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NZIC Chemistry IN NEW ZEALAND

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FOCUS ON
ENVIRONMENTAL MONITORING, WASTE MANAGEMENT, CONSULTING LABORATORIES

CHEMISTRY IN NEW ZEALAND

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FRONT COVER

Shimadzu QP-5000 GC-MS

GCMS Just Got Better & Easier

DOUGLAS Scientific SHIMADZU

Shimadzu and Douglas Scientific recently introduced the new QP-5000 bench-top GC-MS system. GC-MS is the recognised method of choice for many environmental analyses and the high sensitivity and increased mass range coupled with ease of use means the new system is ideal for a busy laboratory.

For further information see the **cover story on page 2**

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May 1994 Issue - Focus on the Dairy Industry

Deadline for material:
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contributions and enquiries to:
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COVER STORY

SHIMADZU QP-5000

GC-MS JUST GOT BETTER & EASIER

Shimadzu and Douglas Scientific introduce the QP-5000, a new high performance benchtop GC-MS system designed to handle the rigours of environmental analysis.

Social demands for more sensitive and precise monitoring of air, water, soil and foods are ensuring that environmental analysis is emerging as one of the most significant areas of the analytical sciences.

Often in environmental analyses, particularly of organics, a large number of components must be identified and determined in a single analysis. Each year the number of components requiring separation and analysis is increasing rapidly. Even with the separation power of modern high resolution capillary GC columns, there is a still greater need for more confidence in peak identification and ever increasing demands for higher sensitivity analyses.

GC-MS is recognised as the method of choice for the majority of these applications.

The Shimadzu QP-5000 is a newly designed benchtop GC-MS which notably features an increased mass range and very high sensitivity. The design concept of the instrument is that it's operation should be easy and accessible to gas chromatographers accustomed to working with FIDs and other conventional GC detectors.

The GC and the mass spectrometer are fully integrated for seamless operation and control through the PC's WINDOWS environment. The software is extremely easy to use, incorporating the latest WINDOWS features and facilitating powerful multi-tasking and switching between jobs. The result is that you will find that you save time setting up, freeing you to concentrate on designing your analyses, reviewing the data and evaluating the results.

The ionisation chamber is at the front of the instrument for improved accessibility. So filament, ionisation box and ion optics are easy to reach for cleaning and replacement. And when it comes to operation you aren't delayed by reading complicated instruction manuals or learning complex methods. Operation under WINDOWS allows everything, including instrument adjustments, analysis and report generation to be performed quickly and intuitively with just the click of a mouse. Complete control of the gas chromatograph, software control of all carrier gas flows including split ratio, optional autosampler, mass spectrometer and printer from the data system provides streamlined and fully integrated operation for all users.

Incorporation of a turbomolecular pumping system allows quick changeover from EI to CI operation in EI/CI models and a quick restart after column changeover. Furthermore you can be assured of cleaner backgrounds and no chance of system contamination compared with diffusion pump systems.

Higher sensitivity is the result of increased ionisation efficiency, high throughput of created ions and increased detection of these ions.

All in all the QP-5000 GC-MS is an instrument that has stirred considerable interest wherever it has been seen in the short time since its introduction. Shimadzu Australia and Douglas Scientific have made a considerable investment to strongly introducing and supporting the system here by investment in demonstration/backup instruments and training personnel in the servicing and operation of the instrument. If you are considering GC-MS instrumentation for your laboratory, call us today for more information or a demonstration.

Douglas Scientific, P O Box 45 027, Auckland 8, Ph (09) 837 5447, outside Auckland Ph (0800) 735 725, Fax (09) 836 0668, **or circle no. 3 on the reader reply card**

ENVIRONMENTAL ISSUES

The NZIC's Environmental Committee

Some two years ago the Standing Committee of the NZIC Council made provision for the establishment of an Environmental Committee.

Previously the NZIC had an "Environment Committee" and a "Hazardous Chemicals Committee" - the first contributed chemical view points on environmental issues and the second dealt with the safe use and transport of chemicals. The proposal was to combine these two committees under the title "Environmental Committee" rather than the longer title of "Environment and Hazardous Chemicals committee".

The objectives set for the Committee were as follows:

- Liaise with the Ministry for the Environment.
- Prepare statements giving a chemists point of view on environmental issues.
- Comment on environmental impact reports.
- Comment on proposed environmental legislation.
- Comment on the safe use and transport of chemicals in the laboratory and in the community.

Issues for the Committee to address were expected to be those referred for comment from the Branches and others that were referred to the NZIC from external sources.

It was envisaged that the Committee would initially be Auckland based. A convenor was appointed and Branches were invited to nominate corresponding members.

Discussions with potential committee members clearly indicated that there was little support for the concept of fixed membership and regular meetings but that membership should change so that the best expertise available would address each specific issue.

To date Branches have not referred issues for comment and as a result the Committee as such has not been formed. Several issues however have arisen from other sources. These have been handled by the convenor and the NZIC's executive officer.

Unfortunately the limited time allowed for response in many cases has not allowed as full an evaluation or obtaining as wide a consensus of opinion as would be desirable.

Activities that have been addressed in this way have included

- Representing the NZIC on the Environment and Health Committee of the NZ Chemical Industries Council.

- Collating responses received to form a submission on the proposed Hazardous Substances and New Organisms legislation (see update in *Chemistry in New Zealand Vol. 57 No. 5*, November 1993 page 2).

- Responding to Ministries requests for comments on proposals such as the use of MMT and other measures to reduce the lead content of petrol, (see discussion in *Chemistry in New Zealand Vol. 57 No. 4*, September 1993 page 24). Also commenting on the implications involved if New Zealand ratifies the Basel Convention relating to the Transboundary Movement of Hazardous Waste.

- Reviewing and responding to TELARC on draft specifications for product categories prior to certification under the Environmental Choice programme (see this issue page 8).

- Receiving comments and queries from members.

An initiative promoted through the Auckland Branch involved a regional survey of surplus chemicals held in secondary schools leading to exchange and appropriate disposal.

Recent and proposed changes to legislation covering environmental, health and safety matters increases the potential for the NZIC or individual members to become involved in these issues. The objectives set for the Committee are such that the NZIC, similar to other professional organisations such as IPENZ, could be pro-active in these matters. This would show that chemists are aware of and informed on these issues and as a result the image of chemistry as a science would be further enhanced.

Within the membership of the NZIC there is considerable expertise. The problem is how to tap into this, particularly at relatively short notice. Also this is the era of user pays. This together with other demands limits the time which can be given by individuals in contributing to a collective response on behalf of the Institute.

