduced by Waters Chromatography Division of Millipore Corporation.

The Waters 820 Chromatography Data Station is comprised of an IBM PC XT or AT and Waters WIRC™ software to provide fast, easy chromatographic data management. The 820 uses a mouse and pull-down menus to allow chromatographers to select operations quickly, ask for help, expand portions of a chromatogram, or perform other processing functions in seconds. High resolution graphics allow clear visualization of even the slightest chromatographic details. Various cursors guide operators easily through various processing choices.

The Waters 820 can simultaneously collect data from up to four HPLC systems, each with four detectors. The station is compatible with most other commercially available compu-

ters, including mainframe computers and the Waters 840 Data and Chromatography Control Station. In addition to Waters WIRC software, the 820 comes with PC Paintbrush and BASIC software, and can be linked to other commercially available software packages. Sample reports can be customized or results can be sent to spreadsheet programs such as Lotus 1-2-3, RS/1 or other IBM compatible software for further calculation and summarization.

For further information please circle no. 24 on reader reply card.

Sep paks

Waters Sep Paks, the industry standard in solid phase extraction, have found wide application in sample preparation. The disposable cartridges are used prior to many other analytical techniques. Examples include HPLC, GC, AA, UV-VIS, and Mass Spectrometry. Sep Paks are now available in an expanded range of materials and include C18, CN, Phenyl, Silica, Alumina, Ion Exchange, Florisil, Diol.

The cartridges can be used

manually or in a semi-automated mode, using a SEP PAK Cartridge Rack to speed sample throughput.

For further information please circle no. 25 on reader reply card.

Waters 600 Gradient Module

Waters new 600 Gradient Module combines advanced control software with Waters proven HPLC pump technology to give you reliable, superior performance for all LC applications. The Waters 600 uses a microprocessor based, programmable single pump capable of degassing, blending and delivering up to four solvents automatically. The unit offers; Fast, easy set-up of even complex gradients, automatic system start-up and shut down, full programmability and storage for gradient or isocratic LC, column temperature control, and system accessories, flow rates from 0.01 to 45 ml/min, automated equilibration and column flushing.

For further information please circle no. 26 on reader reply card.

Ion exchange media — Accell QMA and CM sep-paks

Waters new Accell QMA anion exchange and CM cation exchange media are polymer-coated, silica-based media of 37-55 micron particles with a 500 Angstrom pore size. The rigid silica base is encapsulated with a hydrophilic bonding layer and a highly stable cross-linked functional layer. ACCCELL media provide excellent recovery and high resolution of aqueous biomolecules. The rigid and noncompressible structure of ACCCELL media makes them well suited for the purification and isolation of proteins, enzymes, and immunoglobulins, particularly when preparative or process scale-up is intended.

Available in bulk packing, in pre-packed 2.5 x 15 cm cartridges, or in SEP-PAKS.

For further information please circle no. 27 on reader reply card.

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PRODUCT NEWS

COD Analyzer System titrates batches of COD samples right in the digestion tubes

For simplified determination of Chemical Oxygen Demand, Radiometer introduces the DTS895 COD Analyzer System, which unattended titrates up to 20 samples right in the narrow digestion tubes. Transfer of sample from tube to titration beaker is thus eliminated, saving time and increasing analysis reliability.

The COD Analyzer System is modular, and comprises a titrator, an automatic burette, a printer and a sample changer. The sample changer has a removable turntable, making sample collection easy. The measuring electrode is a combined platinum/mercurous sulphate electrode.

After digestion of samples for COD analysis has been completed, the digestion tubes are simply placed in the sample changer and the START button is pressed. Taking only a few minutes each, the samples are now titrated and the electrode and stirrer are rinsed between samples.

The system calculates and prints out the analysis results in mg/l COD. Other units are user-programmable.

Common digestion tubes, such as Strohlein, Behr, Merck, Tecator and Gerhardt, can be used with the system.

For further information please circle no. 29 on reader reply card.

Fast Ion Analysis in Water with FIAstar

Manual methods of analysis cannot meet today's requirements for speed, accuracy and safety in the routine determination of ions like NO_3^- , Cl^- , NH_4^+ , PO_4^{3-} , Al^{3+} and Fe^{3+} in water laboratories. Therefore there is an increasing demand for automated and flexible water analysers, which are easy to start up, simple to use and provide fast results.

The FIAstar analyser from Tecator in Sweden operates according to the Flow Injection Analysis principle (Figures 1 and 2).

Versatility and high speed

The analyser is now used successfully in many water analysis laboratories throughout the world. Its speed (30 seconds per sample) and simplicity show significant savings in time compared to manual methods. In addition the capacity (80-160 samples per hour) and the versatility show appreciable improvements over existing water analysers, according to the Swedish company. Standard methods are applied, and detailed application information is available from Tecator.

Manual or fully automatic operation

The microprocessors incorporated into the equipment produce results in concentration terms together with a print-out. Calibration and recalibration at chosen intervals and curve correction are integral to the system.

