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Vol 54 No 3 June 1990

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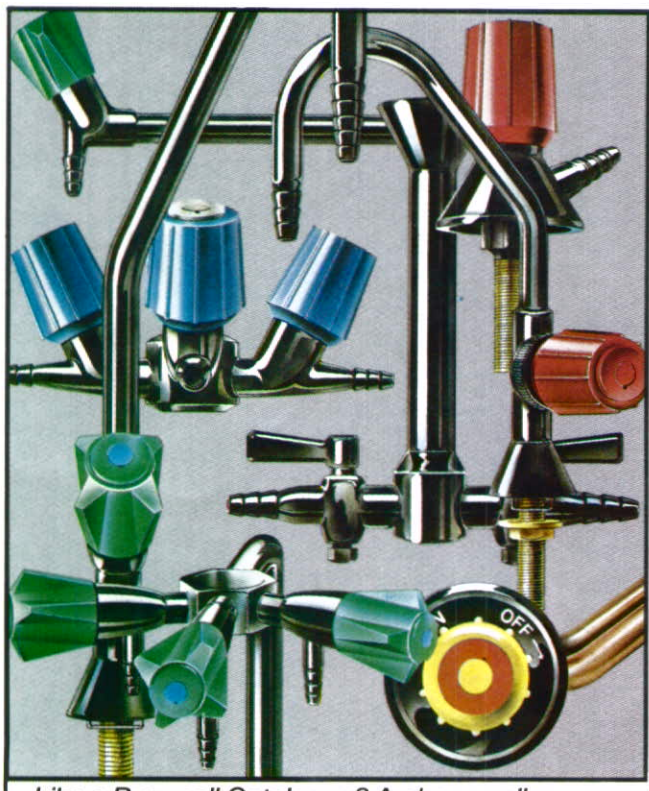

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ABOUT OUR COVER

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SEE PAGE 75

Drs Roger Whiting and Tony Herd are acting editors for the June and August issues. They are seen acting with a helium inflated condom, in the interests of science, at the Edison Science Day for Auckland 6th and 7th Form students, March 1990.

EDITORIAL - SPECIALIST GROUPS

These are troubled times for the Institute. The Council decision to reluctantly increase subscriptions and the reduction in per capita returns to branches is evidence of financial difficulties. Branches are finding it more and more difficult to persuade members to give their increasingly scarce time to serve on branch committees and membership appears to be almost static. Efforts continue to be made at all levels to change this state of affairs, but the central issue remains that the NZIC must offer more to its members and potential members. One aspect of the functions of the Institute is the very sensitive matter of the Specialist Groups.

The Specialist Groups, of which there are approximately ten, vary widely in their size and the extent of their activities. The more active groups, which are run by dedicated enthusiasts, run conferences, symposia and workshops, promoting their areas of chemical interest and facilitating professional contact between chemists working in the same field. For many members and potential members, these activities are the most visible and useful function of the NZIC. In my view, the Institute needs the support of the Specialist Groups for its survival.

Unfortunately, the converse may not be true. Several specialist groups, have through their own hard work, made themselves self sufficient. Their membership often includes non-chemists who have no interest in belonging to the NZIC proper and the remaining links with the NZIC are often based on loyalty rather than mutual advantage.

Perhaps the traditional structuring of the Institute along regional branch lines is no longer relevant, low attendances at branch meetings have been a depressing feature for many years. Would it be better to re-organise and emphasise the role and importance of the Specialist Groups, even at the expense of the Branches?

I think the NZIC Council is in a very delicate position. I believe it needs the support of the Specialist Groups but, after long years of neglect, unless the dialogue is reopened with the utmost care, independance movements will be initiated that make those in Eastern Europe look like a storm in a beaker.

Tony Herd

LETTER FROM THE PRESIDENT

Dear Member

Our links with the RACI have been strengthened to some degree recently when the RACI Council formally accepted the NZ news should be included in "Chemistry in Australia". It is now up to us to send items for inclusion. There is also formal acceptance that an equivalent status applied for RACI and NZIC members at Conferences for the purpose of registration fees.

The Foundation for Research, Science and Technology has announced a further appointment to its Board bringing the complement to six, including the chairman. The new appointee is Dr M. Dunbier, the Director of Crop Research Division of the DSIR in Christchurch. The first newsletter from the Foundation was published in April and it gave information on the sixty-five projects funded so far. These fall into three areas of research, "Antarctic Science and Logistics", "Atmosphere and Climate Change" and "New Technologies for Industrial Growth".

In the April issue of "Chemistry in NZ" I mentioned that NZIC Council is hoping to set up a database of members in which their fields of interest and topics of expertise are listed. The Institute membership is very diverse and one object of the database is to enable the Secretariat to quickly identify members who may be able to help when submissions need to be made. A further objective is to allow the matching of members skills with job vacancies, a service which may be of benefit to those members seeking new opportunities.

The Institute already keeps information on the Specialist Groups to which members belong and the planned database is seen as an extension of this. The giving of any extra information for inclusion will of course be on a purely voluntary basis.

Yours sincerely

Joyce Waters

PROFESSOR CLARK ELECTED FRS

Robin J.H. Clark, who is the Sir William Ramsay Professor and Head of the Department of Chemistry, University College London, has been elected a Fellow of the Royal Society.

Professor Clark is an old boy of Marlborough (1946-48) and Christ's (1949-52) Colleges, and the University of New Zealand (M.Sc., first class honours, Canterbury University College 1958, having carried out research with Dr W S Metcalf). After further research with Dr W S Fyfe at the University of Otago, he moved to University College London (Ph.D. 1961). He was awarded the D.Sc. (London) degree in 1969 and elected a Fellow of the Royal Society of Chemistry in that year. He was elected an Honorary Member of the Royal Society of New Zealand in 1989.

He has lectured widely in Western and Eastern Europe, North and South America, Asia and Australasia and has acted as Visiting Professor at Columbia, Padua, Western Ontario, Berne, Fribourg, Texas A & M, Auckland, Odense, Sydney and Bordeaux. He was awarded the Royal Society of Chemistry (RSC)'s Tilden Lectureship and Medal for 1983/4 and Nyholm Lectureship and Medal for 1989/90. He is author of about 300 scientific papers and three books on inorganic chemistry/spectroscopy, editor of seven monographs on inorganic chemistry, and co-editor of the widely praised review series "Advances in Spectroscopy", now in 18 volumes. Professor Clark has also served on various UK Science and Engineering Research Council and RSC Committees, is currently Vice-President of the RSC Dalton Council, and a member of the Senate of the University of London.

Professor Clark's research interests embrace synthetic, structural and spectroscopic aspects of transition metal chemistry, most recently of mixed-valence, metal-metal bonded and one-dimensional materials. His seminal contributions to Raman and resonance Raman spectroscopy were recognised in his Chairmanship of the highly successful eleventh International Conference on Raman Spectroscopy (ICORS XI), held in London in September 1988.

MEMBERSHIP CHANGES

The following were elected at the February Council Meeting.

MEMBERSHIP

Fellows:

DE MORA, Stephen John, BSc (Hons) (Wales) PhD, Chemistry Department, University of Auckland, Auckland. (Snr. Lecturer).

MINERS, John Oliver, BSc(Well) MSc(Hons) (Well) PhD (Well), Department of Clinical Pharmacology, Flinders Medical Centre, South Australia.

Member:

THAM, Efrem King Shoo, DipPetTech DipAnaChem, Rubbertech Corporation Ltd, Wiri, Auckland.

CUNNINGHAM, Christopher William, BSc(Hons) PhD, National Mutual Building, 70 The Terrace, Poutapeta 3943, Wellington.

CLUBLEY, Christopher Robert, NZCS CAC (UK), Oasis Industries Ltd, Auckland.

COLLINGS, Alan, ONC BSc (Hons) PhD, Zenith Technology Corporation Ltd, Dunedin.

SIRIWARDENA, Asokamali, BSc (Well) BSc (Hons) (Massey) PhD (Well), IPD, DSIR, Lower Hutt.

THOMAS, Wayne Ashley, NZCS, Robert Chemicals Ltd, Petone.

DAVIS, Howard Haupai Joseph, BSc (Auck), W Grayson & Associates Ltd, Penrose, Auckland.

PLACKETT, David Victor, BSc(Hons) (Sussex) PhD (Columbia), Forest Research Institute, Rotorua.

CRUMP, Michael Edward, NZCS, DSIR Geothermal Research Centre, Taupo.

DUNNINGHAM, Elizabeth Ann, BSc (Cant) MSc (Hons) (Cant), Ministry of Forestry, RFI, Rotorua.

HUSBANDS, June Margaret, BSc (Hons) (Belfast) MSc (by Thesis) (Belfast), Department of Food Technology, Massey University, Palmerston North.

Associate:

SIMMS, Raymond Nigel, HTC (England) PGDip (England), W Grayson & Associates

Ltd, Penrose, Auckland.

TAN, Seng To, MSc (Hons) (Waikato), DSIR, Auckland.

HUNTER, Christopher Alexander, BA(Camb, UK) PhD, University of Otago, Dunedin.

FREW, Russell, BSc,(Hons) (Otago), University of Otago, Dunedin.

McDONALD, Dugald Quentine, BSc (Hons) (Cant), Student University of Canterbury, Christchurch.

STUTHRIDGE, Trevor Raymond, BSc (Tch) MSc (Hons) PhD (Waikato), Student.

DONALDSON, Lisa Pearce, BSc (Well), Victoria University, Wellington.

UPTON, Andrew Hugh Philip, (Master's Student) Canterbury University, Christchurch.

Student:

SHAW, Graeme, MSc (Auck), (Student Auck).

JACKSON, Ken, MSc (Auck), (Student Auck).

Obituaries:

RICHARDS, P R, FNZIC, Canterbury Branch

KENNEDY, T H, FNZIC, Otago Branch

JOBEY, D E MNZIC, Auckland Branch

Resignations:

MARKHAM, Ken.

NOTICES

ANNUAL GENERAL MEETING

The Annual General Meeting of the NZ Institute of Chemistry will be held in Wellington on Monday 20 August 1990 at Victoria University of Wellington commencing at 6.30pm, to receive the Annual Report and Financial Statements.

For Council

A.A. Turner

Hon. General Secretary

NOMINATIONS FOR COUNCIL

Reminder to all Members

Rule 16.2 - "The President, vice Presidents, General Treasurer and General Secretary shall be elected annually from nominations made by Branches or by any six corporate members and forwarded to General Secretary by June 30."

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Roger Harker DSIR Fruit and Trees

Mt. Albert Research Centre Private Bag Auckland

Dr Roger Harker is a scientist in the Post Harvest Physiology and Biotechnology Section of DSIR Fruit and Trees. He returned to New Zealand last year after completing a post-doctoral study using microelectrodes to measure intracellular calcium in plant cells at the Institute of Horticultural Research, East Malling, UK.

Over the past decade or so scientists have found that calcium has an important function in the regulation of cellular biological processes. The level of free ionic calcium in the cytoplasm of cells is very low, usually around μ molar concentrations. However, rapid changes in concentration occur in response to environmental or hormonal stimuli. For example, during the fertilisation of ova from sea urchins a transient increase in the cytosol from 0.1 to 2 μ M free calcium takes place over a 20 to 30 second period (Tsien & Poenie, 1986). These changes in concentration act as secondary messages converting an external stimulus into a signal that the cell is able to recognise and respond to. The transient increases occur either from release of calcium from internal membrane-bound pools, or from increases in flux of calcium across the plasma membrane from the extracellular solution.

One of the problems facing biologists studying calcium regulation is the development of methods for measuring the rapid changes in concentration that occur during in vitro and in vivo experiments. The recent development of the neutral carriers ETH1001[1] and ETH129[2], however, has meant that calcium selective minielectrodes and microelectrodes can be fabricated in the laboratory. Neutral carriers are uncharged lipophilic compounds which form a complex with cations and render them soluble in a medium of low dielectric constant, thus providing a mechanism for cation permeation across a normally insulating barrier. The neutral carrier ETH1001, or ETH129, is mixed with sodium tetraphenylborate, a lipophilic anion which limits interference from anion-generated diffusion potentials, and 2-nitrophenyl octyl ether as a plasticiser (these chemicals are available commercially, either individually or as a premixed cocktail). The cocktail is then added to PVC which has been dissolved in tetrahydrofuran. A syringe is used to inject the mixture into the tip of the body of the glass minielectrode or microelectrode, which are then left to dry. The tetrahydrofuran evaporates, leaving a PVC plug with calcium selective properties at the tip of the electrode.

Electrodes made this way are highly selective for calcium as is demonstrated by the following selectivity of factors:

Pot Log K = -5.5, CaNa	Pot Log K = -5.4, CaK	Pot Log K = -4.9 for ETH1001 CaMg
Pot Log K = -5.6, CaNa	Pot Log K = -7.2, CaK	Pot Log K = -6.7 for ETH129. CaMg

The electrodes respond in a Nernstian fashion, by approximately 30mV for every 10-fold increase in calcium concentration, and remain sensitive down to concentrations of 0.1μM and 1nM for ETH1001 and ETH129 respectively (Figure 1).

Minielectrodes

The simplest use of calcium-selective membranes is as a minielectrode which can be placed directly into a biological sample. We have used both glass capillaries and disposable plastic micropipette tips as the body of our minielectrodes with equal success. The minielectrode with its preformed calcium selective membrane at the tip is backfilled with a calcium solution (usually μmolar $CaCl_2$), and connected to a 1X amplifier via a chlorided silver wire. The reference or earth electrode is formed by a second chlorided silver wire, which is attached to a salt bridge (1M KC1, 1% agar), before placing in the biological sample. The emf of the electrode is recorded using a voltmeter and chart recorder, which are connected to the amplifier.

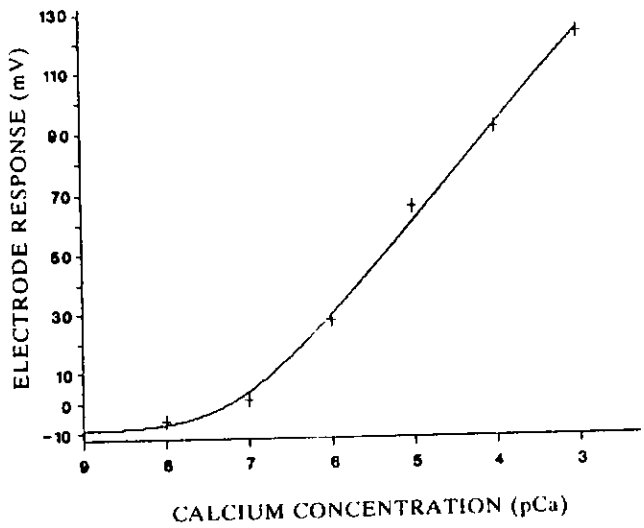


Figure 1. Calibration of calcium-selective microelectrode containing ETH1001. Calcium concentration is given in pCa units (-log [Ca]).

The electrodes must be calibrated in a series of calcium buffer solutions before use, and it is important to recalibrate the electrode at the end of an experiment to ensure that the electrode response has not drifted. The calcium buffers used vary between 10nM and 1mM and are made using a range of different calcium chelators according to instructions published by Tsien and Rink (1980).

The advantage of these minielectrodes for biological research is that they can be used when only small volumes, as low as 20μL, of sample are available, and are extremely sensitive to small changes in concentration when used in solutions containing low background levels of calcium. Thus, they can be used in studies on the uptake and release of calcium from isolated cell organelles such as chloroplasts and membrane vesicles. One problem that we have noted, however, is that some chemicals which are used to stimulate calcium uptake by organelles (eg ATP), also bind calcium and result in a non-specific depletion of calcium from the medium. Another problem is that many chemicals such as the calcium ion channel blocker nifedipine have a direct effect on the response of the calcium-selective membrane.