It must be left to the members either individually or collectively through Branches to decide whether or not the Environmental Committee should continue as at present or become more pro-active. In the latter case this would require greater willingness on the part of members to contribute their expertise.

If you would like to know more about the Committee or to contribute your expertise to its activities please contact the convenor: Norman Thom, Hon. Lecturer, Environmental Science, Faculty of Science, The University of Auckland, Private Bag 92019, Auckland. Ph (09) 3737 599 Extn 5659, Fax (09) 373 7470, Email n.thom@auckland.ac.nz

GREENHOUSE UPDATE

At the recent 5th NZ Coal Conference Dr Michael Porter, Director of the Tasman Institute in Australia prefaced his paper on the use of economic instruments to meet environmental goals, by questioning the supposed dangers of global warming and ozone depletion. He went on to say that in his judgement New Zealand was "shooting itself in the foot" by agreeing to cut its carbon dioxide levels by 20% of 1990 levels by the year 2000. His task as an economist, he said, was to calculate the consequences of the "unwise" decision and, if possible, suggest ways to mitigate the damage. He considered the Rio Climate Convention to be grossly unfair by binding energy efficient nations to the same targets as inefficient ones.

He showed that New Zealand would suffer more than any other nation if it tried to meet its target. He estimated that it would need a carbon tax of US$97 per tonne of carbon dioxide, which would lead to a reduction in standard of living by 1.65%. The same level of emissions reduction by other countries would cause a reduction in standard of living of only 0.19% for Japan and 0.38% for the USA. He said that the USA has the highest emissions per capita and the USA, former USSR and China between them emit 51% of all carbon dioxide emissions. Action by New Zealand, on its current 0.12% of global emissions would result in no measurable effect on global emissions, at great expense to the New Zealand economy.

Michael Porter said that he was in favour of exchangeable permits for all emissions and pollutants. A full scale global trading system could reduce New Zealand's greenhouse gas stabilisation costs by one-third.

SOURCE: "Greenhouse Update", Coal Research Newsletter, Number 12, December 1993.

OBITUARY

PROFESSOR RICHARD DEAN BATT

Dick Batt died on the 2nd January aged 70. He was Professor of Biochemistry at Massey University and a leader in the field of alcohol metabolism.

Professor Batt joined Massey in 1964 when he was appointed to the Chair of Biochemistry in the Chemistry and Biochemistry Department and also appointed Dean of the newly established science faculty. He retired in 1989 as Emeritus Professor of Biochemistry.

His studies lead to assessments of the extent to which the rates of alcohol metabolism could affect the estimated blood alcohol levels based on consumption. His preeminence and expertise in this field saw him called over 500 times to give his opinions in court cases.

In 1976 he was awarded an MBE for services to science. He was generous in his support of younger scientists and many will remember him for the help and support he gave to their careers.

He is survived by his wife Nancy, 3 children and 3 grandchildren.

COMPANY AND INDUSTRY NEWS

ICP-MS...A FIRST FOR NEW ZEALAND, A FIRST FOR PERKIN-ELMER

Perkin-Elmer New Zealand recently completed installation of a Perkin-Elmer Sciex ELAN 5100 Inductively Coupled Plasma - Mass Spectrometer at the laboratories of ESR: Environmental on the Gracefield site in Lower Hutt. The instrument is the first ICP-MS to be installed in New Zealand and will be fully supported by Perkin-Elmer New Zealand service personnel based in Wellington and Auckland. For further information on the Perkin-Elmer Sciex ELAN 5100 system see the product focus on page 26.

ANNOUNCING ENVIRONMENTAL TECHNOLOGY LTD

A new company has emerged in the environmental field. Environmental Technology Ltd will concentrate on supplying equipment and consumables for dust, asbestos, bacterial gases and organic vapours monitoring in air. The managing director of the new company will be Grant Kentell, formerly sales manager at Labsupply Pierce (NZ) Ltd, who has a strong history in the air monitoring industry. Key agencies for Environmental Technology Ltd include Gilian (personal sampling pumps and passive sampling badges) Gastec (detector tubes), pbi (bacteria and virus air samplers) Bacharach (confined space monitors, sniffers and area monitors).
Contact: Grant Kentell, Environmental Technology Ltd, P O Box 101 260, Auckland 10, Ph (09) 444 5927

SURVEY ON NZ's INNOVATION ENVIRONMENT

A survey is presently being carried out as part of a study of the country's innovation environment. The Ministry of Research, Science and Technology is undertaking the "Innovation Environment" project jointly with Business and Economic Research Ltd (BERL), and in association with Tradenz and the New Zealand Manufacturer's Federation. The project arose out of proposals to develop initiatives that would lead to higher levels of innovation and innovative uses of technological advances in industry.

The project seeks to define the characteristics of the New Zealand innovation environment with the aim of identifying the factors, both internal and external to a firm, which influence the interest and ability of firms to innovate.

According to a summary paper and hypothesis that has been completed by the working group, the project has developed from the concept that firms do not operate in isolation; they operate in an environment. This environment encompasses a firm's customers, suppliers and competitors, as well as research institutes, universities, schools, government departments and other organisations in the wider industry infrastructure. It is certainly more than research and development, and technology.

The way a firm interacts with its environment is determined by its size, structure, competencies, and other internal factors. In addition to these, however there are external factors which impose on a firm and force it to act in particular ways. These factors derive from issues such as national or regional cultures, availability of skills, existing competition and suppliers etc. In order to determine what changes might be appropriate to Government's role in encouraging a more innovative private sector there is a need to identify what these factors are for New Zealand.

Two surveys are therefore being undertaken with the aim of clearly identifying the different factors and their relative importance in determining innovation.

The first survey is of some 2500 firms and this addresses the issues of innovation as seen by the firms themselves. The second survey, which will be undertaken early in 1994, will be of "infrastructural" organisations and will include Crown Research Institutes, research associations, banks, government departments etc. It will address the likely impact of these organisations on innovation within firms. A number of case studies of individual firms are also being carried out to develop detailed insights of the effects of internal attributes such as structures, attitudes and competencies, on innovation. For information on the project please contact Dr George Stuart, Ministry of Research, Science and Technology, Ph (04) 472 6400.

TOO MANY ACCOUNTANTS AND LAWYERS?

"Too many New Zealand firms have managements populated by accountants who are good cost controllers but lack the forward-looking orientation necessary to the innovation process. This is in stark contrast with the technical backgrounds of the management of most German and Japanese firms"
Crocombe, Enright and Porter

There have been many claims made in New Zealand that there are 'too many accountants and lawyers in key positions and not enough scientists and engineers'. Earlier studies have suggested that there is an over-emphasis on accountancy and law as business qualifications in New Zealand.