The analyser can either be operated by manual injection, or fully automated with an auto sampler.

Where relatively few samples need to be analysed, the equipment can be used as a general purpose analyser for making several different determinations, due to the easy change-over between analysis (completed within 4 to 6 minutes) and the short response time to obtain results.

When a larger number of samples are to be analysed, typically more than 100, the FIAstar analyser is operated in a fully automatic way. In this case a batch of 100 samples for one analysis will be completed within one hour.

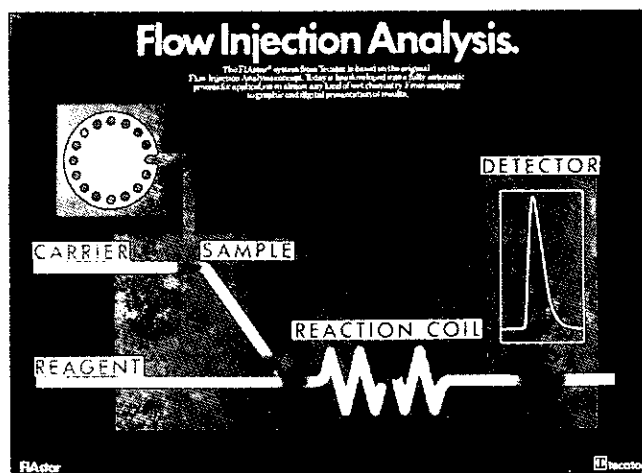
By virtue of its compactness, speed of operation and ease of use, resulting in appreciable

savings in time and costs, the FIAstar equipment represents a significant advance in analytical instrumentation within the field of water analysis.

Figure 1

The operating principle of FIAstar. The liquid sample (usually 40-200 μl) is injected into a moving, nonsegmented carrier stream. The injected sample forms a zone that is merged with a moving reagent stream. In the reaction coil the sample is mixed with the reagent and the chemical reaction takes place. The carrier and reagent streams are pumped through the tubes and reaction coil (I.D. 0.5-0.7 mm) at a constant flow.

For further information please circle no. 30 on reader reply card.



NEW CHARGING POLICY FOR DSIR

The Department of Scientific and Industrial Research is now charging full commercial rates for its services. A pamphlet outlining the new "user pays" policy as well as the range of alternative work relationships is now available from DSIR divisions. The charging policy being implemented now is the result of Government policy decided last year. The Government wants the DSIR, like other Government departments and Government funded institutions, to earn more revenue. This year (1986-87) the DSIR is expected to earn \$20 million or 17 percent of its operating budget from charges for services, rising to nearly 30 percent in three years' time.

DSIR's Assistant Director General Mike (M A) Collins said the "user pays" charges could mean industry will take DSIR more seriously. "All too often

we've been seen as boffins beavering away in a side room, to be used only as a last resort. Charging demonstrates we are a commercial agency available to industry. Now that industry has to pay for our advice, contract research and the like, they'll be much more inclined to make sure they need the information and more likely to use it," Mr Collins said.

The more commercial approach will bring the DSIR closer to its clients' needs and could lead to greater efficiency. Research and development are key elements in New Zealand's future economic development and the DSIR has the expertise and information to help industry, Mr Collins said.

Fees for services are not the only way that the DSIR can earn revenue. Licensing developments on a royalty basis, entering joint ventures and undertak-

ing contract research with or without a joint venture undertaking are all allowed for under the new policy. Work done for other Government departments, local authorities, quangos, research associations and universities will be charged as for private sector companies, except for some specific joint research projects.

Mr Collins said the DSIR is the only organisation in New Zealand offering many of its scientific services but, in a few areas, the DSIR will be competing directly with the private sector. "However our philosophy is to compete with the private sector as little as possible. We have encouraged companies to take up services provided by the DSIR when those services become routine for us. We want to work at the highest scientific and technological levels, to look ahead to meet New Zealand's needs and to make sure no opportunities are missed."

Rates charged will be realis-

tic and reflect the true costs of doing the work. Mr Collins said the DSIR had to make sure that the work was not being cross subsidised by the Government. If contract research work requires special equipment, then the client may have to pay for that equipment. However equipment used as part of a national facility will be paid for by the Government and clients will be asked to pay for the use of that equipment.

NOTICE

On 21 July the Chemistry Division of DSIR, Auckland will be moved to new laboratories at the Mt Albert Research Centre, 120 Mt Albert Rd, Auckland. The phone number will be changed to 893-660, but the postal address will remain as: Government Analyst, DSIR, P.O. Box 2224, Auckland.



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All orders, quotations and inquiries should be addressed to any of the following:

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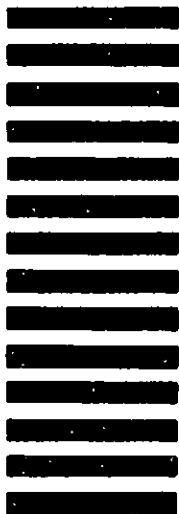
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