1 (-)-(R,R)-N,N'(bis(11-ethoxycabonyl)undecyl)-N,N'-4,5-tetramethyl-3,6-dioxaoctanediamide.

2 N,N,N',N'-tetracyclohexyl-3-oxapentanediamide.

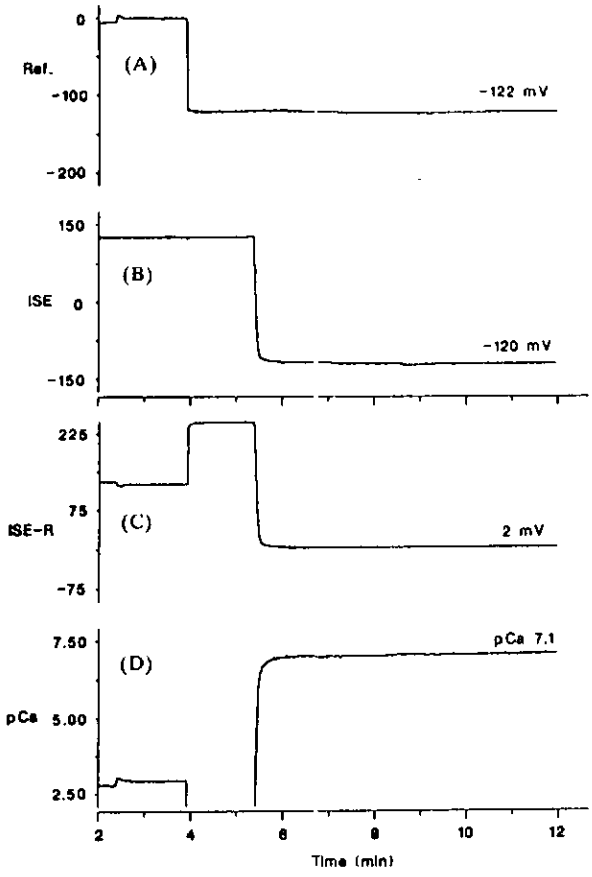


Figure 2. Measurement of cytoplasmic calcium inside a living cell of the giant alga Chara. Traces show impalement of the cell by the reference microelectrode (A), by the calcium-selective microelectrode (B), as well as the recording of traces B-A (C), and the calcium level as related to the calibration curve shown in figure 1 (D).

Microelectrodes

Microelectrodes can be used to measure calcium concentrations inside intact cells. The body of the microelectrode is formed by pulling a glass capillary to a fine point (tip diameter approximately 0.3 to 1.0 μm), using an electrode puller. This glass micropipette is silanised, then the tip filled with the calcium sensor/PVC mixture.

The apparatus and electronics required for the measurement of intracellular calcium are more complex. A microscope and micromanipulators are used to position the microelectrode next to the cell, then the tip of the microelectrode is impaled through the cell surface. In addition to the calcium-selective microelectrode, a reference microelectrode (glass micropipette backfilled with 1M KC1) must be placed inside the cell and the medium containing the cell must be earthed. The calcium-selective and reference microelectrodes are connected to preamplifiers via chlorided silver wires, which are in turn connected to a differential electrometer.

When inside the cell the calcium-selective microelectrode will record the membrane potential (emf between the inside and the outside of the cell) as well as the calcium concentration. The reference microelectrode, however, only records the membrane potential. Thus, the intracellular calcium concentration can be determined by subtracting the signals from the two microelectrodes (Figure 2).

The main problems associated with this technique are: a) ensuring both the calcium selective and reference microelectrodes are located in the same cell compartment, and b) ensuring that impalement with microelectrodes does not damage the cell. An advantage of calcium-selective microelectrodes which is of particular importance to plant science, is that the microelectrodes are strong enough to force through the hard cell wall that surrounds plant cells. Thus, microelectrode techniques provide a very reliable method for measuring calcium in intact living plant cells.

References

Tsien, R.Y. & Poenie, M.(1986) Tibs 11,450-455.

Tsien, R.Y. & Rink,T.J.(1980) Biochimica et Biophysica Acta 599,623-638

FTIR STUDIES OF ELECTRODE SURFACES

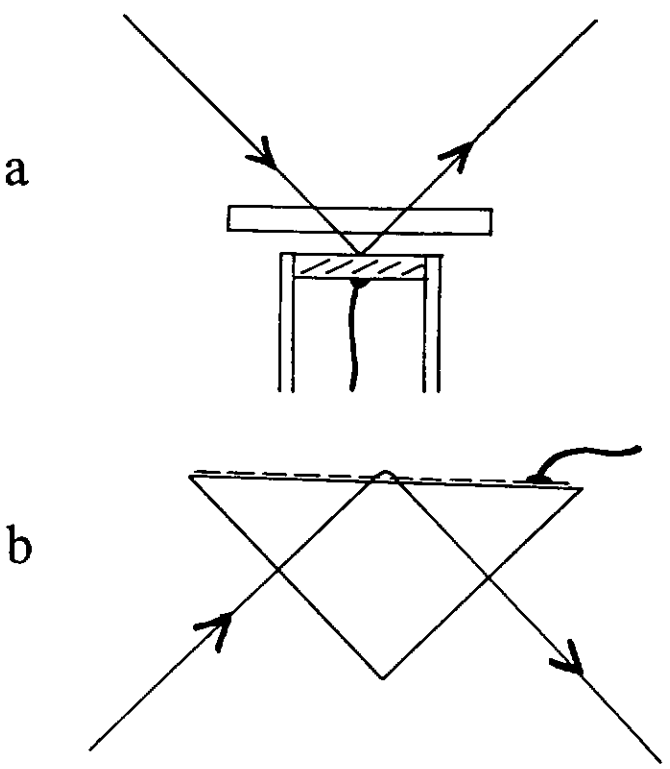
Jim McQuillan, Chemistry Department, University of Otago

Jim McQuillan is a Senior Lecturer in the Chemistry Department, University of Otago with a special interest in *in situ* spectroelectrochemistry. He completed his PhD at Otago in 1972 and then worked with Martin Fleischmann at Southampton University on the pioneering Raman spectroscopic studies of adsorption at electrode surfaces. He returned to Otago as a Lecturer in 1975 and in recent years has used UV-visible absorption, EPR and FTIR spectroscopies to study electrochemical reactions in aqueous and non aqueous systems, some of which are discussed in this article.

In this article I will explain the current electrochemical interest in surface coatings and adsorbed species at electrode surfaces and give some details on the in situ Fourier transform (FTIR) techniques which have enhanced the understanding of processes in such systems. Examples will be selected from recent results obtained mainly in our research group. Electrode reactions in methanol have been studied because of their relevance to the quest for corrosion inhibitors suitable for the methanol based automotive fuels of the future. We have begun work on the adsorption and electrochemistry of molecules on titanium dioxide surfaces because of their importance in photoelectrochemical schemes for harvesting solar energy and in the known biocompatibility of anodised titanium surfaces.

Electrode Surfaces

Modern research in electrochemistry is largely concerned with the kinetics of electrode reactions and with obtaining a molecular view of structural factors which often determine electrode kinetics. The increasingly widespread use of cyclic voltammetry in inorganic, organic and biochemical research has brought "electrochemistry", in the form of determinations of standard electrode potentials, into many current research publications. However quite frequently, sluggish electrode kinetics prevents satisfactory determination of such thermodynamic quantities. Often slow electrode reactions are due to electrode surface coatings or adsorbed layers that "poison" electrode activity. A knowledge of the molecular composition of such layers is needed to understand and possibly prevent such poisoning. In corrosion reactions, on the other hand, certain adsorbed species can act as effective corrosion inhibitors. The study of corrosion inhibiting layers has the aim of revealing the detailed mechanisms of such inhibition and hence the prospect of better designed inhibitors. Deliberate surface modification and coating of electrodes with conducting polymers, oxides and even clays has become an important field in recent years (1) in the quest for electrocatalysis and in the design of electrochemically based sensors. In all of these areas in situ vibrational spectroscopy is being increasingly used to probe interfacial structure and to reveal new information hitherto unobtainable from conventional electrochemical measurements of e.g. current, potential, impedance and capacitance.

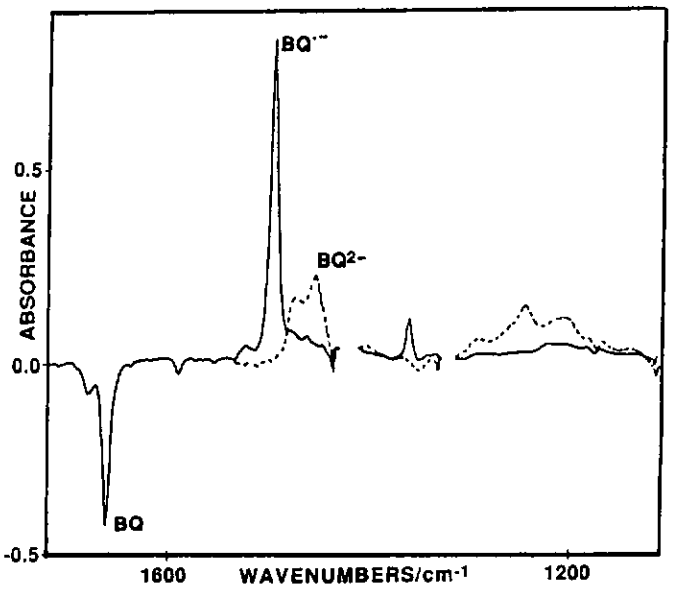


1. FTIR spectroelectrochemical sampling configurations. (a) specular reflectance, (b) attenuated total reflection (ATR)

FTIR Spectroelectrochemistry

Both in situ Raman and infrared spectroscopic methods of examining electrode surfaces were first developed in the Southampton electrochemistry group (2,3). What has now become known as surface enhanced Raman spectroscopy (SERS) is largely restricted to silver, gold and copper electrodes (4) but is particularly valuable for aqueous studies with water being a weak Raman scatterer. Strong solvent absorption, especially for aqueous solutions, was a deterrent for infrared electrode studies but this has been overcome in two ways. The most popular approach (5) is to place a highly polished electrode within 5-10 μm of an infrared transmitting window, such as calcium fluoride, as shown in Figure 1(a). This reduces solvent absorptions to acceptable levels. Less commonly, the attenuated total reflection (ATR) or total internal reflection configuration is employed (6) as shown in Figure 1(b).

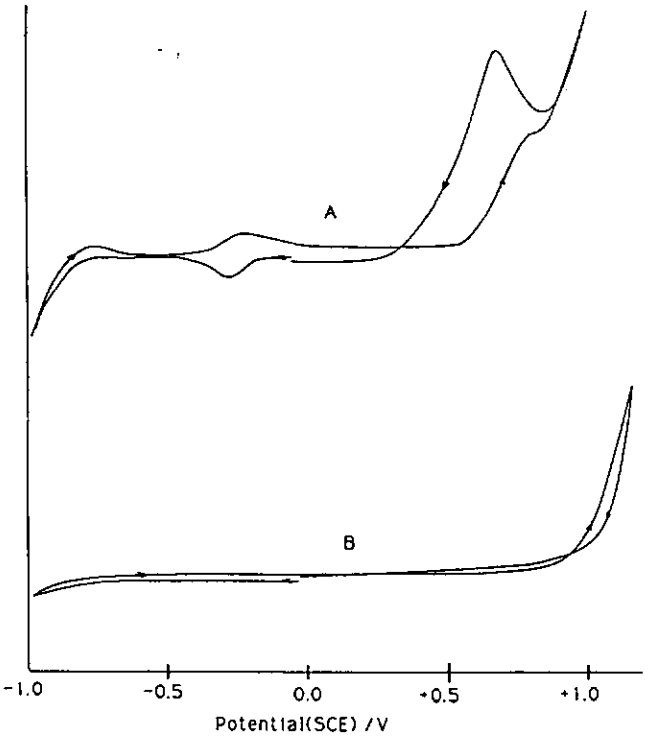
The electrode is usually a thin evaporated metal coating over a high index of refraction prism, typically zinc selenide. This latter configuration has advantages for aqueous systems as penetration into the solution in contact with the metal coated prism is only of the order of 1 μm. Such small pathlengths are difficult to achieve in the thin layer specular reflectance configuration of Figure 1(a).



2. SNIFTIRS spectra of 1,4-benzoquinone (BQ), its radical anion ($BQ^{\cdot-}$) and dianion (BQ^{2-}) in dimethylsulfoxide solution.

A potential stepping sequence is usually employed to collect spectral data. Although the acronym for subtractively normalised interfacial Fourier transform infrared spectroscopy (SNIFTIRS) was proposed somewhat in jest (7), it is still with us. In this technique a single beam reference spectrum is recorded at some initial electrode potential followed by sample spectra at other potentials of interest. The resulting SNIFTIRS spectra are difference spectra where only the changes induced by the potential differences appear in the spectra. When spectral intensities are presented as absorbances, positive peaks arise from species present at the sampling potential and not at the reference potential and vice-versa for negative peaks. Figure 2 shows the SNIFTIRS spectra in the carbonyl region of 1,4-benzoquinone (BQ) and its reduction products in dimethylsulfoxide solutions (8). Solvent absorptions are effectively deleted leaving only the BQ reference potential spectrum and those of the $BQ^{\cdot-}$ radical anion and the BQ^{2-} dianion recorded at successively more negative potentials. An alternative but related technique to SNIFTIRS uses a conventional scanning spectrometer with slow (1-10 Hz) modulation between potentials of interest and in phase spectral detection.

Specular reflection of infrared light at a metal surface results in a standing wave field which is able to interact with vibrational modes having oscillating dipoles normal to the surface but not those with dipoles oscillating parallel to the surface. This is the basis of the "surface selection rule" (9) and is why polarised radiation is generally used in surface experiments. Furthermore, it is also the basis of a third approach to surface species where a photoelastic modulator enables the polarisation of the infrared beam to be rapidly modulated and in phase infrared signals recorded.



3. Cyclic voltammograms from a platinum electrode in methanol soltuion. (A) nitrogen saturated, (B) carbon monoxide saturated. Saturated calomel reference electrode (SCE).

Studies in Methanol

A move to methanol based fuels has been suggested as the only way the United States is going to meet proposed anti-pollution standards (10). In this country, methanol blended fuels have been considered as an option to reduce dependence on imported oil However, methanol presents corrosion problems when used in existing automotive fuel systems and effective corrosion inhibitors need to be identified and studied in advance of any such moves.

Investigations of electrochemical reactions of methanol and the behaviour of added corrosion inhibitors are relevant to the possible future use of methanol blended fuels. Initial work has been done on the electrochemical reactions of absolute methanol at platinum electrodes. Figure 3(a) shows a cyclic voltammogram of this system and it is dominated by an irreversible oxidation process at about 0.8 V prior to the CO_2 evolution reaction at the anodic limit. Conventional electrochemical measurements on this complex methanol oxidation have failed to generate an adequate model for the observed behaviour which is suspected to involve adsorbed intermediates. We were unable to detect any adsorbed species in our FTIR work but the appearance of bands at 0.8 V due to formic acid (1728 cm^{-1}) of CO_2(2334 cm^{-1}) at more positive potentials confirms that formic acid is a major solution intermediate in the oxidation process.