What is not clear is the extent to which other fields of study are represented amongst key decision makers - in particular, those with science, technology and engineering qualifications.

A study being undertaken by the Ministry of Research, Science and Technology will provide a clearer picture of the extent of technology related qualifications and experience that exist amongst senior personnel in Government and the business sector. The survey asks for a simple record of the academic and other qualifications and experience of key individuals likely to affect significant decisions made in the private and public sector and includes individuals such as chief executives, senior managers/executives and board members. The study includes parliamentarians, key decision makers in local government, the public sector, New Zealand's Top 200 Companies plus a further 200 companies of particular importance to the economy.

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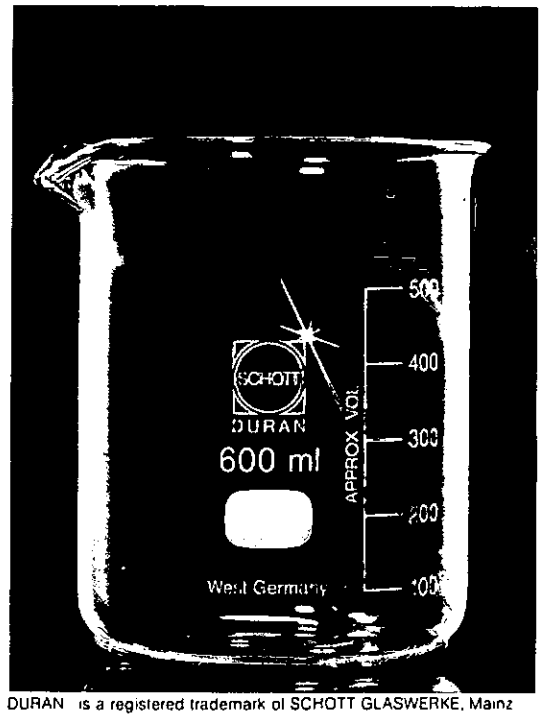

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The study attempts only to establish the distribution of qualifications and experience of key individuals. It does not explore consequential questions such as the factors leading to this distribution, nor the relationship between qualifications and company performance.

1994 ZONTA SCIENCE AWARD FOR WOMEN

Applications for the Zonta Science Award are now invited from women graduates who have excelled in the fields or pure or applied science. The applicant must be either: studying for a further qualification, involved in research or employed by a public or private company.

The contribution to the community of her current work and her own potential to benefit from the Award will be considered important. During the selection process, entries will be reduced to about ten finalists whose applications are submitted to an invited panel of five with university, government, scientific, industrial and business backgrounds.

The Award recipient receives $5,000, an around-the-world air ticket and a medal.

ZONTA is an international service organisation of executive and professional women. The Wellington Zonta Club - one of 25 clubs in New Zealand - initiated the biennial Zonta Science Award to encourage young women to pursue a scientific career; to further the careers of women in science; to acknowledge the valuable contribution of women scientists and to provide the opportunity for developing international contacts.

Application forms can be obtained from: ZONTA CLUB OF WELLINGTON, Attention: Science Committee, P O Box 10274, Wellington. * Applications close on 18 March 1994.

REVIEW OF FOUNDATION FOR RESEARCH SCIENCE AND TECHNOLOGY ACT 1990

The Ministry of Research, Science and Technology and the Foundation for Research, Science and Technology are each statutorily required to "review" the operation of the Foundation Act 1990 as amended. The matters to be considered are whether the Foundation should be retained or abolished and whether any amendments are necessary or desirable. The Ministry and the Foundation will report their findings to the Minister who will table the reports in the House of Representatives.

As part of the Ministry's review process, the Ministry invites members of the science community to make submissions, bearing in mind that it is the operation of the Act rather than the Foundation that is the subject of the review. Formal consultation with science organisations will take place at the same time.

The 1990 Act was significantly amended by the Foundation for Research, Science and Technology Amendment Act 1993.

Submissions should be addressed to the Ministry of Research, Science and Technology, P O Box 5336, Wellington. Attention: Christine Richardson, Ph (04) 472 6400, Fax (04) 471 1284, Email Christin@morst.govt.nz

* The closing date for submissions is 22 February 1994.

THE NEW ZEALAND ASSOCIATION OF SCIENTIST AWARDS

The following awards were recently announced:

MARSDEN MEDAL	Mr Denis Hogan HonFNZIC
RESEARCH MEDAL	Dr Peter Steel FNZIC

The Marsden Medal is awarded for outstanding service to science, in recognition of services rendered to the cause of science in the widest connotation of the phrase, without limitation of time. Denis Hogan was a professional scientist with the Chemistry Division of DSIR from 1949 to 1989 when he retired as Deputy Government Analyst based in the Christchurch branch. He was Registrar of the NZIC from 1959 to 1987 and is now the editor of ChemNZ, the NZIC's successful chemical education journal.

The Research Medal is awarded for outstanding pure and applied research work in the physical, natural or social sciences and published during the year of the award or during the preceding three calendar years. Peter Steel is a senior lecturer at the Chemistry Department of the University of Canterbury. His current research interests include the structure and properties of heterocyclic compounds, cyclometallation chemistry and stereoselective organic reactions.

NEW DEVELOPMENT AT OTAGO

The Chemistry Department has recently purchased a laser Raman system which will be used by Dr Keith Gordon. Dr Gordon joined the Chemistry Department of the University of Otago as a physical chemist in 1993. His research interests encompass the study of photoinduced electron energy transfer processes using Raman spectroscopy. This system comprises three different types of lasers and a single-stage spectrometer with a multichannel detector. The latter is capable of simultaneously detecting Raman photons across a 24 nm spectral range. As such it is considerably more sensitive than older scanning photomultiplier configurations. The Raman system will be used to probe molecules in a variety of environments. Data has already been obtained for molecules adsorbed to silver electrodes using the helium-neon laser. The nature of surface binding is of great interest particularly for oxide films on titanium because of their importance in bone-to-artificial joint interface. Spectroscopic techniques such as infrared spectroscopy have helped elucidate the surface species on titanium dioxide. Raman spectroscopy will add to the armoury of spectroscopic techniques available for such studies. It is envisaged Raman spectroscopy will be used to examine enzyme-substrate interactions and modifications to metal complexes as a function of electrochemical oxidation and reduction. Raman spectroscopy may be used to target certain absorbing molecules such as dyes, and this is called resonance Raman spectroscopy. This means that for an enzyme substrate complex it is possible to selectively observe the Raman spectrum of the dye only, thereby detecting the linkages from the dye which bind it to the enzyme structure.