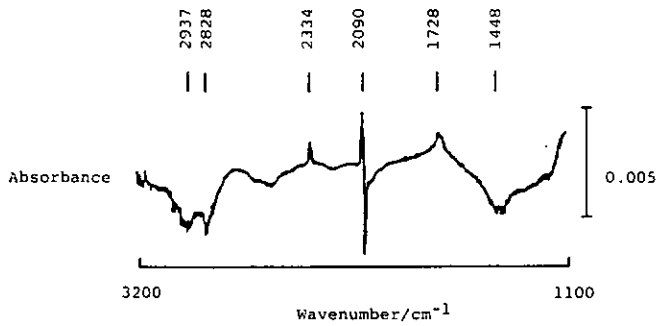
$$CH_3OH + H_2O \rightarrow HCOOH + 4H^+ + 4e$$
$$HCOOH \rightarrow CO_2 + 2H^+ + 2e$$

In contrast to the results of previous FTIR studies in aqueous methanol solutions, adsorbed carbon monoxide was not detected as an intermediate in our absolute methanol work and experiments were then carried out on the same system in the presence of CO (11). Figure 3(b) shows the influence of CO_{ads} on the cyclic voltammogram. The oxidation of methanol to formic acid is suppressed as are the proton redox processes around -0.2V. Furthermore the limiting anodic and cathodic processes are inhibitedby the "poisoning" influence of CO_{ads}.

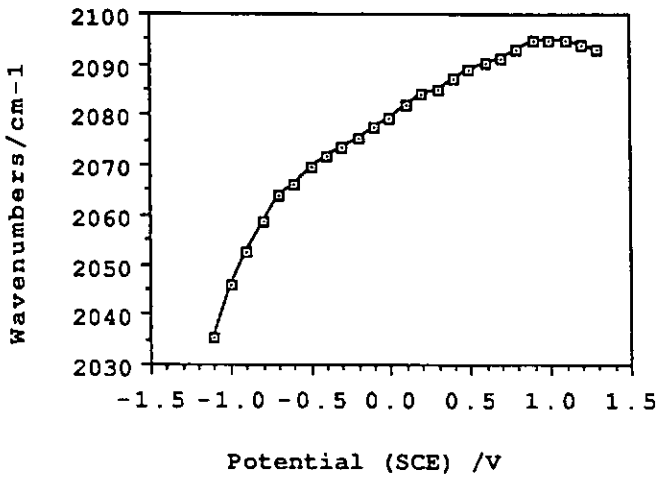
A SNIFTIRS spectrum of this system at 1.0 V relative to a 0.0 V reference potential, recorded in the specular reflectance

mode (Figure 1(a)), is shown in Figure 4. As expected, loss of methanol (2937, 2828, 1420-1450 cm^{-1}) is accompanied by production of formic acid (1728 cm^{-1}) and CO_2(2334 cm^{-1}). The presence of CO_{ads} is evident in the sharp bipolar band around 2090 cm^{-1} corresponding to a shift in the CO_{ads} wavenumber with change in potential.

Note the absorbance scale in comparison with that of Figure 2 indicating the relative weakness of surface signals. A plot of the full variation in the CO_{ads} wavenumber with potential is given



4. SNIFTIRS spectrum from a platinum electrode at 1.O V (SCE) in CO saturated methanol solution. Reference potential O.O V (SCE).



5. Potential dependence of CO_{ads} wavenumber from a platinum electrode in methanol solution.

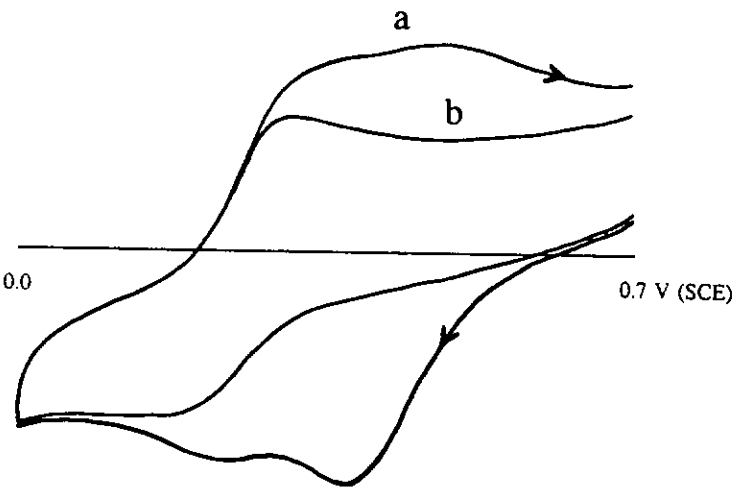
in Figure 5. This is a much more extensive range of potentials for CO_{ads} than has been observed in previous such studies in aqueous solutions. The striking potential variation has previously been explained in terms of a potential dependent degree of back donation from the filled metal $d\pi$ orbitals to the unfilled CO $2\pi^*$ orbital (12) but also in terms of an electrochemical Stark effect arising from the high electric field in the double layer (13). Further experimental and theoretical work is needed to clarify a number of unexplained features of the data in this field.

Although most of the emphasis in the Otago work to date has been on establishing the FTIR spectroelectrochemical behaviour of methanol itself, some preliminary FTIR studies of selected corrosion inhibitors at various metals in methanol have been carried out and will be reported in due course.

Studies of Adsorption at TiO_2 Surfaces

The past decade has seen considerable interest in the photoelectrochemical behaviour of photosensitised titanium dioxide colloids and electrodes (14).

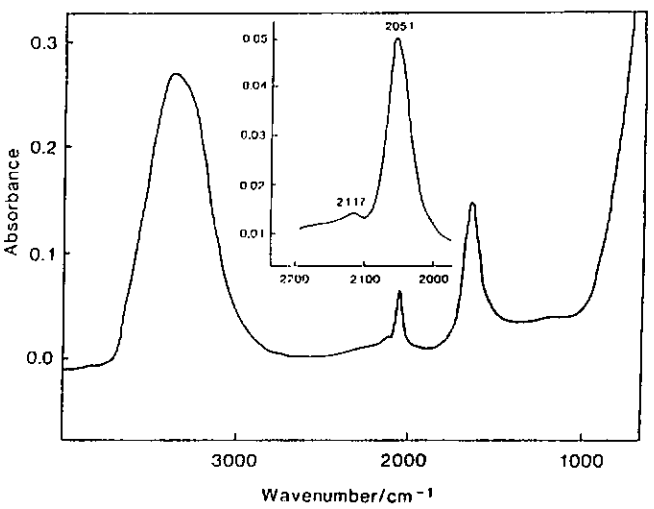
Recently, photoelectrochemical cells with sensitised high surface area TiO_2 electrodes have demonstrated solar energy conversion efficiencies comparable to those of solid state photovoltaic cells (15). Although the adsorbed photosensitisers are critical in the overall behaviour of these systems there have been, until recently, no in situ studies of their vibrational spectra and redox behaviour. Further interest in adsorption at TiO_2 surfaces comes from the observation that the anodised surfaces of titanium surgical implants readily integrate into bone tissue. A few ex situ spectroscopic studies of TiO_2/biomolecule interfaces have so far been carried out but in situ vibrational spectroscopy of these systems is expected to be more valuable.



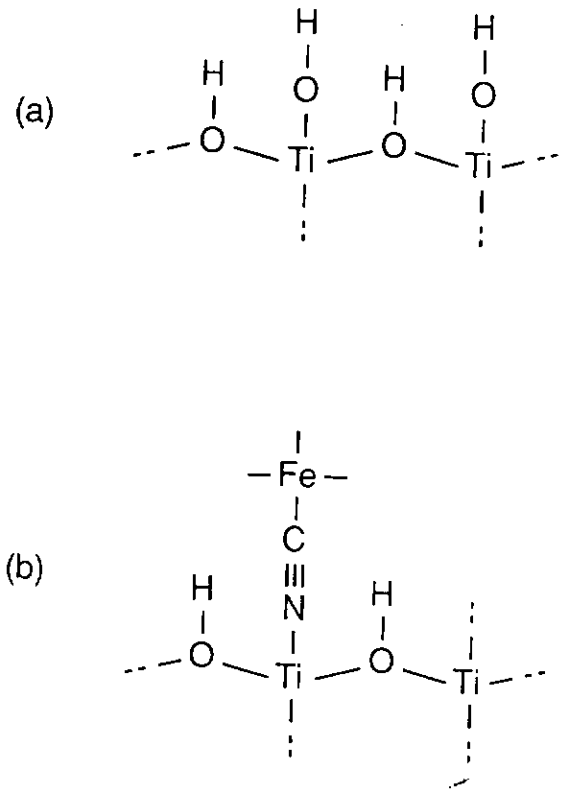
6. Cyclic volammogram of a gold electrode in a 5 x 10^{-5} M $Fe(CN)_6^{3-}$ aqueous solution at pH = 2 (a) with TiO_2 colloid layer, (b) without TiO_2.

Very recently it has been discovered that evaporation of dilute aqueous colloidal TiO_2 onto a surface leaves a thin TiO_2 gel layer in addition to the mainly crystalline colloidal particles. Such coatings on gold electrodes exhibit the electroactivity of species adsorbed to the TiO_2 layer (16) in a manner not previously observed with crystalline TiO_2 electrodes. Figure 6 shows the cyclic voltammogram of a TiO_2 colloid coated electrode in contact with a solution containing hexacyanoferrate (II) ion at a pH of 2. Under such conditions the TiO_2 surface is positively charged and expected to adsorb $Fe(CN)_6^{4-}$. The cyclic voltammogram shows a shift in the hexacyanoferrate(II)/(III) couple from that in solution and which corresponds to significantly stronger adsorption by $Fe(CN)_6^{4-}$ than $Fe(CN)_6^{3-}$. At higher pH, where the surface charge is negative, redox features of adsorbed hexacyanoferrate ions are not detected.

These observations are confirmed by ATR studies of TiO_2 colloid coatings in contact with hexacyanoferrate(II) ion solutions (17). Figure 7 shows the ATR FTIR spectrum of $Fe(CN)_6^{4-}$ adsorbed to TiO_2 at pH = 2. The water bands around 3300 cm^{-1} and 1650 cm^{-1} dominate but the CN stretch modes of adsorbed $Fe(CN)_6^{4-}$ at 2117 and 2051 cm^{-1} are quite strong. This data has been interpreted in terms of surface binding of one of the $Fe(CN)_6^{4-}$ cyanide ligands to a surface Ti^{4+} ion as shown in Figure 8.



7. ATR FTIR spectrum of $Fe(CN)_6^{4-}$ adsorbed to surface deposited colloidal TiO_2.



8. (a) Surface structure of TiO_2, (b) proposed model for adsorbed $Fe(CN)_6^{4-}$.

From this promising beginning we now look forward to combining the FTIR spectroscopy and electrochemistry using a suitable metal coated ATR prism. Furthermore, studies of biomolecules at such TiO_2 surfaces are now within reach.

Acknowledgements

Special thanks to Jon Love, Siva Umapathy, Ranjith Gamage and Bill Ingram whose contributions to getting FTIR spectroelectrochemistry off the ground at Otago have been invaluable. Part of the work reported was carried out on a recent study leave at the University of York and at the University of Utah. Financial support has come from the University of Otago, the University Grants Committee and the Industrial Processing Division of the DSIR.

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BOOK REVIEWS

POLYMER UPDATE: SCIENCE & ENGINEERING

Edited by W.D. Cook and G.B. Guise, RACI Polymer Division 305 pages; ISBN 0 909589 67 4.

This is the second volume in the Australian Polymer Science Series, the first being Engineering Science of Polymer Materials published in 1987. The content of Polymer Update reflects the interdisciplinary nature of polymer science and would be equally at home on the bookshelf of an engineer as on that of a chemist. Bruce Guise comments in the Preface that even the name of the Polymer Division was chosen deliberately not to include the word chemistry so as to truly represent the broad audience of scientists and technologists working with polymers.

First impression on opening the (appropriately) green and yellow covered book is of the abundance of clear diagrams and tables; if a picture is worth a thousand words then this must be a winner. The seven chapters have been written by an equal number of Australian scientists active in polymer research and education. Despite the multi-author approach, the result is an integrated text covering the relevant basic science of polymers complemented with recent developments in each field. The authors state that it is not intended to be a complete course in polymer science - it is pleasing to see that they have not attempted (like as so many other books) to present an exhaustive compendeum of information, resulting in a reference rather than a readable text. The aim of Polymer Update is stated in the title. ie. to update oneself on polymer fundamentals.

Chapter headings are:

1. Polymer Science : Evolution and Future Directions
2. Polymer Synthesis by Chain Growth Polymerization
3. Step Growth Polymerization
4. Melt Properties and Solidification
5. Glass Transition and Crystallization
6. Elastomers: Structure and Properties
7. Mechanical Behavious of Amorphous and Semicrystalline Polymers

The book can be obtained at a cost of $A45 ($NZ60) for NZIC members, or $A55 (approx. $NZ75) for others by writing to :

N.R. Edmonds
Faculty of Science and Engineering
Auckland Institute of Technology
Private Bag, CPO
Auckland

Each text will be supplied with an invoice for payment.

Merk FT-IR Atlas

Edited by E. Merk in collaboration with Bruker Analystische Messtechnik.

Published by VCH 1988. Hardcover 1196 pages. Approx US$605.00

ISBN3-527-26459-0

This collection of 3000 infrared spectra represents the hardcopy version of the Bruker-Merk FT-IR digital spectrum libraries. Measured on a Bruker IFS 85 at a resolution of 2 cm^{-1}, there are three spectra to a page and each spectrum measures 14.5 by 5.5 cm. They are absorbance spectra, linear in wavenumber (4000-400 cm^{-1}) with the usual scale change at 2000 cm^{-1}. The nine strongest bands are marked on the chart and their wavenumber positions are printed in the legend.

The majority of solid samples have been measured as KBr disks, but where interactions prevented this, nujol mulls have been used with the mineral oil peaks removed by spectral subtraction. The substances employed have been taken from the Merk sales range which means that polymers do not appear. Spectra are arranged according to molecular formula which does mean that if a compound is identified as an aliphatic ketone for example, it is necessary to look up the individual spectra of the homologous series which are obviously spread throughout the book. There are three indexes, by molecular formula, alphabetically by IUPAC name and finally by CAS registry number.

We have found the quality of the spectra to be excellent and the atlas easy to use by experienced and learning IR spectroscopists alike.

Keith Ufton and Tony Herd
Auckland Institute of Technology.

More Book Reviews on page 73

The Foundation for Research, Science and Technology

Peter Winsley, Manager (Policy)

Peter Winsley is Policy Manager for the Foundation for Research, Science and Technology. He holds a BA (Hons) from Victoria University, a Diploma in Business and Administration and a Diploma in Social Sciences (Economics) from Massey University. He has recently completed an MA thesis in the economics of industrial research and development at Victoria University. Peter Winsley has a strong interest in a wide range of science and technology matters, specifically in the fields of industrial innovation, and the relationship between technical change and employment.

The recent reforms of government science in New Zealand involve the separation of the functions of science policy advice, funding allocation, and the actual conduct of scientific research. A Ministry of Research, Science and Technology has been established with a range of functions, primarily the provision of science policy advice. A foundation for Research, Science and Technology (FRST) has also been set up. It has two main functions: operating a contestable funding system for government science and providing policy advice.

The Foundation is a Crown agency that will operate under its own Act. Its Board is appointed by the Minister for Research, Science and Technology. It has significantly more financial flexibility and autonomy than government departments. The Foundation will allocate 20% of the total pool of contestable funds for science in 1990/91. The remaining 80% will be allocated by the Ad Hoc Cabinet Committee on Research, Science and Technology on the advice of the Ministry or be treated as a capital investment. The total funds allocated by the Foundation will progressively increase in future years. It is intended that the Foundation will eventually allocate all the funds for public good research, which is defined as research that produces broad public benefits. Some government funding for science department such as DSIR and MAFTech will however be treated as capital investment from which the Crown as owner will expect a commercial rate of return.

The Foundation's main task will be the operation of the contestable funding system, but it will also have a role of providing policy advice directly to the Minister. A major task will be working with the Ministry on developing a science priorities framework which will guide the Government's allocation of funds to science. The development of these science priorities will involve extensive consultation with the community, much of which will be outside the traditional channels through which the views of interest groups are conveyed to government. The Foundation will also provide advice to government on a broad range of other science policy issues. The Foundation is an independent legal entity and its' Board includes wide community representation. As such, it is well positioned to provide advice which reflects the concerns that diverse community groups have in science.

The Foundation will fund science within a priorities framework that will be agreed by government on the advice of the Ministry and the Foundation. The science funded by the Foundation is organised into broad categories called output classes. Examples of output classes include "databases on the atmosphere", and "new and improved materials and industrial processes and products". In turn, science outputs must contribute to general government outcomes such as employment generation and maintenance of the environment. The priority setting process means that government can give effect to changing priorities by increasing (or decreasing) the funds allocated to each output class, and this of course reflects the outcomes that government wishes to support. The Foundation wants to achieve the maximum benefit for New Zealand from the funds available for scientific research. As such it will approve bids that offer the highest quality scientific research at the most competitive price. This in turn means the Foundation is keen to encourage wide access to the contestable funds to allow genuine choice among competing bids.

In the past, most government science was conducted in agencies such as DSIR and MAFTech which were funded on an institutional basis. In separating funding allocation from the conduct of research, the aim is to open up access to government funds for science. Already, private companies and individuals have had contestable bids approved under the new system. The research potential of agencies that formerly had no access to government science funds can therefore be brought to fruition under the new system.

Currently, all private research agencies and individuals as well as research associations can bid to the Foundation for funds for research undertaken within the science output framework. Science departments that have contributed funds to the contestable pool can also bid to the Foundation. Universities and government department that have not contributed to the pool cannot bid, but it is possible that agreement could eventually be reached for tertiary sector institutions to be included on some basis in the contestable funding system. This will be linked to a requirement on tertiary institutions to contribute funds to the contestable pool operated by the Foundation.

The Foundation's contestable system therefore allows a lot more flexibility in science funding because it involves allocation of resources on a competitive basis to areas of national science priority. The Foundation is also strongly committed to long term basic and strategic research and to the maintenance of New Zealand's technological infrastructure. As such, the Foundation will not allow the funding system to destabilise research agencies by emphasising short-term research, or by changing the pattern of our research effort. It will rather maintain a dynamic balance between the need for flexibility and redirection of science funding, and the need for science agencies to maintain a career structure of personnel and to support the very long term research at the more basic end of the research spectrum. This means that the new science priority framework when in place will not be radically changed every year, but will rather be fine tuned on a managed basis that will balance funding flexibility with research continuity and the maintenance of national skill bases.

The Foundation will fund public good research in accordance with such criteria as quality, applicability, relevance and cost effectiveness. Collaboration in research both within and between organisations will be favoured. Bids will undergo extensive merit review which will assess the capability of scientists and research agencies to do the work and ensure that the research contributes to the delivery of the science outputs required by government.

The Foundation therefore emphasises the integration of a competitive bidding process into the science priorities framework. As such it will fund science outputs that are nationally relevant and clearly linked to overall community goals. In doing so, it will also act to sustain the ability of science agencies to undertake longer term research, so that the more basic and strategic research will be emphasised. The Foundation will aim to make government science in New Zealand more focused on New Zealand's needs, and to build a closer relationship between public agencies, industry and community groups in determining priorities and in improving the productivity of the funds government can afford to devote to research.

MORE MONEY FOR MATERIALS RESEARCH

New Zealand Aluminium Smelters Ltd have given $50,000 to the Centre for Surface and Materials Science at Auckland University.

The Centre, the first of its kind in the country, was formed in 1988 to undertake analyses of surfaces using modern methods.

The money will go towards building a secondary ion mass spectrometer which will provide sensitive measurement of a single atomic layer on a surface.

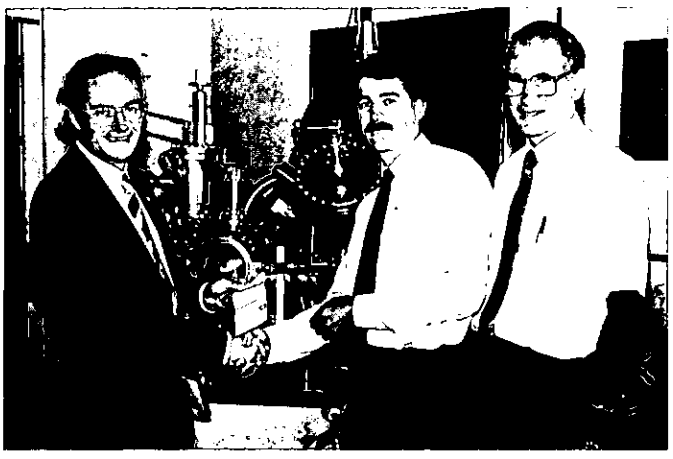
"This will greatly increase our capabilities which until now have relied on an XPS/Auger instrument to perform tasks for industry, research bodies and other universities," says Dr Jim Metson, technical director of the Centre.

The donation brings to $500,000 the amount spent by Aluminium Smelters and its parent company, Comalco Ltd, on research at the University over the past 10 years.

Comalco also sponsors a postgraduate scholarship while Aluminium Smelters have flown students in the department to their Tiwai Point smelter to study metallurgical processing on site.

"All this support has helped us build up one the strongest process metallurgy and surface research groups in the southern hemisphere," says Professor Barry Welch, the Centre's director. He see growing scope for industrially sponsored research.

Much of the research funded by Comalco has, he stresses, been fundamental or academic in nature with the findings available to anyone interested. "Testing and other work done for the exclusive benefit of Comalco or some other company is arranged on a proper commercial basis through Auckland UniServices Ltd, the University's commercial arm."



Tom Campbell (left), acting general manager of NZ Aluminum Smelters Ltd, Invercargill, hands a $50,000 cheque to Dr Jim Metson, technical director of the Centre for Surface and Materials Science at Auckland University, Professor Barry Welch, the Centre's director, is on the right.

CHEMICAL EDUCATION TRUST

REPORT FOR YEAR ENDING APRIL 30 1990

As indicated in the second report of the Chemical Education Trust published twelve months ago, CET activities have been curtailed because of the loss of funds through the failure of Equiticorp Holdings. Individual branches have, of course, maintained activities financed from their own resources and these will be reported separately.

So far as CET is concerned, the video "Do-It-Yourself Chemistry" prepared by the Canadian Chemical Society has been purchased and copies have been made available to individual branches. These have been very well received in schools and endeavours are now being made to arrange for copies to be available for permanent use by individual schools.

Discussions have continued concerning support for a team to take part in the 1992 Chemistry Olympiad to be held in Washington D.C. A good level of support has been indicated for such a proposal and it is probable that CET will be able to assist in financing some of the preliminary elimination rounds involved in selecting such a team. It is, of course, recognised that a major commercial sponsor will be required to meet the full costs.

The CET fund stands at a little over $35,000 which has fallen from $53,000 due to the failure of Equiticorp Holdings. A further appeal for support from industry was made during the year with only modest success. Individual NZIC members will again be invited to provide contributions when the subscription notives are despatched late in the year.

G.N. Malcolm
G.B. Petersen
A.W. Mackney
TRUSTEES

CHEMECA 90

18th Australasian Chemical Engineering Conference. "PROCESSING PACIFIC RESOURCES"

AUCKLAND, 27-30 August 1990

CHEMECA 90, the 18th Australasian Chemical Engineering Conference, will be opened at the newly-completed Aotea Centre by Dame Cath Tizard, the Mayor of Auckland and the Governor-General Designate. The Opening Ceremony will also be addressed by dignitaries including the President of the Institution of Chemical Engineers (London), Mr Robin Paul.

This is the second time this annual conference will be held in New Zealand and it coincides with the 150th Anniversary of the signing of the Treaty of Waitangi and the 150th Anniversary of the City of Auckland.

Traditionally, this conference is sponsored by the IChemE, the IEAust College of Chemical Engineers and the RACI Industrial Chemistry group. This year, it is also sponsored by IPENZ through Chemical Engineering Group (NZ), and supported by the Institute of Energy.

While the Conference will be opened at the Aotea Centre followed by a number of plenary/keynote speeches, the technical sessions and the remaining plenary/keynote addresses will be held at the Hyatt Kingsgate Hotel. The Conference Dinner and Awards Presentation will be held at the Aotea Centre on the evening of Tuesday, 28 August 1990. An address will be given by the Minister of Science and Technology, Margaret Austin.

To highlight the theme of the Conference "Processing Pacific Resources", Plenary/Keynote addresses will be given by authorities including the following:

Dr Colin Adam, Director of the Institute of Industrial Technologies, CSIRO, on the development of advanced materials;

Barry Ashwin, Technical Director, Forest Industries Group, Fletcher Challenge Ltd., on Processing the Forest Resources;

Dr Geoff Belton, Director of BHP Central Research Laboratories, on the development of specialty steel;

Gary Hammond, Vice President of Bechtel Petroleum, Chemical and Industrial Company will talk on Petrochemical Opportunities in the Pacific Basin;

Professor Peter Munro of Massey University on University R&D in Support of Commercial Marketing Objectives;

Karl Stewart, Managing Director of Coal Research Association of New Zealand, on the Future of New Zealand Coal - the Potential and the Challenge;

Kit Wilson of Winstone Pulp International on special pulping techniques.

200 technical papers will be presented covering a very wide range of process engineering activities including Modelling, Membranes, Mineral Processing, Metallurgical Processing, Coal, Food Processing, Multiphase Systems, etc. etc. just to name a few. Because of the large number of papers submitted, the Organising Committee has decided to extend the Conference to three-and-a-half days. A number of pre-/post conference courses on areas such as project management, process control etc. are also being arranged.

In addition to a very busy technical programme, Partners' Programmes already planned include visits to traditional Maori Arts & Crafts centre, harbour Cruises etc. Also organised are Post-Conference tours to the many scenic spots in the South Island and Central North Island.

The Conference Programme and Registration form availale by writing to Dr. J.J.J. Chen, Conference Secretary, CHEMECA 90, Department of Chemical and Materials Engineering, University of Auckland, Private Bag, Auckland. Alternatively, use Fax (09) 3660702 or Phone 737999 ext 8175.

P.B.D. de la Mare Memorial Fund

The Chemistry Department of the University of Auckland has established a fund to endow an annual "P.B.D. de la Mare Memorial Lecture". It is believed that this is a most appropriate way to pay tribute to "P.B.D." in view of his great interest in and contribution to chemical research.

Friends, past students and colleagues of Peter de la Mare are invited to contribute to the necessary capital fund. Contrinutions to the "P.B.D. de la Mare Memorial Fund, University of Auckland" should be sent to the Head of Department, Department of Chemistry, University of Auckland, Private Bag, Auckland.

All contributions will be appropriately acknowledged and receipted by the University of Auckland.

CHEMISTRY IN NEW ZEALAND YEARBOOK 1990/1991 DIRECTORY QUESTIONNAIRE

The NZIC Council and the publishers of Chemistry in New Zealand consider that the publication of a 1990/1991 year book would be of benefit both to the Institute's members and to the chemical industry.

The following questionnaire relates to the directory.

The directory will only have maximum usefulness if it is complete, please ensure that a copy of the questionnaire reaches the relevant person in your organisation and that it is completed and returned by 31 August 1990.

Completed copies should be returned to, and additional copies of the questionnaire can be obtained from:

Dr R. Whiting MNZIC
Chemistry in New Zealand
PO Box 9072
Newmarket, Auckland.

Thanking you in advance for your co-operation.
Roger Whiting

TO BE COMPLETED ONLY BY AN AUTHORISED COMPANY OFFICER WHO MUST DATE AND SIGN HERE.

DATE .....

COMPANY DETAILS

SIGNATURE .....

COMPANY NAME .....

ADDRESS AND PHONE NUMBER OF HEAD OFFICE

.....

ADDRESSES AND PHONE NUMBERS OF BRANCHES

..... **PH:** .....
..... **PH:** .....
..... **PH:** .....
..... **PH:** .....
..... **PH:** .....

MAIN ACTIVITY AREA(S)	**Laboratory Instruments and Accessories**	**A**
	Laboratory Equipment and Fittings	**B**
	Consultants	**C**
	Chemicals	**D**
	Process Control Instruments	**E**
	Process Equipment	**F**

Please circle the appropriate letter(s) and complete the corresponding sections.

BRIEF DESCRIPTION OF COMPANY .....

.....

.....

.....

OVERSEAS PRINCIPALS REPRESENTED .....

.....

.....

BRAND NAMES .....

.....

.....

IF ADDITIONAL SPACE IS REQUIRED, CHECK HERE ☐ *AND CONTINUE ON BACK PAGE.*

A. LABORATORY INSTRUMENTS AND ACCESSORIES

Categories of instruments for which your company has an agency (Please list brand names)

- **BALANCES**
  - Analytical balances .....
  - Top-pan balances .....
- **CENTRIFUGES** .....
- **CHART RECORDERS** .....
- **CHROMATOGRAPHY**
  - Gas Chromatographs .....
  - HPLC .....
  - Ion Chromatographs .....
  - Chromatography columns and packings .....
  - OTHERS (specify) .....
  - Syringes .....
- **COMPUTERS**
  - Laboratory Computers, data stations, integrators .....
- **ELECTROCHEMISTRY**
  - Conductivity meters .....
  - pH/mV meters .....
  - Electrodes (glass, Pt, reference) .....
  - Selective ion and gas sensing electrodes .....
  - Polargraphs .....
- **SPECTROSCOPY**
  - Visible spectrophotometers .....
  - UV-vis spectrophotometers .....
  - Infrared spectrophotometers .....
  - Fluorimeters .....
  - NMR .....
  - Flame photometers .....
  - ICP .....
  - Atomic Absorbtion Spectrophotometers .....
  - Hollow cathode lamps .....
  - Arc/spark spectrographs .....
- **THERMAL ANALYSIS** .....
- **X-RAY AND RADIOCHEMISTRY**
  - Radiochemical equipment .....
  - X-Ray diffraction and fluorescence .....
- **MICROSCOPES** .....
  - OTHER (please specify) .....

B LABORATORY EQUIPMENT & FITTINGS

Items or categories in which your company is involved (Please list brand names).

- Bench surfaces .....
- Burners .....
- Clamps, stands, bossheads .....
- Crucibles .....
- Dessiccators .....
- Filter media .....
- Fume cupboards and Laminar Flow Equipment .....
- Furnaces .....
- Gas regulators .....
- Glassware .....
- Heating mantles .....
- Hot plates .....
- Laboratory coats .....
- Laboratory furniture .....
- Mills .....
- Pipettes (auto) .....
- Plasticware .....
- Safety glasses .....
- Sieves .....
- Spatulas .....

IF ADDITIONAL SPACE IS REQUIRED, CHECK HERE ☐ *AND CONTINUE ON BACK PAGE.*

Stirrers .....
Thermometers .....
Tongs, test tube holders .....
Ovens .....
Vacuum pumps .....
Valves and fittings .....
Water Baths — Thermoregulators .....