Using a pulsed laser it is hoped the Raman spectra of the excited states of molecules will be studied. In such an experiment a laser pulse of the order of 10^{-9}s is used to prepare and probe the excited state. The leading edge of the pulse creates the excited state molecules and the trailing edge induces Raman scattering from them. This gives us the capability of measuring the vibrational spectrum of an excited state and obtain the detailed structural information therein. This information is used in studying a variety of excited state processes such as electron and energy transfer.

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WHAT IS ENVIRONMENTAL CHOICE NEW ZEALAND?

By John Wydenbach, **Telarc New Zealand**

The Environmental Choice Programme is a voluntary programme which has been created to identify products that reduce the burden on the environment. This programme results from a New Zealand Government initiative and is operated by Telarc, New Zealand's independent certification and accreditation authority for goods and services. It is anticipated that a wide range of products will become environmentally certified and will be identified by the Environmental Choice Certification Mark shown above.

Why is this programme needed? In recent years shoppers have faced an ever-increasing array of products asserting their environmental "friendliness". Some of these assertions are valid, some are irrelevant and some have been shown to be unfounded. Many countries, led by Germany and by Canada, have set up independent programmes to environmentally certify products and so provide consumers with guidance they can trust regarding those products which are environmentally preferable. The formal objectives of the New Zealand Programme are those defined by the Ministry for the Environment when Telarc undertook to establish and operate the Environmental Choice Programme:

1. To provide an incentive for manufacturers and importers to reduce the environmental impacts of products sold in New Zealand.

2. To recognise the genuine moves by companies to reduce the adverse environmental impacts of their products.

3. To provide a clear, credible and independent guide to consumers wishing to take account of environmental factors in their purchase decisions.

4. To encourage consumers to purchase goods which have lower environmental impacts.

5. To ultimately aim to improve the quality of the environment and to encourage the sustainable management of resources.

What is a good environmental choice? Any product which is made, used or disposed of in a manner that significantly reduces the harm it would otherwise cause the environment can be considered a good environmental choice. A product may be certified because it, or its manufacture or its disposal improves energy efficiency, promotes the sustainable management of resources, reduces or eliminates hazardous by-products, reduces emissions, is readily biodegradable, reduces waste by promoting reuse or recycling.

Where do the certification criteria come from? The criteria for each product category are published by Telarc. Firstly specifications are drafted by committees set up for each type of product. The membership of these committees is drawn from persons with expertise in environmental science, consumer interests and the relevant manufacturing sector. When a draft is ready it is circulated for public comment. The comments received are used to produce the finished specification. The specifications are valid for three years and are then reviewed and if necessary revised.

What criteria specifications have been published? To date sixteen specifications have been published covering the following product categories: laundry and dishwashing detergents, re-refined lubricating oil, dry cell batteries, car batteries, recycled plastic products, paints and seven types of paper products. A specification for wool pile carpets is almost ready for publication. Other product categories are in the planning stage.

How does a product become certified? The manufacturer or importer of a product which complies with the relevant criteria specification may apply to Telarc for certification under this programme. Telarc will then verify compliance by examining the product, associated production records and test results where appropriate. Test must be arranged by the applicant at an acceptable testing laboratory, such as a Telarc registered laboratory. Applicants pay a standard application fee, and once the product is certified an annual licence fee is payable on a sliding scale depending on the value of product sales.

How many products have been certified? To date one paint product has been certified, Levene Wall and Ceiling Acrylic. Several other manufacturers are investigating whether their products comply with the certification criteria. As yet there has not been much consumer pressure on manufacturers and importers because the programme has not been widely publicised. Telarc is in something of a chicken and egg situation since promotion to consumers before a significant range of Environmental Choice products are available for shoppers to buy could be counter-productive. At the same time, without consumer pressure some manufacturers are yet to be convinced that this certification will give them a marketing edge.

Are Environmental Choice products "environmentally friendly"? Telarc prefers the description "environmentally preferable" since few, if any, products are perfectly harmless to the environment. Products are certified by Environmental Choice because they help reduce the burden on the environment, thus enabling consumers to make their own environmental choice.

WASTE WATER ODOUR MEASUREMENTS

Mark Brimble and Ram Sharma
Watercare Services Ltd, Scientific Services

One of the criteria by which the public measures the quality of water is the odour that it emits. Most people associate an obnoxious smell with waste water but other types of water can also smell. Ground water from hot water springs can sometimes smell because of the presence of gaseous sulfides. Some people complain because they can detect the odour of chlorine in drinking water. What is a bad smell? This article will describe the way Watercare has been trying to develop measures of smell and odour near its water facilities in the Auckland area. We will try to focus on the chemical aspects of this work.

Monitoring of air quality at the Mangere waste treatment plant and waste water pumping stations has been a high priority. Odours in waste waters can arise because of incomplete oxidation of organic materials, principally fats, carbohydrates and proteins. With an adequate oxygen supply carbohydrates and fats break down completely into carbon dioxide and water. In the absence of adequate oxygen they can form alcohols, esters, aldehydes, and organic acids; which can be very odorous. Odours from the breakdown of proteins are more complex because they contain the elements nitrogen and sulphur as well as carbon, hydrogen and oxygen. Ammonia, amides, mercaptans and hydrogen sulfide may be formed from proteins. Most of these compounds emit intense odours that are evident at very low concentrations. Hydrogen sulphide can also be formed from bacterial reduction of sulfate in waste water.

Hydrogen sulfide

Most of our efforts to date have been directed towards the monitoring of this compound. Hydrogen sulfide escaping into air from sulphide containing waste water causes odour nuisances. Sulfide levels in waste water entering the Mangere waste water treatment plant range from 0.1-68 mg S/L with a mean value of 1.9 mg S/L. Industrial discharges can contribute to the actual level observed entering the plant. The level of sulphide from industrial waste discharged into the Auckland waste water system was restricted by the 1991 Trade Waste Bylaws to 5 mg S/L or up to 50 mg S/L if authorised by a trade wastes officer.

Hydrogen sulphide in high concentrations may cause immediate unconsciousness followed by respiratory paralysis; at lower concentrations it causes irritation of all parts of the respiratory system and eyes. The New Zealand Department of Labour has published a TWA for hydrogen sulfide of 10 ppm. Biological oxidation of hydrogen sulfide to form sulphuric acid can cause serious corrosion of concrete sewers. The National Ambient Air Quality Guidelines set by the Ministry for Environment in New Zealand will set limits for hydrogen sulphide in the low ppb range. Thus our measurement of hydrogen sulfide around water sources requires detection in the ppb range.