Other (Specify) .....

C CONSULTANTS

Consultants will be sublisted geographically.

TYPE OF ANALYSES OR SERVICES AVAILABLE .....
.....
.....
.....

INSTRUMENTATION .....
.....
.....
.....

D CHEMICALS

Check against the categories listed below. Although these categories are very broad they will be cross referenced to the main listing where detail can be given in the company description.

Adhesives ..... ☐
Agricultural Chemicals ..... ☐
Catalysts ..... ☐

Compressed Gases ..... ☐
Detergents ..... ☐
Disinfectants ..... ☐
Dyes ..... ☐
Emulsifiers ..... ☐
Food Chemicals ..... ☐
Laboratory Chemicals ..... ☐
Metals and alloys ..... ☐
Pharmaceuticals ..... ☐
Pigments ..... ☐
Polymers ..... ☐
Solvents ..... ☐
Surface Coatings ..... ☐
Surfactants ..... ☐
Water Treatment Chemicals ..... ☐
Other (specify) ..... ☐
..... ☐
..... ☐
..... ☐

E PROCESS CONTROL EQUIPMENT

Control areas in which your company is involved. Please list brand names.

Pressure .....
Flow .....
Mass .....
Volume .....
Density .....
Temperature .....
pH .....
Conductivity .....
Vacuum .....
On stream analysers .....
Turbidity .....
Oxygen and Chlorine Monitors .....

Other (specify) .....

(Continued overleaf)

IF ADDITIONAL SPACE IS REQUIRED, CHECK HERE ☐ *AND CONTINUE ON BACK PAGE.*

F PROCESS EQUIPMENT

Categories of equipment which your company manufactures or holds an agency. (Please list brand names).

Mixers .....
Filters .....
Sterilisers .....
Crushers .....
Grinders .....
Pumps .....
Fans .....
Valves .....
Heaters .....
Coolers .....
Freezers .....
Crystallisers .....
Other (please specify) .....
.....
.....

RETURN THE COMPLETED QUESTIONNAIRE BY 31 AUGUST 1990

Completed copies should be returned to, **Dr R. Whiting MNZIC**
Chemistry in New Zealand
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Newmarket, Auckland.

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HALF PAGE	430	490	550
ONE THIRD PAGE	330	390	440
QUARTER PAGE	275	320	370

ADDITIONAL INFORMATION

BRANCH AND UNIVERSITY NEWS

AUCKLAND BRANCH NEWS

In April, the Branch was visited by Mr Ron Arbuckle, Chairman of the Foundation for Research, Science and Technology. He clearly explained the role of the Foundation in the new science funding structure now in operation. This was a very informative evening and dispelled many doubts that members had had about the operation of the Foundation.

In May, Dr's Margaret Lawton and Brett Morris of the DSIR gave an interesting joint presentation on their work with DNA. Dr Lawton explained the DNA profiling carried out for the Police in criminal cases, whereas Dr Morris described his work with modifying plant DNA to produce new strains. The meeting was well attended and it was pleasing to see several new faces present, attracted by these topics.

The June meeting was the Presidential Visit, and Dr Joyce Waters was warmly welcomed by an enthusiastic group which included many of her friends and former colleagues. She gave a well-researched and very entertaining address on science education in the Pacific Basin, which she had based on a comparative study well backed-up with facts and figures. The underlying message was the New Zealand is not doing too well in this area.

The Auckland Branch Prizes for academic excellence were recently awarded. The prize for top Chemistry V student at ATI was presented to Caroline Wilson. The prize for top masters student at the University was presented to Lyndsay Howe.

Dr Peter Nelson has moved within Chemistry Division, DSIR. He has left the Mt Albert laboratory and joined the Necal laboratory at Mt Eden where he is working in the area of waste management. His position as head of Forensic Services (Auckland) has been filled by Dr. Margaret Lawton.

WAIKATO BRANCH APRIL BRANCH MEETING

The Branch were privileged to receive for their April meeting Professor Soren Jensen from the Wallenburg Environmental Laboratory of the University of Stockholm. He spoke upon the topic; "The Discovery of PCB'S and their Consequences on the Environment". Professor Jensen was in the country spending 3 months of a sabatical year working at the FRI in Rotorua with Dr. Robert Franish. Professor Jensen's interests lie in the environmental sciences and he has undertaken a deal of research into the effects of persistent chloro-organics such as polychlorinated biphenyls - PCB'S. His immediate and particular interest being the use of pineneedles as receptors of airborne pollutants.

Professor Jensen delivered an enthralling address to an excellent turnout of the Branch Membership. He discussed in some detail his investigations into airborne pollution using the pineneedle as his basic tool. He outlined his sampling trees being ranged from the Pyrennes to the Baltic, in Europe, and how he could progress crops and forest spraying fallout from DDT and DDE residues in his pineneedles from those trees.

He described research into the genetic effects of PCB'S in various animals, birds and fish. He enlightened a number of "boaties" into the widespread use of PCB's in antifouling paints. He went on to assure them that the practice had ceased, in Sweden at any rate, in 1976. During an active question and answer session reference was made to the efficacy of 'organic farming methods' if there was such residues present from global airborne pollution.

A motion of thanks was proposed by Dr. Rick Ede of Waikato University. The Branch extends its thanks to Dr. Robert Franish for having made the visit and address possible.

UNIVERSITY OF OTAGO CHEMISTRY DEPARTMENT

Dr David Larsen has taken up an appointment as Lecturer. David completed his PhD with Dr Rutledge of Auckland in 1986 and has since been at the University of Manchester Institute of Science and Technology investigating the use of carbohydrates in the synthesis of pseudo sugars, Diels Alder reactions and chiral catalysis reactions. At Otago he is studying the synthesis of pseudo-sugar monosaccharides of biological interest.

Ranjith Gamage has just completed his PhD theses "Spectroelectrochemistry of anthroquinone sulphonates in aqueous solution" with Jim McQuillan. He and his wife who completed her PhD in chemistry last year are presently visitng their home in Sri lanka before Ranjith takes up a post-doctorate position with Professor Charmian O'Connor in the Chemistry Department, Auckland University.

Another recent PhD graduate, Jonathan Love ("Electrochemistry and spectroscopy of corrosion inhibition in methanol solutions") is now a post-doc with Professor David King, at Cambridge, working in the field of surface science. A former secondary school teacher, Mrs Barbara Duncan has been appointed to the new position of Organising Tutor in the Chemistry Department.

UNIVERSITY OF CANTERBURY NEWS

During February, Dr W.T. Robinson was invited to teach at a Crystallography School of Natural Materials for Science and Industry in Bangkok, Thailand. This school was organised by Chulalongkorn University in cooperation with the International Union of Crystallography (IUCr) and UNESCO. Dr Robinson reports that there is now increasing international sponsorship for schools of this kind in various branches of science in Asian centres. Australian chemists seem, at present, to be ahead of their New Zealand counterparts in establishing mutually beneficial collaborations with the potentially huge body of chemists in these equatorial Asian countries. Dr Robinson also managed visits to lecture at Silpakorn University and the Institute of Advanced Studies at the University of Malaya, in Kuala Lumpur, establishing many new and worthwhile contacts.

Prof. L.F. Philips spent the period from November 1989 to February 1990 at the University of Birmingham as an SERC Senior Visiting Fellow. His work in Birmingham involved the study of the laser-induced fluorescence of OCN from the reaction of CN with O_2 and was in collaboration with Prof. I.W.M. Smith.

Prof. A.D. Buckingham, FRS, is currently visiting the University of Canterbury as an Erskine Fellow. He is Prof. of Theoretical Chemistry at Cambridge University and editor of Chemical Physics Letters. He will be spending six weeks in the Chemistry Department lecturing on intermolecular forces.

Dr Murray Munro, spent a leave period during 1989/90 at the National Cancer Institute's (NCI) research facility at Fort Detrick in Frederick, Maryland. As part of the campaign against various cancers and against the HIV (AIDs) virus the NCI has instigated a wide ranging programme based on the collection of marine and terrestrial plants, animals and microorganisms from many parts of the globe. These are stored at Frederick, where they are extracted, and the extracts tested against up to 100 different cancer cell lines and against HIV. While at Frederick, Dr Munro worked on a variety of plant extracts that showed promise as potential anti-HIV treatments. He also contributed to a symposium on Marine Natural Products held at Blanes in Spain and was a Plenary lecturer at the VIth International Symposium on Marine Natural Products, Dakar, W Africa.

Siew Tai Fong and Sian E. Miller were the co-winners of the 1987 Ralph Earle Seminar Prize. The topics of their presentations were, respectively, "Asymmetric Epoxidation of Allylic Alcohols" and "Chelation Therapy".

CANTERBURY BRANCH NEWS

The first meeting of the year was held on February 22 at the Chemistry Department of the University of Canterbury. Prof. Dieter O. Hummel, from the University of Cologne, addressed the branch on the subject of linear temperature programmed pyrolysis mass spectrometry and FTIR of multicomponent polymeric systems.

On March 13, the annual Canterbury branch barbecue was held at the Ilam Homestead. Although the weather was poor, the attendance was similar to that in past years. Afterwards, Dr Murray J. McEwan of the Chemistry Department, University of Canterbury, addressed the meeting on the topic "Voyager's Encounter with Nepture". The Canterbury Branch thanks Canterbury Frozen Meats Ltd for their sponsorship of this meeting.

WINSTON CHURCHILL MEMORIAL TRUST

The trust was donated by New Zealanders in 1965 as a memorial to Sir Winston Churchill. It was his wish to be remembered by some means which enabled people to travel particularly when this promoted understanding and was for the betterment of mankind. The income from the fund is used for grants to New Zealanders for any study project which advances their occupation or field of interest, in some way benefits New Zealand; or helps to maintain the Commonwealth as a beneficial influence in World Affairs.

There are not prescribed qualifications, academic or otherwise, for the award of a Winston Churchill Fellowship. Merit is the primary test, whether based on past achievement or demonstrated ability for future achievement in all walks of life. The value of an applicant's work to the community and the extent to which it will be enhanced by the applicant's overseas project are important criteria taken into account in selection Churchill Fellows.

Applications are called for in an open category and consequently the fellowships awarded cover very diverse fields of study. In 1989 the Trust Board awarded 24 Fellowships to New Zealanders for projects to be carried out in 1990.

The closing date for applications is 31 July each year for awards to be taken up in the following year. Application forms and further information can be obtained by writing to Joanne Oliver, Trust Administrator, PO Box 10-345, Wellington or from Regional Offices of the Department of Internal Affairs.

MORE BRANCH CHAIRMEN

Auckland

Rodney Norris is the current Chairman of the Auckland Branch.

Rodney was born in England and educated in Auckland (Kings College and Auckland University). In 1969 he joined Chemistry Division DSIR in Lower Hutt as a Toxicologist, and later gained experience in other areas of forensic analysis. From 1975 to 1980 he had a particular interest in blood alcohol analysis and worked on the automation of the analyses using head space GC's coupled to a computer.

Moving to Auckland in 1980, Rodney worked for Chemistry Division in applied chemistry and spent several years working with the late Arthur Kennett and developing a strong interest in polymer chemistry. A recent change has seen Rodney back in forensic science as a specialist in the analysis of illicit drugs.

Rodney joined the NZIC in 1970, and was Secretary/Treasurer of the Polymer Group for some time. He has been on the Auckland Branch committee for several years, most recently as Treasurer.

His spare time is taken up with family life (trying to keep up with his two teenage daughters) and he enjoys fixing cars, postal history, tramping, wine tasting and dabbling in shares.

Manawatu

Manawatu Branch Chairman Alastair MacGibbon studied chemistry at Massey University where he graduated with a B. Sc. (Hons) and subsequently a Ph. D (1977) in physical chemistry involving the study of the kinetic mechanism of the enzyme aldehyde dehydrogenase from sheep liver. Following postdoctoral research at the Institute of Molecular Biology at the University of Oregon and the Biochemistry Department of the University of California, Riverside. Dr MacGibbon returned to New Zealand and worked with Dr Len Blackwell of the Chemistry Department, Massey University. In 1984 Dr MacGibbon joined the Milkfat and Butter Section of the New Zealand Dairy Research Institute. His work has involved the investigation of the chemical and physical properties of milkfat and the effect of these properties on milkfat products.

HUNTLY HOSTS IC SEMINAR

An Ion Chromatography Seminar was held on Friday, 20 April, in Huntly. It was organised by Dr. Peter Robinson of Waikato Polytechnic and the Chromatography Specialist Group and Nath Pritchard of Huntly Power Station. It was the second such IC seminar to be held in the country. The first was held in May of 1987, at the same venue.

The proceedings were commenced by Tim Bowser of Waters (Australia) discussing the use of IC for industrial, environmental and process monitoring applications. He was followed by:

Anna Percy, Auckland University, "Geochemical interpretations made possible by analysis of major ion concentrations in a Coromandel river";

Steven Hope, Kinleith Anal. Lab., Tokoroa, "Where does the chloride go";

Karen Harvey, NZ Synfuels, New Plymouth, "Anions in cooling water & other process waters";

Mark Albertson, Hyde Instruments Ltd, "The analysis of heavy & transition metals in seawater using chelation concentration IC";

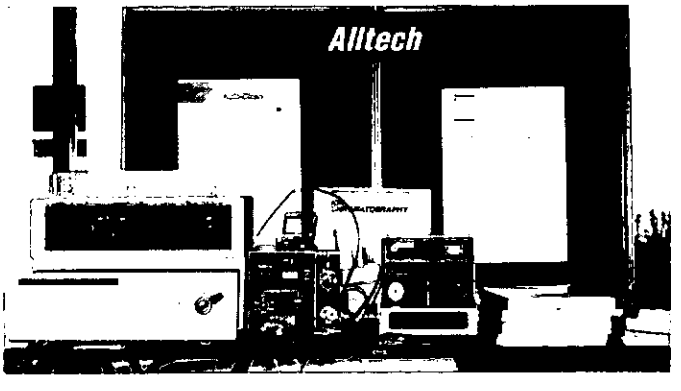
Geoff Davies, Petralgas, New Plymouth, "General use of IC at Petralgas";

John Watkinson, Ruakura, Hamilton, "IC measurement of inorganic sulphur species from the microbial oxidation of elemental sulphur in soil";

Roy Parish, Huntly P.S., "IC at Huntly Power Station".

The seminar proved highly successful from a number of standpoints. The attendance of over thirty people from all over the country, with twentyfive genuine 'hands-on' endusers, indicated how the use of the technique had grown in New Zealand within the last three years. The diversity of the speakers, and the attendees, well illustrated how an analytical technique, such as Ion Chromatography, can gain widespread application. Another intriguing aspect was the technique's range of detection; from almost "beakers per bucket" to parts per trillion. There are few techniques which can rightly boast such a range.

Hyde Instruments with Mark Albertson (left) demonstrating.



The Alltech display stand.

The undercurrent to the seminar was the demonstrable need for practitioners of an art to be able to come together, in neutral forum and surroundings, to discuss: their craft; their experiences; their successes and to share them with like minds. This surely was science at its best. It indicated an ongoing need that should be fullfilled by, for example, the NZIC.

After lunch the proceedings continued with a technical visit to the nearby Huntly Power Station where the attendees could witness IC at work in ECNZ's largest thermal power station.

The seminar was heightened by the presence of a significant trade display provided by:

Alltech Limited - Westscan IC
Alphatech Limited - Waters IC
Hyde Instruments Limited - Dionex

The organisers appreciated the efforts of those companies concerned. See you at Huntly in '93!

Nath Pritchard and Peter Robinson.

ADHESIVES SYMPOSIUM

The 3rd Adhesive Symposium of the NZIC Polymer Group drew a good attendance despite the continuing rationalisation taking place in the chemical industry. The 2 day symposium involved 18 speakers whose combined efforts resulted in a full range of topics being covered, from natural adhesives through to specialised products not yet available in N.Z.

Bound copies of proceedings are available at a cost of $60 from:

Eric Baggen
Peterson Chemicals Ltd
PO Box 19-041
Avondale
Auckland

Obituary - PETER RICHARDS

HOD Science, Riccarton High School

Many of us have been touched by Peter's life and could speak from our particular vantage point. For me, I was first moved into Peter's life and laboratory in 1965 at Christchurch Boy's High School, three years after Peter started there. My first impressions of Peter back in '65 was that he was a very good teacher, a term still applied to him by his colleagues today. I was impressed too by his commitment to a task, and by his flair for demonstrations with punch.

This last year has seen the most consistent contact as I have had the privilege of spending a large part of the year with Peter on the Science Roadshow; on the phone, at his home, at school, and on the road. From this I have memories that I will never forget. We worked, talked, struggled and raced around together, we dreamt ideas of how things might be next year, how demonstrations and experiments could be better. Much of this was committed to paper, but it will be for others to action.

In all this close time together there was never a cross word that I can recall - it was a very special time. Peter was very much in his element in this role, as a semi-mad scientist, communicating through experiments with thousands of children and young people. Throughout his teaching this has been Peter's real strength - making science live through practical work and demonstrations (hands on!). Perhaps his interest in magic gave him an edge in the public demonstration situation.

Recently there has been news of the Science Centre in Christchurch moving much closer. Peter had been involved in aspects of this and spoke with interest to Tim Oughton and myself about his possible involvement in this. Sadly this is not to be - but some of his ideas will undoubtedly be incorporated.

There's much else one could say - about his creativity in practical work - his attention to detail - his ability to innovate - to analyse - to work hard, but also to encourage students to do well - to understand - whether gifted or less able. He spent coutless hours helping students with projects for Science Fairs - many of which succeeded - but he also spent time with students who never looked like succeeding.

His colleagues have made some comments:

"Peter will be remembered by the kids he taught for the rest of their lives."

"He was the best chemist I have come across."

"Master of demonstrations."

"An excellent communicator, taking ideas and expressing them simply."

"Pre-eminent in the art of communicating through the medium of practical work."

"A good teacher of science."

I (We) shall miss him very much.

R.B. Jansen

Obituary - ROY HANSEN

The death of Roy P. Hansen, B.Sc., D.Sc. (Victoria University of Wellington) occurred at Palmerston North Hospital on March 30th 1990. On his return from World War 2 he joined the staff of the D.S.I.R. Fats Research Division shortly after its inception in 1947 as its deputy leader until its incorporation into the D.S.I.R. Applied Biochemistry Division in 1969. There he led the Fats Research Group for several years preceding his retirement.

Dr Hansen was a major contributor to the chemistry of oils and fats having published some 100 research papers, mainly in overseas journals which did much to enhance New Zealands scientific image in the area.

Dr's C.B. Johnson and F.B. Shorland are preparing an obituary for future publication.

BOOK REVIEW

PLANTS FOR MEDICINES,

A Chemical and Pharmacological Survey of Plants in the Australian Region, by D.J. Collins, C.C.J. Culvenor, J.A. Lamberton, J.W. Loder, and J.R. Price, CSIRO Publications, Australia, 1990, 303 pages, $70.00 (Aust). ISBN: 0 643 04992 7.

Phytochemical surveys of the indigenous flora of a country provide a source of information which can be of inestimable value to a wide section of scientists ranging from those concerned with medicinal drugs to those whose interest is in botanical systematics. This volume which draws together the results of the screening of nearly 2000 species of the Australian flora for alkaloids and tumour inhibitors is the culmination of a vast effort which had its origins in an organised investigation of Australian plant species for medicinal purposes during the Second World War. The survey became a major project initiated by CSIRO and was supported by many chemists in Australian universities. In 1984 a committee was formed to review the historical and scientific aspects of the survey. One objective was to publish the main screening results much of which had been caried out many years before and which was not readily accessible. However, the CSIRO Bulletins (No's 241 and 265) of 1949 and 1952 authored by L.J. Webb, a botanist appointed to CSIRO (Division of Plant Industry) at the end of the war, and which were concerned with the screening of Queensland plants for alkaloids, were well known.

The five authors of "Plants and Medicines" are chemists who have been intimately concerned with the survey and they are to be congratulated on producing a book which is not only timely in view of the upsurge of interest in "things green" but also in providing a reference book which will become a must for any Australian natural products chemist.

The book includes chapters on the history of the Photochemical Survey and the CSIRO screening programme, the alkaloid and anti-tumour screening results, the pharmacology of the alkaloids, and the anti-tumour constituents. Each of the latter two chapters presents the results in tabular form but also gives details and a discussion of the testing for each entry. Included is a bibliography of Australian phytochemistry for the period 1940-1987, and indexes of plant genera, plant families, authors from the bibliography, and the 443 chemical structures which are presented throughout the book. While not purporting to be exhaustive, the bibliography, which comprises over 2000 references, is a register which illustrates the depth of Australian endeavour in the natural products field. The contents are enhanced by a selection of colour plates of Banks' Florilegium prints and colour photographs representative of species in various categories.

The book is attractively produced by the Publication Section of CSIRO and at $70 (Aust.) is good value for money. The volume is likely to fnd a place on the shelves of most Australian natural products chemists and indeed on those of many overseas chemists.

R.C. Cambie

WOMEN IN SCIENCE

ASSOCIATION FOR WOMEN IN THE SCIENCES

The Association for Women in the Sciences (AWIS) was formed in 1986 to encourage women to use and develop their scientific abilities and to achieve their full potential. AWIS has over 80 members throughout New Zealand, although most live in Wellington, members may be contacted in many of the larger centres.

The Association aims:

— to provide a network for women interested or working in the sciences to share scientific information, experience and skills;

— to explore and speak on issues relating to women and to science;

— to provide social interaction with others who have similar interests;

— to assist girls and women in their role in the sciences and to increase self-knowledge;

— to provide visibility for women in the sciences.

AWIS invites membership from women in paid or unpaid employment who may be students, women wanting to get back into the workforce, or women in full-time or part-time jobs. They can be interested or working in any of the sciences including biological science, physical science, engineering, mathematics, social science, health science, computer science and technology.

The women in AWIS keep in contact through a bi-monthly newsletter and meetings on a variety of topics. Some recent meetings include: Dr Margret Vissers, biochemist at the Christchurch Clinical School who spoke about her life and work; an annual dinner at a Wellington restaurant; an evening for postgraduate women science students at Victoria University where career opportunities and job-seeking skills were discussed; Dame Joan Metge, Member of the recent Science and Technology Advisory Committee who led discussion on the STAC report 'A New Deal for Science'; Carol Van Grondelle, Media Women who spoke on 'The Media and How it can Work for You'.

The annual subscription is $15 for Wellington members and $10 for out-of town members. If you wish to join, or want more information please write to the Treasurer, P.O. Box 184, Wellington.

PRODUCT FEATURE ELECTROCHEMICAL METHODS

For many years electrochemical methods of analysis have been less popular than say spectroscopy or chromatography. This has perhaps been a reflection of mistrust that many chemists have of electrochemistry. Traditionally electrochemistry has been part of chemistry that students have struggled with. A lot of chemists now in middle management positions can probably remember studying electrochemistry just after IUPAC fixed the convention for electrode potentials. This resulted in half the textbooks being written as reduction potentials and half as oxidation potentials. To the student this was a veritable mine field of misinterpretations and confusion. Then when confronted with undergraduate laboratories with a collection of electrodes joined together with rusty alligator clips the main exercise was getting a good electrical connection and a reproducible reading. Of course poor reproducability of the electrode surface meant that any result could be justified at a pinch. Thus students studying electrochemistry then did not appreciate its true value.

Now these times are long past and electrochemistry has gained a lot in respectability. The pH electrode is now standard equipment in nearly all laboratories. In fact many chemists forget that the pH meter represents one of the most commonly used electrochemical devices. The development of cheap reliable instruments and sophisticated data processing has greatly enhanced its image. It is only natural that a technique based on electricity should be eminently suited to automation and electronic data processing.

The simplest technique is of course conductivity. Here the principles of cell design have varied very little over the years other than the shift from glass to plastic which is more robust. One interesting development is a new conductivity cell from Radiometer with an in-built temperature sensor. This allows automatic temperature correction with the temperature measured being that in the actual cell.

The ion selective electrodes have been with us for some time now and for particular analyses have become almost universally accepted as the preferred method. Improvements in reliability and durability along with the simplicity of the selective ion electrode in use make it ideal for rapid routine analyses. The most common selective ion electrode is the glass combination electrode for measuring pH. This is also one of the most abused electrodes, commonly used to measure pH in a wide variety of solutions which contaminate and block it. A recent development from several manufacturers are electrodes in which electrolyte diffuses slowly out through the liquid junction to prevent contamination of the interior of the electrode. Also available through John Morris Scientific is a series of booklets published by Ingold which describe how to care for pH electrodes.

Selective ion and pH electrodes are now a mature technology with a wide range of products on the market. This has raised the question of what meter and what electrode to use for a particular application. To help with this dillema manufacturers publish guides as to which electrode should be used for which application and EDT now publish a guide as to which meter will best suit particular applications and budgets.

One of the big advances in electrochemistry has come from the application of automation and data processing. The autotitrator has been around for many years now. Many laboratories have used them to perform routine acid base or chloride titrations using an pH or chloride electrode and a chart recorder. The samples were changed by hand and the data read of the chart to give (after some calculation) a result. This has changed considerably over recent years. Sample changers have dropped in price although still considered somewhat a luxury by many chemists. The biggest change has come in the data interpretation. Digital data handling techniques have developed to the point where titrations which would not give a sufficiently clear end point for a simple graphical interpretation can be used to give multiple determinations. Instead of sophisticated chemical pretreatment of the sample to allow a clear end point to be obtained in a titration now sophisticated data treatment after the titration allows little or no sample pretreatment to obtain the same data. The new technique is much faster and can often be purchased off the shelf. Several companies supply a range of autotitrators suited to various budgets and back these up with a wide range of applications brochures. Metrohm, through John Morris Scientific, have perhaps the longest involvement in this area of application brochures but many other principles provide similar expertise.

The polarograph is not a new instrument to chemical analysis. However application of modern electronics and data handling procedures have got rid of the old sawtooth wave which horrified many a budding chemist. In its place are diffential pulse techniques which have detection limits lower than the more routinely accepted atomic absorption spectrophotometry. It is odd that New Zealand has not taken to polarography while it has

proved moderately popular in Australia. This is in spite of AAS having originated in Australia. One of the strong features of Polarography is its ability to determine several species in one sweep. This coupled with its ability to determine reducible organics make it a very powerful technique. In fact polarography is the ASTM recommended method for the determination of nitrobenzene in aniline and methods are available for styrene monomer in polystyrene and other polymers.

The next development from polarogrphy was anodic stripping voltammetry which has developed into cyclic voltammetry. This has proved to be more popular than polarography because of its ability to detect trace metals to the parts per billion range. The sensitivity of this technique is so great that purified mercury has to be used in many instances. Recent environmental concerns about trace levels of heavy metals will no doubt give a lot of chemists a chance to get to know this technique. for heavy metals it is particularly well suited and will rival ICP at a much lower cost.

Coupling electrochemical detectors to ion and HPLC chromatography has meant a vast increase in the range of species detected electrochemically. One of the problems that electrochemical methods can suffer from is a lack of selectivity in very complex mixtures. How much is each species contributing to the electrode current is a common problem. With a chromatographic separation of the species before they reach the detector this problem disappears and the sensitivity of electrochemical detection become a big advantage.

In its simplest form electrochemical detection is the conductivity detector in ion cromatography. This technique has proved very versatile for ions in solution enabling quantitive determination of a wide variety of ions in one operation. This has proved a major step forward for analysis of anions at low concentrations. It can be extended beyond the obvious determination of sulphate and chloride to fluoride and on to such species as phthalate. With the use of an amperometric detector another range of species can be detected with very high sensitivity. The fact that different species are best detected by different techniques is embodied in the new Pulsed Electrochemical Detector from Dionex. This instrument is capable of detecting species by several different techniques for example conductivity, amperometry or cyclic voltammetry.

The strength of electrochemical detection in HPLC is demonstrated by the development of systems for the electrochemical detection of amino acids. The Dionex system is to derivatise the amino acid with Phenylisothiocyanate which is then sensitive to amperometric detection. This detection system does not suffer from interference from other species in solution in the way UV detection does. Dionex has also developed a system for oligosaccharides analysis. This is based on separation of the oligosaccahrides on an anion exchange column at high pH followed by detection by pulsed amperometric detection (PAD). One of the advantages of this method is that derivatisation is not required.

HPLC SAMPLE PRETREATMENT AND PREPARATION

High-performance liquid chromatography (HPLC) has become a virtually universal tool in the separation and analysis of complex mixtures from a variety of liquid matrices. HPLC's combined attributes of speed and sensitivity, when coupled with improvements in detector and pump designs as well as in column sensitivies and resolution, have led to a growing number of applications.

However, the growth in scope of HPLC applicability has increased the burden on conventional sample handling techniques. As HPLC technologies have improved to the point that the use of ever smaller sample volumes and improved sensitivities has become routine, the need has grown more critical to protect prechromatographic sample preparation steps against factors that could impinge on the ultimate accuracy and efficient use of HPLC. These include: sample contamination, recovery losses, or perturbations to the intrinsic chemical behaviour of the molecule(s) of interest.

One sample handling solution is centrifugal vacuum evaporation. The SpeedVac® system (Savant Instruments, Inc., Farmingdale, NY) combines vacuum evaporation with centrifugal force in a gentle, bump-free concentrating action that produces easily redissolved, dry residue at the bottom of each tube.

Another factor complicating the selection of a proper sample handling technique is the growth in scope and applicability of HPLC. Currently, there are two distinct segments: analytical and preparative HPLC.

Analytical HPLC provides information about samples and the substances contained in them, using quantitation and detection at limits that can range as low as femtomolar concentrations. On the other hand, preparative HPLC enables the separationa and recovery of substances in amounts ranging from microgram to kilogram quantities. Newer column absorbents allow an expanded field of molecules that can be amenable for separations ranging from small (~several hundred molecular weight) to macromolecular (10,000 to 1 million molecular weight).

To maintain the high performance of the separations achievable with HPLC, the volume in which the substances are dissolved and injected becomes a critical parameter. But along with the widening range of HPLC applications comes a widening range of sample volume requirements.

Whatever the HPLC application or chromatography mode used, SpeedVac-ing can be applied to process samples to minimal volumes with the highest possible recoveries. The systems accept a variety of tubes, flasks, and vials, and range in capacity up to 200 tubes or 1.6 L batches. As a result, centrifugal vacuum evaporation can be applied equally effectively to organic solvents in small-volume HPLC fractions and to HPLC fractions ranging in volume to 100mL per fraction.

Volume Requirements

Recovery of samples presents different volume considerations. Samples recovered from typical elutions from an HPLC column are diluted 10-to 50-fold. Dilution effects are even more appreciable with preparative HPLC, given the lower efficiencies of preparative columns and the enhanced band broadening that results from the use of such columns, which are packed mainly with large microparticulate particles (~40 µm).