We have been using mobile units manufactured by MDA Scientific, Inc to measure hydrogen sulfide in the range 1-90 ppb. Figure 1 shows how the MDA TLD-1 system works. A tape called a "chemcassette is exposed to the target gas in the gas sampling head for 15 minutes. The chemcassette will change colour in proportion to the amount of gas present-the higher the concentration the darker the stain that will appear. Each chemcassette is traceable to calibration to a primary reference.

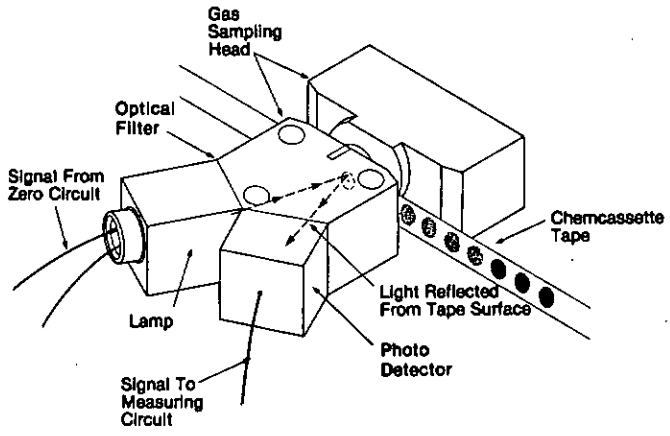

Figure 1

The change in colour, or stain, is read by the photo-optical system in the MDA monitor shown above, then compared to a standard response curve programmed into the system. The calibration of the monitor is checked regularly using a calibration card containing standardised stains. This is a secondary reference which monitors the instruments performance after it has been dynamically calibrated against a specially calibrated reference instrument. In this way the optics calibration system is directly traceable to the original dynamic calibration and eliminates calibration in the field. With this unit in hand we have been monitoring hydrogen sulphide levels around our water treatment facilities. At each sample point we measure hydrogen sulphide in ppb, temperature, wind speed, wind direction and the time. There are over 60 pumping stations spread throughout Auckland and 25 sampling points around the Mangere waste treatment plant that we monitor on a routine basis using this equipment. Data analysis will allow us to determine whether odour emissions from our facilities meet NAAQ guidelines. Some data that has been generated from our monitoring is shown in figure 2.

3-D odour maps are one way to visualise odour emission problems. Using 190 surveyed sampling points around the waste treatment plant, a 3-D odour map such as figure 3 has been generated from hydrogen sulfide measurements using the MDA mobile units. This has been useful to identify point sources of odour emission in the plant.

Other compounds

Now that we have begun a program monitoring one of the odour nuisances emanating from our treatment facilities what is the next step we intend take in odour measurement? We

could start a similar program for other odour nuisances but rather than focusing on individual compounds we are considering a more general way of assessing smell. More progress may be made using panel assessment of odour because you do not have to know the exact compound that is causing the smell.

In addition a combination of compounds giving rise to an odour can be assessed. The level at which the human nose finds a particular odour objectionable can be assessed as well as the level that at which it can be detected. This has some attraction when faced with the wide range of odours that might arise from a water treatment facility.

Systems of odour assessment using panel management methods have been developing for many years. Several problems have existed e.g. what odour delivery rate to panel members should be used, how should the odours be sampled and stored? Some international consensus is now emerging about how to carry out such odour assessment. Commercial smell delivering units, olfactometers, are now also available. In the near future do not be surprised if you see advertisements from Watercare Services for people to volunteer to smell water!

Acknowledgements
Associated Process Controls (agents for the MDA units in N.Z) for photographs and diagrams of the TLD-1 unit.