Whatever the type of solvents, centrifugal vacuum evaporation will speed up the removal process. For organic solvents, removal can take no longer than 1 to 2 hr. In addition, taking acqueous solvents to dryness will take no longer than 4 to 6 hr. For heat stable samples, the process can be speeded up with the application of heat, an optional capability with this system.

Sample pretreatment

Often, when complex, heterogenous mixtures are involved, the work load of the HPLC column can be improved significantly through sample pretreatment. Many of the interfering substances present in the sample can be reduced by means of any of several pretreatment methodologies. The ultimate benefits derived from sample pretreatment are shorter analysis and recycle times and enhanced column lifetimes. Whatever the sample pretreatment technique used - from solvent or solid-phase extractions to ultrafiltration - an intermediate step involving sample reduction is frequently involved.

However, to achieve high recovery yields, multiple extraction steps are required. Working volumes usually range from 1 - 20 mL, depending on the extraction efficiency of the solvents employed for the solutes of interest. The definition of the immiscible phases can be facilitated through the use of a low-speed centrifugation step. Removal of the desired top or bottom phase then follows with the solvent concentration step.

The time course for solvent removal is dependent on the organic character of the solvent and the mode of solvent reduction employed.

Conclusion

SpeedVac-ing is capable of meeting the growing variety of sample volume, preparation, and recovery requirements of HPLC. This technique provides advantages over the more traditonal methods of sample concentration by means of its wide solvent utilization capabilities, speed, large sample handling capabilities, absence of cross-contamination, and the elimination of any transfer steps.

FRONT COVER STORY

The MISTRAL 2000 is the high tech replacement for the very successful Centaur II. The 2000 brings technological advances to the small centrifuge which were previously only found in much larger MSE instruments.

This instrument exhibits some remarkable design innovations which produce significant gains in precision and reproduceability, in safety and in convenience of operation. The MSE rotor identification system automatically recognizes the rotor being used, thus making the system completely safe, even with inexperienced operators. A touch sensitive pad and liquid-crystal display guides the user through setting run parameters. e.g. actual 'g' force required (without needing additional calculation or input of rotor data).

When the centrifuge is switched on, opened and loaded, the display automatically shows the parameters of the last run. If a repeat run is not desired, the user is prompted to reset the parameters. The operator is guided by commands on the display in setting the new values, achieved by using the numeric keypad and the key indicated as 'NEXT'. At this stage, the user has the option to set an RCF value

rather than speed. During the run, the display gives a status report of actual run conditions, showing speed achieved and counting down the remaining run time.

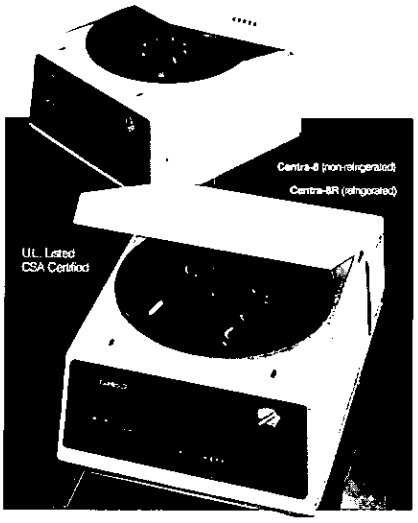
With these features and the versitility of 4x200ml bucket rotors, fixed angle and microtiter rotors the MISTRAL 2000 is one of the most formidable benchtop centrifuges available.

FEATURES:

Large capacity 4x200ml
Max 6500rpm
Max 5574g
Brushless motor - for longlife and consistency
Imbalance detector
Bowl can be autoclaved
Three brake rates
Automatic rotor identification
Battery Backup

For further information, contact Labsupply Pierce (NZ) Ltd, PO Box 34-234, Birkenhead, Auckland.

SCI MED/IEC OFFER RANGE OF CENTRIFUGES



International Equipment Company is one of the oldest (established in 1901) and largest centrifuges, with or without refrigeration, 25 models in total.

IEC are well known for providing high quality and high performance centrifuges that have an extremely long lasting ability. Customers can still purchase parts and accessories for many years after a particular model has long been discontinued.

Compatibility of accessories between models is a feature that IEC has, especially in the large capacity bench top model, the Centra 8/8R and the floor model PR 7000. Centrac adaptors can be interchanged between these instruments providing a user-friendly approach to the busy laboratories of the nineties.

For further information, contact your nearest Sci-Med branch.

NEW ZEALAND COMPANY TO BUILD NEW PLANT FOR NZFP OXYGEN SUPPLY

Air Separation Ltd, a New Zealand company which represents in australasia Air Sep Corp, a giant in the world of PSA oxygen supply plants, has won a contract to build a new $4 million chemical complex at NZ Forest product's Kinleith pulp and paper mill.

The long term contract for the building of the plant and the oxygen supply contract has been signed by Phil Thomas, managing director of the Auckland based company Air Separation Ltd, and Mr Trevan Smith, corporate secretary FERNZ Corporation Ltd.

The signing of the contract marks the end of an extensive world wide search by FERNZ for a low maintenance, efficient and economical plant which will provide NZFP's mill with oxygen.

It also marked a milestone in the history of Mr Thomas' company Air Separation Ltd, which represents in Australasia the New York based principals Air Sep Corporation.

The plant for Kinleith is the largest pressure swing oxygen (PSA) plant in the world, and until now Air Separation has been concentrating mainly on the provision of smaller packaged oxygen generation plants which have been designed to meet oxygen needs on demand for hospitals and industrial applications in remote locations, such as Pacific Island construction projects.

But Mr Thomas says the Kinleith plant is a completely different concept, mainly because of its huge production capacity. It will produce 38 metric tonnes of oxygen a day and will be built and operated to the most stringent limitations.

It is a very sophisticated plant, and once running, computer controls governing its operation will extend as far as Buffalo, New York, where a computer will allow Air Sep to monitor and control the plant online from their offices.

A contract for the construction of the plant was signed at FERNZ Auckland headquarters on May 9, and FERNZ corporation's development manager, chemicals, Mr Ron Moon said his company will place the Air Separation Ltd plant at the chemical complex adjacent to the Kinleith Mill site for the supply of chemicals to NZFP. The Oxygen will be used in the de-lignification bleaching of pulp and is an environmentally clean process producing no waste products.

Mr Moon said FERNZ evaluated a number of static oxygen technologies world wide and chose the Air Sep system of pressure swing absorption because of its high plant reliability, process simplicity, low maintenance, the depth of experience from Air Sep personnel and the number of high capacity plants already operated by Air Sep world wide.

Mr Moon said he is delighted with the acceptance of their chemical complex by NZFP and looks forward to more chemical complexes being established in future using Air Sep PSA oxygen systems.

The PSA method of oxygen generation, which has been proven and accepted over a 20 year period as an efficient and economical method of oxygen production for certain applications, is to be used in the new complex. Pulp and paper plants have been identified as a key target for this type of plant.

The PSA system generates oxygen by passing air through a molecular sieve of synthetic zeolite, which lasts indefinitely. It uses two molecular sieve beds alternately. Air is passed through one absorbent ned at high pressure. The sieve absorbs nitrogen, allowing the oxygen to pass through as product gas.

Before the bed becomes saturated with nitrogen, the inlet air is switched to the second bed. The second bed is now regenerated by desorbing nitrogen through depressurization and then purged back to atmosphere.

The pure oxygen is then passed to a separate holding tank (called the surge tank). The complete cycle is then repeated. The zeolite is completely regenerative, and under normal operating conditions will last indefinitely.

The PSA method can also be used very efficiently to generate oxygen in small transportable packaged plants.

Although most of the components for the Kinleith plant will come from overseas, much of the labour and the equipment, including the pressure vessels, will be sourced from New Zealand.

Parties to the signing of the contract for the provision of the high capacity oxygen generation plant for FERNZ are (left) Mr Phil Thomas, managing director, Air Separation Ltd and Mr Ron Moon, development manager, chemicals for FERNZ Corporation Ltd.

FLETCHER CHALLENGE SUMMER SCIENCE SCHOOL

Development of Science and technology within New Zealand will benefit from the establishment of a summer science school for top students throughout the country, announced in Auckland recently.

The Fletcher Challenge Summer Science School will be held each January at Auckland University, and will cater to more than 100 of the best sixth form science students from schools throughout New Zealand and the Pacific Islands.

During the two-week school they will study recent developments in all fields of science, meet some of New Zealand's top scientists as well as overseas experts, Auckland University's Dean of Science, Associate Professor Roy Geddes.

"We want to help talented youngsters recognise possible vocations in science, and give them the best possible start."

Professor Geddes says New Zealand desperately needs more trained scientists, if it is not to stagnate economically and sink to Third World level.

"Environmental problems - local and global - will be solved only if tackled by the best brains in the land," he says.

The school, modelled on one run successfully in Australia for some years, is being organised as a partnership between Rotary New Zealand, Auckland University, Auckland Institute of Technology and Fletcher Challenge Limited.

An inaugural trial school was held at the university for one week last January, with 100 students from New Zealand and five from the Islands.

"We assisted that trial as a 1990 sesquicentennial project," says Fletcher Challenge's corporate affairs manager, Mr Bruce Wallace. "Based on the success of that trial, Fletcher Challenge is tonight announcing it will fund a similar but larger two-week school each year for the next three years.

"As a major beneficiary of scientific invention and endeavour, we believe industry has a duty to help talented young people to study science at the highest level.

"We also believe there is a need to improve scientific and technological competitiveness within New Zealand and internationally," Mr Wallace says.

"We are living in an era of rapidly increasing scientific and technological advances, affected all of us in every aspect of our lives.

"Yet a number of recent reviews show New Zealand is not training enough scientists. Consequently, we are entering the Nineties, and a new era of scientific skills, marvels and problems, deficient in people trained to introduce the new technologies in a manner that is efficient, effective, economical and sensitive to our national heritage," Mr Wallace says.

"Therefore, we see the Fletcher Challenge Summer Science School as an investment in the future well-being of our society."

The sponsorship, announced at a university function, was welcomed by Dr Colin Maiden, vice chancellor of the university, Professor Geddes, and the Hon. Dr Ian Shearer, Dean of Faculty of Science, Engineering and Maths, at the Auckland Institute of Technology.

Application forms for the 1991 summer science school are now available from Rotary clubs and secondary schools throughout New Zealand.

For further information contact:

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Res. (09)478-6562

Dr Ian Shearer
Dean - Faculty of Science
Engineering and Maths
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Mr Norm Winterbottom
Rotary Organiser for school
Phone. (09) 463-729

Mr Bruce Wallace
Corporate Affairs Manager
Fletcher Challenge Limited
Bus. (09)590-000
Res. (09)765-649

PRODUCT NEWS

Chromajet

Electrochemical Detector for HPLC

The CHROMAJET TM Electrochemical Detector system from EDT Analytical is the latest product in an evolutionary series going back to the earliest days of the technique. EDT introduced the LCA 10 in 1974, followed by the LCA 15 and LCA 16 in the intervening years. There are now many hundreds of these detectors in everyday use throughout the world. Based on that experience and on a programme of continuous development, EDT has now introduced the CHROMAJET TM. The electrochemical expertise of EDT has been combined with tasteful industrial design and latest manufacturing methods. The result is a high performance instrument which is ergonomic and attractive.

Pulsed Electrochemical Detector

CONDUCTIVITY AND AMPEROMETRY COMBINED IN ONE PROBLEM-SOLVING PACKAGE DIONEX

The Dionex Pulsed Electrochemical Detector (PED) combines two powerful electrochemical detection techniques - conductivity and amperometry - in a single, cost-effective module.

Both conductivity and amperometry are well established techniques for the detection of ionic and oxidizable compounds, both organic and inorganic. Many compounds can be detected by both methods, with the optimum choice governed by the sensitivity and specificity required.

Now Dionex makes it easy and economical to choose the best detector for your IC and HPLC methods. For a price only slightly greater than a single detector, the PED gives you no less than seven modes of operation.

Compare PED to other Detection Methods.

Compounds with little or no UV absorbance are frequently detected by low-wavelength UV or refractive index (RI), simply because these detectors are easy to use and are already in most laboratories. Many compounds, however, cannot be detected at any UV or visible wavelength and RI lacks the sensitivity of absorbance detection. Even when a compound is UV-absorbing, electrochemical techniques are often more sensitive and specific, especially if the UV wavelength is < 220nm. While modern RI detector sensitivity has improved somewhat, lack of specifity and incompatibility with gradient elution are still serious limitations.

Dionex has made both conductivity and amperometry compatible with gradient elution. When operated in series with a UV/Vis detector, PED provides a nearly universal methods development detection strategy with unparalleled capability.

The new DL70 Titrator from METTLER:

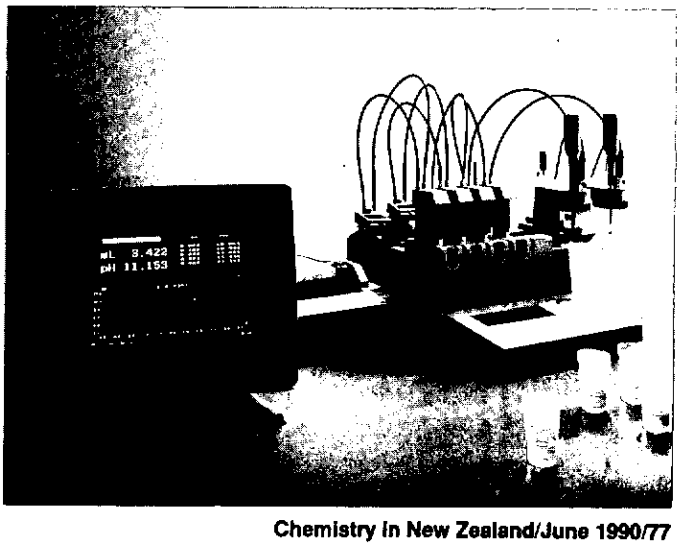
Time-saving multitasking and a high degree of automation.

Up to four burettes can be mounted on the new Mettler DL70 Titrator from Watson Victor. Automation can thus be extended with several burettes without the need for more space. As a multitasking system the titrator controls burettes and electrodes automatically. Parallel to this, new sample data can be entered, a new method developed or modifications made to a method currently in progress.

Each method is composed of a series of functions such as sample preparation, content determination, evaluation, result recording, etc. The functions can be combined in any way and each can be inserted at the location most appropriate to the application in question. Fine tuning to the specific application is achieved by use of parameters that make up each function of a method.

The built-in method data base provides solutions for applications in widespread use. Either these are accepted unchanged by the user or his/her own, quite specific method can be compiled via the parameters and the recombination and addition of functions.

The DL70 Titrator handles practically all common titration methods such as acid/base, redox, complexation and precipitation titrations to equivalence or end point. These the DL70 Titrator can perform as a direct titration, back titration, sum, displacement or simultaneous titration. It also handles conductometric, potentiometric, photometric and voltametric titra-



tions as easily as single or multi-stage titrations.

Special applications such as PH-stating or titrations according to standards (DIN,ASTM) can also be performed.

The DL70 starts the titration in accordance with the specified method instructions. This includes automatic activation of the burettes, electrodes and resources configured in the method.

While the DL70 Titrator titrates a sample, the user can enter new sample data, develop a new method and make certain modifications to a method currently in progress. Weight values, which are reconciled automatically to the result, can be entered before, during or after the determination.

Operation is via a clearly arranged alphanumeric keypad which is used to identifiy samples, configure methods and enter instructions. The multiline display provides continuous information durlng the titration data such as titration curves, curve of the 1st and 2nd derivative, the table of measured values, the current titrant consumption and the current potential can if desired be shown on both the display and terminal. These titration representations specified in the method can be called up online during the titration and selected on the display at a keystroke. The titrator can also be operated from the keyboard of a terminal.