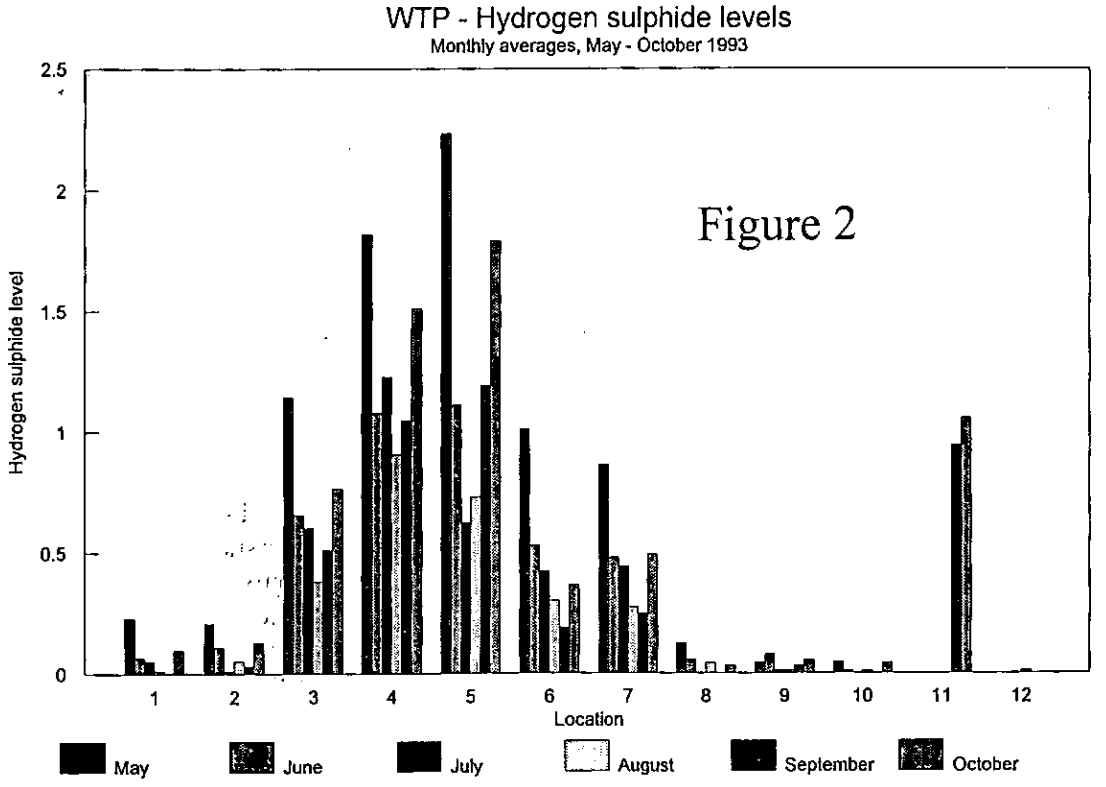

Figure 2

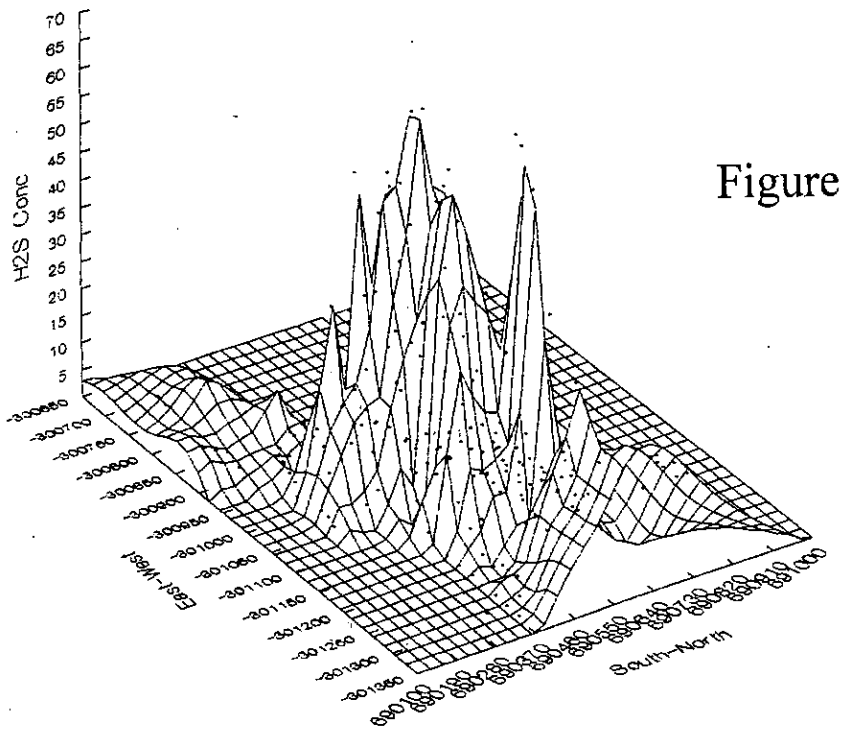

Figure 3

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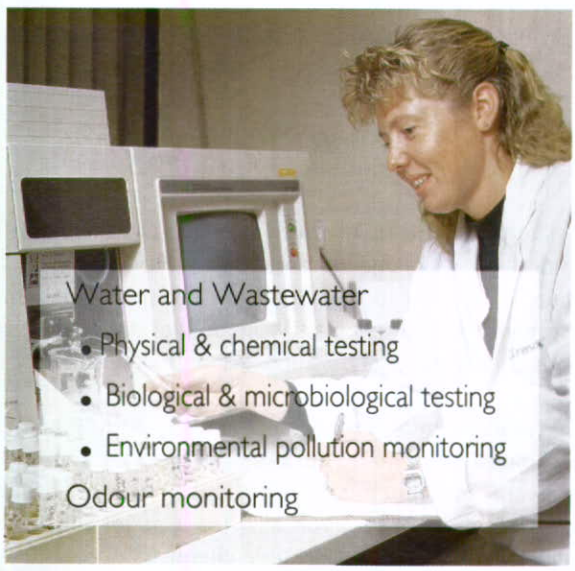

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INTERNATIONAL NEWS

THIEME PUBLISHERS AND IUPAC IN COLLABORATION WITH THE EDITORS OF SYNTHESIS•SYNLETT•HOUBEN-WEYL announce

THE 1994 THIEME IUPAC PRIZE IN SYNTHETIC ORGANIC CHEMISTRY

SPONSORED BY GEORG THIEME VERLAG STUTTGART, NEW YORK

The Thieme-IUPAC Prize is presented every two years on the occasion of the International Union of Pure and Applied Chemistry - International Conference on Organic Synthesis (IUPAC-ICOS). The 1994 ICOS will be held in Bangalore, India on December 11-16, 1994.

PRIZE: DM 10 000

The prize is awarded to scientists under 40 years of age (as of January 1 of the year in which the prize is awarded) whose research has had a major impact in synthetic organic chemistry.

The first Thieme-IUPAC Prize was awarded in 1992 to Stuart L Schreiber (Harvard) for his outstanding achievements in the application of sophisticated chemical synthesis to crucial problems at the frontiers of structural, molecular and cell biology.

Call for Nominations (deadline 15 April 1994)

The prize will be awarded on the basis of scientific merit for independent research dealing with synthesis in the broadest context of organic chemistry, including organometallic chemistry, medicinal and biological chemistry, designed molecules, and materials.

Proposals must be accompanied by a biographical sketch of the nominee, a list of the candidate's ten most significant publications, and a statement of how the candidate's research has had a major impact on the field of synthetic organic chemistry.

Nomination materials (8 copies) should be submitted by 15 April 1994 to the Executive Secretary, IUPAC Secretariat, Bank Court Chambers, 2-3 Pound Way, Templars Square, Cowley, Oxford OX4 3YF, England. Telephone +44 (865) 747 744, Fax +44 (865) 747 510.

INTERNATIONAL NEWSLETTER ON CHEMICAL EDUCATION

IUPAC, through its Divisions and Commissions, enlists the help of the worlds' leading chemists in developing and refining the language and symbolism of chemistry. IUPAC publications contain the results of this cooperative international effort. These publications are widely used by professional chemists. However, they are of more limited value to those involved in the formal teaching and learning of chemistry. They are accessible to postgraduate students, but much less so to undergraduate students. At lower levels - the secondary and primary levels - these publications are of little or no value.

Nevertheless, part of the knowledge embodied in these publications is valuable to those who teach and learn. At present this knowledge is transmitted through teachers and textbooks whose own selection and interpretation may not even be derived from the original sources. This leads to considerable variability in the language and symbolism of chemistry, much more in fact, than is desirable. Indeed, this variability probably contributes significantly to the proliferation and maintenance of misconceptions.

This undesirable state of affairs has led to a Committee on the Teaching of Chemistry project, of which a handbook entitled *RECOMMENDATIONS FOR LANGUAGE, SYMBOLS AND REPRESENTATIONS IN CHEMISTRY* is the first public outcome. It should be seen as a pilot publication which is being given wide exposure to potential users in order to determine how appropriate it is. The emphasis is on the meaning of selected basic chemical concepts and the associated symbolism. The meaning is discussed rather than defined in one sentence in order to make the correct meaning understandable as far as possible. Attention is given to known misconceptions or misrepresentations. Provisions are made for the fact that at different educational levels the meaning of concepts has to be understood to different extents. Nevertheless the more elementary descriptions must be in harmony with more advanced ones.