Various peripherals such as the METTLER ST20 Sample Changer and computers can be attached to the DL70. An RS232C interface for a dot matrix printer (Epson and Epson-compatible), a current loop interface for the attachment of a METTLER balance and three outputs for auxiliary instruments such as pumps, valves, etc. are built in as standard.

The new Mettler DL70 Titrator is available from Watson Victor Ltd.

Cholinesterase Assay

Accurate, precise and easy determination of cholinesterase activity is obtained by means of the pH-stat method, which directly measures the hydrolysis of choline esters caused by the enzyme at a constant pH-value.

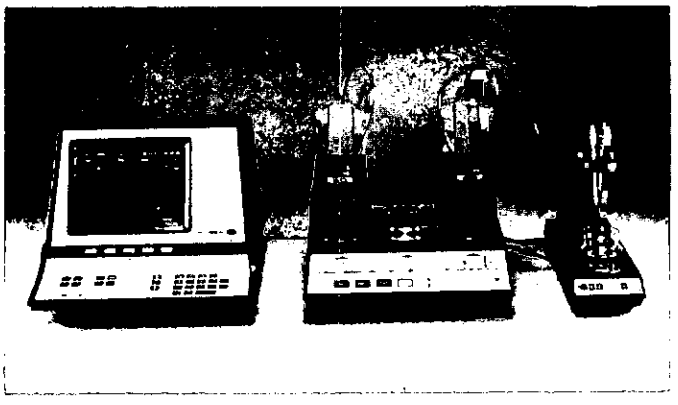
The pH-stat method takes only 6 minutes to perform, during which period the reaction can be followed on the CRT-Screen of the system. Result facilities include calculation of specific activity, curve of added volume versus time, curve of pH-value versus time, statistics, etc.

Compared to spectrophotometric methods, pH-stat does not require buffers or substrates foreign to the enzyme, and it is not subjected to errors from colour interference. Different types of cholinesterase can be determined specifically by using appropriate substrates.

The TitraLab*TM 11 High Performance Titration Laboratory from Radiometer Analytical A/S is designed for pH-stat work, and it offers automatic calculation of results. They system measures the pH value of the sample 40 times per minute with a resolution of 0.001 pH and adjusts the continuous addition of alkali accordingly. The volume of added alkali is determined with a resolution of 0.1 ml. This gives excellent maintenance of a constant pH value and a reliable real-time kinetics curve for rate calculations.

The assay procedure is documented on a 3-page application note describing the apparatus settings, reagents, sample preparation ad typical results with statistics. The procedure "cholinesterase activity, computerized method" is available free of charge.

For further information, please contact Radiometer Analytical A/S or the sole distributor in your country. Our distributor in New Zealand is: Radiometer Pacific Ltd., P.O. Box 58468, Greenmount, Auckland. Telephone: 573-110. Telefax: 573-1106.



Conducitivity cell with built-in temperature sensor

Conductivity measurements are very temperature dependent. Consequently, in order to ease the analysis considerably, the new CDC304T cell from Radiometer Analytical is designed to get simultaneously measurements of conductivity and temperature.

The new cell is based on the proved CDC304 type having a bell-design with one inner and two outer electrodes, which secure a well defined and stable cell constant. Incorporated in the new design is the temperature sensor at the same position as the measuring electrodes. That is conductivity and temperature are correctly associated with each other and any automatic temperature correction is doen in an optimal way.

The CDC304T is primarily used together with the CDM83 autoranging and autocalibrating conductivity meter. This meter has 7 measuring ranges and measures from 0.001 mS/cm to 1300 mS/cm. Range and frequency selection is doen automatically using 4 different frequencies from 73 Hz to 50kHz. Therefore, measurements at high conductivities are possible using cells with bright platinum electrodes.

For further information, please contact Radiometer Analytical A/S or the sole distributor in your country. Our distributor in New Zealand is: Radiometer Pacific Ltd., P.O. Box 58468, Greenmount, Auckland. Telephone: 573-110. Telefax: 573-1106.

ORION UNBREAKABLE ROSS SURE-FLOW pH ELECTRODE

ORION have added an unbreakable, epoxy body version to their line of ROSS SURE-FLOW electrodes. The new Model 81-65 can stand up to rugged handling that would break a glass electrode. It won't smash if it falls from your benchtop, or crack if you hit it against your beaker. And, there is no need to wrap and protect the Model 81-65 when travelling to the field.

The Orion Model 81-65 available from Watson Victor Ltd has the same unique reference junction design that solves the common problem of clogged reference junctions. In a conventional pH electrode, a clogged junction leads to poor reproducibility and even electrode failure. The SURE-FLOW design assures you of stable, drift-free potentials with a free-flowing, liquid-to-liquid junction.

And, when you have a really dirty sample that would clog conventional electrode junctions, the SURE-FLOW electrode junction can easily be opened and cleaned. Simply depress the cap and the junction is flushed; release the cap. and the junction is reset. Orion instruments and electrodes are available in New Zealand from Watson Victor Ltd.

ORION SA720 pH/ISE METER

ORION has many years of experience in electrode technology - they know what is being measured "in the beaker". They also know that your analysing needs now, may not be the only needs you require satisfied in the future. With the ORION SA720 pH/ISE Meter from Watson Victor Ltd you can measure pH, concentrations, redox or O_2.

Easy to operate, the green ready light is your signal to go. As you proceed, other green LED's will also light up on the meter's splashproof keypad, letting you know at a glance where you are in the measurement.

For the best in electrode measurements today and tomorrow, look to the ORION SA720 meter; the meter with the flexibility to manage your expanding measurement needs. Orion instruments are available in New Zealand from Watson Victor Ltd.

ORION SA520

ORION's SA520/mV/temperature Meter is designed for hard work, including economical oxygen measurement. Teh SA520 is ideal for industrial Q.C. laboratories, school/university use, and municipal water treatment plants, or whenever a durable workhorse is required.

pH measurements are simple to perform with many automated features. With autocalibration for 4.01, 7.00 and 10.01 pH buffers, two keys are pressed and calibration is complete. Additional advanced features include automatic temperature compensation, prompting, adjustable isopotential, and diagnostic operator assistance codes.

Orion SA520 available from Watson Victor Ltd, has controls which are easy to understand and use. Recessed on/off and mode selection switches eliminate changes caused by bumping protruding knobs and dials. The eight key, sealed membrane touch-pad withstands dust and spills.

A choice of more speed or more accuracy, according to your requirements, is given. Faster results are achieved with .1 pH resolution of .01 resolution for more accuracy.

The ORION SA520 which may be battery or line operated, and includes recorder and Karl Fischer outputs, is available from Watson Victor Ltd.

NEW SAFER FUMECUPBOARD

The newly launched XTRACARE fumecupboard by Thermoplastic Engineering Ltd of Wellington is a real breakthrough. This "fumecupboard that thinks" has a microprocessor control system for greater operator safety.

Incorporating warning sound devices, it provides an automatic start-up sixty second purging cycle during which services other than water cannot be utilised. A display panel signalling the operating mode and an automatic emergency shutdown are among the new features.

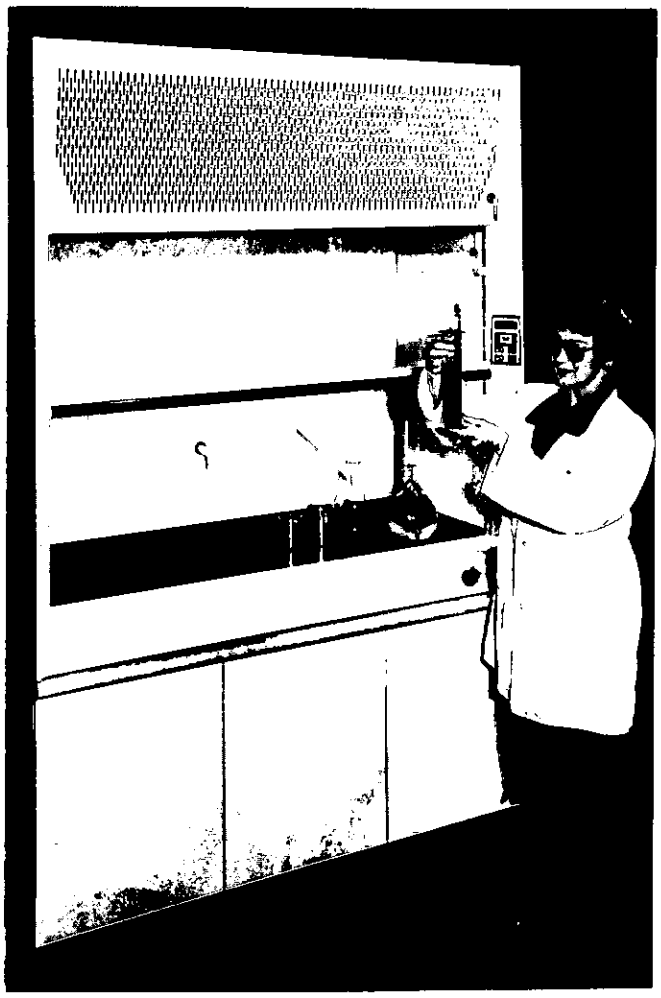
The two part counterweighted vibration-free door has a fial-safe stop at 50mm from the sill, thus protecting operator hands. Airflow through the door is maintained at 0.5m/sec irrespective of door position.

Slimline front columns give minimal impedance to airflow, thus increasing fume containment. The ergonomically designed front beam carrying control taps and greater interior space make for ease and simplicity of operation.

Automatic heat and airflow sensing systems help XTRACARE to fully meet N.Z. Standards 7203and 6101 Part 3. It is the only New Zealand fumecupboard to do so.

Standard units in italic cream calender pressed PVC come complete with a rear mounted water tap and front mounted control; an oblong sink and overhead lighting delivering 400 lux at the working surface. A wide range of optional extras are available.

Thermoplastic Engineering Ltd.
151 Park Road, Miramar, P.O Box 15-174, Wellington.
Telephone (04) 882092,
Fax (04) 887523



SURVIVAIR "OUTSTANDING SUCCESS IN NEW ZEALAND"

An agency agreement between US respiratory equipment manufacturer Survivair and NZ Safety Limited has proved highly successful in the Kiwi market.

NZ Safety was appointed sole New Zealand distributor for Survivair's respiratory halfmasks in September and since then business has been booming.

"Sales have been outstanding and market acceptance of product excellent," says NZ Safety general manager Mike Arnott.

Mr Rodney Culwell, Survivair's international sales manager, who recently visited New Zealand, says tough US safety standards contribute to Survivair's excellence in the marketplace.

For further information contact NZ Safety Ltd, Private Bag, Auckland.

TWO BALANCES IN ONE

The METTLER AT261 offers a classic analytical balance in the macro range, plus a semimicro balance in one compact unit. The new AT261 provides economy of space and funds with the semimicro balance facility which can be called up via the DeltaRange. The semimicro capacity can be swung into action at any point over the entire weighing range of 205g (readability 0.1mg) and as often as required. The DeltaRange always comprises a weighing range of 62g with a readability of 0.01mg.

METTLER's AT261 is particularly suitable for weighing small quantities into heavy vessels, in addition to very precise formula weighings. Featuring all technical benefits of the recently introduced AT series, including a fully automatic draft shield, the AT261 is equipped with a current loop and RS232C interface as standard.

For further information contact Watson Victor Ltd, Auckland, PO Box 1216; Wellington, PO Box 1180; Christchurch PO Box 706; Dunedin PO Box 921.

NEW AND IMPROVED ION-EXCHANGE COLUMNS

Phenomenex has introduced a new series of HPLC columns for analysis of carbohydrates, organic acids, amino-sugars, and alcohols. Based on a rigid, sulfonated styrene divinylbenzene matrix, REZEX columns offer outstanding separations via ion-exchange, ionexclusion, and partition mechanisms. Two ionic forms are currently available, calcium and hydrogen, providing a range of selectivities; columns are available in 5 standard dimensions as well as custom configurations.

For further information contact Sci-Med, P.O. Box 321, Dunedin.

FLOW INJECTION ANALYSIS BIBLIOGRAPHY FROM TECATOR

More than 2000 articles covering Flow Injection Analysis have been published.

Tecator has now released the "FIAstar Flow Injection Analysis Bibliography, Supplement 1987/88".

It contains 500 references from scientific journals and is organized in the same way as the original 1974-1984 Bibliography and the 1985 and 1986 Supplements with a cross-index covering 255 species determined with FIA, tables for different application areas and instrumental techniques used and a keyword index. All authors are listed in a special alphabetical author index.

Almost 90% of the references are application oriented with environmental analysis/water testing as the single most important application area.

The Tecator series of FIAstar Bibliographies has been shown to be a valuable tool to anyone using or intending to apply Flow Injection Analysis.

For more information contact Wilton Instruments, PO Box 31-044, Lower Hutt.

ICI/GBC 904 & 905 SPECTROPHOTOMETERS

ICI Instruments have released the ICI/GBC 904 & 905 atomic absorption spectrophotometers. These models are based on the ICI/GBC 906 fully automatic AAS and are designed for routine analysis in the budget conscious laboratory. The 905 has single beam optics and the 904 has double beam optics. Both instruments incorporate automatic wavelength and slit setting, video display, disk storage and full alphanumeric keyboard. Options include four lamp turret and programmable flame control. The inbuilt disk drive provides storage for methods, results, signal graphics, calibration graphs, report headings, notes, sample labels and sample weights.

Complete software for analysis by flame, furnace and vapour generation is included. Accessories include the FS3000 autosampler for flame analysis, the System 3000 for automated graphite furnace analysis and the HG3000 for automated hydride generation.

For applications requiring only graphite furnace operation, a dedicated double beam system is available. The 904G dedicated furnace AAS with System 3000 utilizes the unique Ultra-Pulse background correction technique.

The Ultra-Pulse background correction system is so fast that it corrects for rapidly changing background. The system is capable of, *inter alia*, analyzing Cadmium in sea water and Selenium in high iron background. Such analysis previously required a highly priced Zeeman system. Now the budget conscious chemist can perform these analyses not only more effectively but also more economically.

For further information contact ICI Instruments, Telephone (09) 735-765

ICI Instruments

ARRIVES IN NEW ZEALAND

And we are ready to provide you with the best in chromatography, spectroscopy and materials testing instrumentation, with on-going service to match.

Reliable, accurate and efficient measurement is at the heart of every scientific, industrial and manufacturing solution. Our experience, scientific know-how and international network guarantees satisfaction and expert professional support throughout a wide range of demanding applications.

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A suite of compact, user friendly and modular instruments to simplify your most complex chromatography needs.

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- ICI LC1260 Electrochemical Detector
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- ICI LC1600 Advanced Auto Sampler
- ICI TC1900 HPLC Oven
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An advanced range of instruments providing essential data for the definition, quality control and processing of high technology materials.

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ICI/GBC 904 Atomic Absorption Spectrophotometer

Spectroscopy

Incorporating the latest features and accessories ICI/GBC provide cost-effective solutions to a host of analytical applications.

- ICI/GBC 911 UV Visible Spectrophotometer
- ICI/GBC Atomic Absorption Spectrophotometers
- ICI/GBC HG3000 Automatic Hydride Generation
- ICI/GBC System 3000 Graphite Furnace Atomic Absorption Spectrophotometer.

when measurement matters, and experience counts.

For further information:
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246 Khyber Pass Road
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