The assistance of chemists is now sought in the development of the language and symbolism of chemistry with particular reference to the needs of teachers and learners. A copy of the handbook is available from the Editor, Chemistry in New Zealand. Comments on either individual points or the whole design concept of the handbook are now invited. These should be sent to:

Professor J D Bradley,
Department of Chemistry,
University of the Witwatersrand,
Johannesburg,
South Africa

* * * * *

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NEW ZEALAND SUCCESS AT CHEMISTRY OLYMPIAD

In the second year of participation in the International Chemistry Olympiads our New Zealand representatives performed outstandingly well, exceeding all expectations. At the 25th International Chemistry Olympiad which was held 11-22 July, 1993 in Perugia, Italy, all four students received medals; David Yuen of Selwyn College, Auckland and Andrew Gilbert of Palmerston North Boys' High both gained silver medals while Jason Tseung and Simon Blakey of Auckland Grammar were awarded bronze medals. Medals are awarded on performance in a theoretical and practical examination. Scores are combined and individuals are then placed in a rank order. This year, 65 per cent of candidates were awarded medals and to receive a silver medal, a participant needed to be in the top 35 per cent.

This is a marvellous result when it is realised that our students are competing with the best in the world and that most of the student from other countries are one year older and have completed their final year at secondary school. Although team performances are not officially recognised, analysis of the results this year indicated that the New Zealand team could be placed in the top third of all competing countries, at about equal twelfth place with the Czech republic and Romania, and ahead of Australia, France and the UK. This year there were thirty eight countries competing.

The traditionally high achieving teams like China, Russia, USA and Germany were acutely aware of the number and type of medals obtained. Perhaps it was a measure of the New Zealand team's fine performance that many of the participants photographed our students complete with their medals. The Chinese were obviously very excited for us but not nearly excited as the New Zealand leaders.

Following a selection examination in November 1992, 23 students accepted places in the training group. The students selected came from Auckland, Palmerston North, Havelock North, Wellington, Christchurch and Dunedin. There were unfortunately only two girls in the group. This year's group come from a total of 14 schools, only three of which had students included in last year's training group. During 1st term the students had weekly reading assignments plus fortnightly problem assignments and a test before the training/ selection camp held 9-15 May 1993 at the University of Auckland. The camp was again organised by Dr Sheila Woodgate, who left the weekend before the camp on leave, leaving the last minute details in the hands of Dr John Packer. The camp again followed the format of lectures in the morning and early evening with laboratory sessions in the afternoon. The team selection, following a selection examination held on the final morning proved particularly difficult with several students just missing out on selection.

For the four students selected the preparation now intensified as they rigorously worked their way through a booklet of preparatory problems, provided by the Italian organisation committee with further weekly tuition from staff at Auckland and Massey Universities.

On Thursday 8 July they departed for Leonardo Da Vinci Airport in Rome, accompanied by Tim Oughton, currently at the Christchurch College of Education but normally at Rangiora High School where they were joined by Sheila Woodgate who was a leader last year. The start to the Olympiad was an exhausting 30-hour flight to Rome, a 25°C temperature difference and an orienteering exercise locating the Youth hostel, some 30 kilometres from the airport carrying enough baggage for two teams. Acclimatisation was brief - two nights in the Youth hostel, a lot of walking and sightseeing around Rome, and plenty of pasta. It was a great relief for the leaders to be safely in the hands of the Italian organisers. Walking across a street in Rome must be the closest thing to playing Russian Roulette that any of the team had experienced.

The team travelled 200 kilometres north by bus to Perugia. The students were accommodated at a very high quality hotel in Assisi, the Cenacolo Francescano, while the team leaders and observers stayed some 30 kilometres away in a hotel owned and run by the University of Perugia, the Villa Colombella. To say the hospitality extended by our Italian hosts was superb would be an understatement. The food was outstanding, the wine was in generous supply and the sensible and varied nature of the programme meant that our twelve days in and around Perugia were most enjoyable. Each team was assigned a guide to help ensure the needs of the students were well catered for. We were extremely fortunate to be guided by Paola Crea, a recent graduate of the University of Perugia. Paola's cheerful, enthusiastic and friendly approach ensured our students were happy and relaxed throughout the Olympiad.

The first part of the competition, a 4-hour practical examination, proved to be the most discriminating. While the activities themselves were not academically demanding, the procedures involved required care, precision and the ability to follow instructions to the letter. The first problem involved the oxidation and isomerisation of cholesterol to give an α, ß - unsaturated ketone. Students had to determine the melting point of their product and they were marked on purity, not amount. Less than 5 percent of the candidates achieved the melting point within 5°C of the theoretical figure. The second problem was a relatively straight forward titrimetric determination of citric acid, using standardised sodium hydroxide.

The theoretical exam however, was another story. The Italians put a distinct emphasis on physical and organic chemistry, excluding the large inorganic content of the syllabus which can be derived from the preparatory problems. This is the host country's prerogative and those who chose to point out the organic bias to the examiners were reminded of the fine Italian history in organic chemistry. Questions on radiochemistry and chromatography were also included. Once the students had completed their examinations, the papers were marked by both the leaders and members of the Italian examination panel, followed by an adjudication session. While the students enjoyed a sports tournament, a spaghetti party and other social activities, the leaders completed the serious business of marking individual papers, arbitration, and lengthy jury sessions to determine the future Olympiad policy.

Once the work was over the cultural exchanges began in earnest. Highlights included sightseeing of ancient Rome, a Papal audience, the Sistine Chapel, St Peter's Basilica, a day

in Florence, a visit to a wine museum (and of course a tasting), a day in ancient Gubbio town, an Italian evening and a most memorable gala dinner. Tim says he had never been served ten courses in one sitting before, all served from fine silver trays, but sheer determination and a wish not to offend his hosts meant he struggled valiantly through to the end, all in the cause of international chemical relations! Time was also spent enjoying the facilities of a private sports club in Perugia. The team members were encouraged to mix with members of other delegations and learnt much about the education systems and cultures of other societies around the world.

The medal presentation took place on the final evening, completing an incredible educational and cultural experience that will remain long in the hearts and minds of all involved. The result was greeted with jubilation by the members of the New Zealand team and provided an excellent finale to the months of hard work and preparation.

Tim Oughton was particularly pleased to be able to discuss our impending curriculum changes. He was able to discuss ideas and the directions we may head in with chemistry teachers from all over the world. After reading our third draft some suggested New Zealand was ambitious, many were surprised by the emphasis on practical work, but generally speaking the document found favour. One leader got carried away - "But this is simply excellent, Tim how are you going to teach it though?" Therein lies another story.

We wish to acknowledge the financial support given by the following organisations: The New Zealand Institute of Chemistry, NZIC Chromatography Group, Royal Society of Chemistry Auckland and Wellington Region Secretaries, Ministry of Research, Science and Technology, Ancat Holdings Ltd, Dynavac New Zealand, IChem Ltd, ICI New Zealand Ltd, John Ilot Charitable Trust, Nuplex Industries Ltd, Rohm and Haas NZ Ltd, Tasman Pulp and Paper Company Ltd and Union Chemicals Ltd. An important donation was a class set of the text Solomans: Organic Chemistry by Jacaranda Wiley Ltd. This will help the training of future teams enormously. Air New Zealand supplied accommodation en route for the team. Staff at Auckland, Canterbury and Massey universities contributed to the training of the team and the training group.

MIXING TECHNOLOGY

:A SHORT COURSE
by Dr Jim Oldshue
24-25 February 1994, Auckland

Dr Jim Oldshue, a world authority on mixing, will be conducting this 2-day short course in Auckland. The course has a strong practical content dealing with problems in mixing including impeller power, scale-up, pilot-plant, mechanical design, blending, solids suspension, gas-liquid processes, energy conservation: capital vs operating cost, fermentation, waste treatment, paper stock etc.

Dr Oldshue is a past president of the American Institute of Chemical Engineers (1979). He worked for LIGHTNIN for 42 years and was Vice President, Mixing Technology from 1970-1992. He is the Author of the standard text book on mixing "Fluid Mixing Technology" McGraw-Hill, 1983; and author or co-author of numerous articles and book chapters on the subject.

For further information and to be put on the mailing list, please contact: John Chen, Chemicals and Materials Engineering Department, University of Auckland, Ph (09) 3737599, Fax (09) 3737463 or Barry Williams, Continuing Education, Ph (09) 3737599, Fax (09) 3737419.

ENVIRONMENTAL MANAGEMENT SYSTEMS

Max Robertson
Grayson Group

INTRODUCTION

All organisational activities, products and services interact with, and have some effect upon the environment. Environmental management involves all those planned and systematic actions necessary to contain and reduce the adverse environmental effects of those activities, products and services.

Given the increasing concerns about the effects of the depletion of the ozone layer, the destruction of native forests, spillages of oil into the sea and the need for sustainable resource development, it is timely that Britain and Europe have developed standards for environmental management.

Environmental management systems are designed to emphasise prevention of adverse environmental effects, rather than detection and restoration after occurrence. Such systems enable organisations to demonstrate compliance. The environmental management systems described here are based on the British Standard BS 7750:1992.

THE ENVIRONMENT

The environment is the surroundings and conditions in which an organisation operates, including living systems (human or other). It extends from within the work-place to all the surrounding country-side. It includes raw materials used as well as the upper atmosphere when the organisation's products are finally consumed.

ENVIRONMENTAL EFFECT

An effect is a direct or indirect impingement of the activities, products or services of an organisation on the environment, whether adverse or beneficial.

Effects may relate to spills or releases of liquids, collections and disposals of solid or liquid wastes, venting and discharge of gases, vapour, smoke, dust or odours, noise emissions and vibrations, visual impacts or any other nuisances. The wasteful use of resources is an effect.

ENVIRONMENTAL MANAGEMENT SYSTEMS

An environmental management system consists of the organisational structure, responsibilities, practices, procedures and resources involved in managing these environmental effects. A structured system enables clear demonstration to all interested parties that a responsible approach to environmental management is being taken.

The most effective environmental management approach is preventative. It must be integrated into all facets of the industry and actioned by well informed and fully committed staff members at all levels. Plans and programmes are based on reliable, ongoing data collation.

The system starts with establishment of an environmental policy that is proactive towards all resource management and health issues affected by company operations. The ongoing process then includes undertaking of regular environmental risk assessments of all operations to ensure that programmes and activities are consistent with the environmental policy.

Integrating environmental performance activities into the company's quality assurance system and developing individual site systems relevant to local operations, are key components of the effective environmental management systems as implemented by the Grayson consultants.

Our structured approach is designed to:

Improve health, safety and the environment through prevention.
Involve everyone in the organisation.
Improve public image, enhancing the competitive position.
Reduce risks.
Improve staff motivation through participation.
Demonstrate regulatory and industry code compliance.

WHY ORGANISATION'S MUST MANAGE THEIR ENVIRONMENTS

The Resource Management Act 1991 brings a shift in the responsibility for protecting the environment, from regulatory authorities to organisations themselves. "No discharge of contaminants from trade premises etc is allowed unless expressly permitted by a rule of a regional plan, a resource consent or regulations."

The organisation must positively demonstrate to authorities and to the public that its activities do not adversely effect the environment.

A public complaint or a regulatory inspection may bring a successful prosecution leading to personal fines up to $200,000, or imprisonment for senior executives. The prosecution must prove that the person caused or allowed the offence but does not require proof that the offence was known to the offender or was intentional.

The Health and Safety in Employment Act 1992 provides for the prevention of harm to employees. Employers are duty-bound to identify and eliminate or minimise hazards to employees and to protect employees from unavoidable hazards in the work environment. Employees must protect themselves and their colleagues.

Taking action that may cause serious harm, can result in fines up to $100,000 or imprisonment. Offences are of strict liability.

Due Diligence: Should an environmentally adverse event occur, a well documented environmental management system will publicly demonstrate due diligence and justify the defence of "all reasonable steps" during the inevitable enquiry.

THE ENVIRONMENTAL GOALS

An environmental management system does not set environmental goals or specifications which define when an organisation has arrived at a satisfactory performance. Rather, it defines the processes for the organisation to evaluate its

environmental effects and legal requirements and to consequently establish its own objectives and targets.

The organisation will regularly re-evaluate its performance and set higher targets for the coming period. Thus a continuous improvement tool common to Total Quality Management is incorporated.

PREVENTION

The preventative approach focuses on the processes and the system (the assembly of processes). The objective is to understand the sources and causes of adverse effects:

Hazardous materials.
Wasteful resource use.
Work procedures.
Equipment design.
Work environment.
Training and human resource management.

Everyone within the organisation must be committed to working together towards common goals.

An atmosphere must be created where barriers to communication are broken down and where defensiveness and blame are converted into constructive problem solving.

BENEFITS OF AN ENVIRONMENTAL MANAGEMENT SYSTEM

Cost Savings In:

- Insurance-
- Remediation
- Resource usage
- Sick leave, rehabilitation and compensation
- Fines

Legal

- Resource Management and Occupational Health and Safety compliance
- Demonstration of due diligence following accidents

Human resources

- Motivation / team-work
- Improved health and well-being

Business benefits

- Credibility with clients and suppliers
- Finance availability
- Investor confidence
- True land values
- Remediation liabilities declared

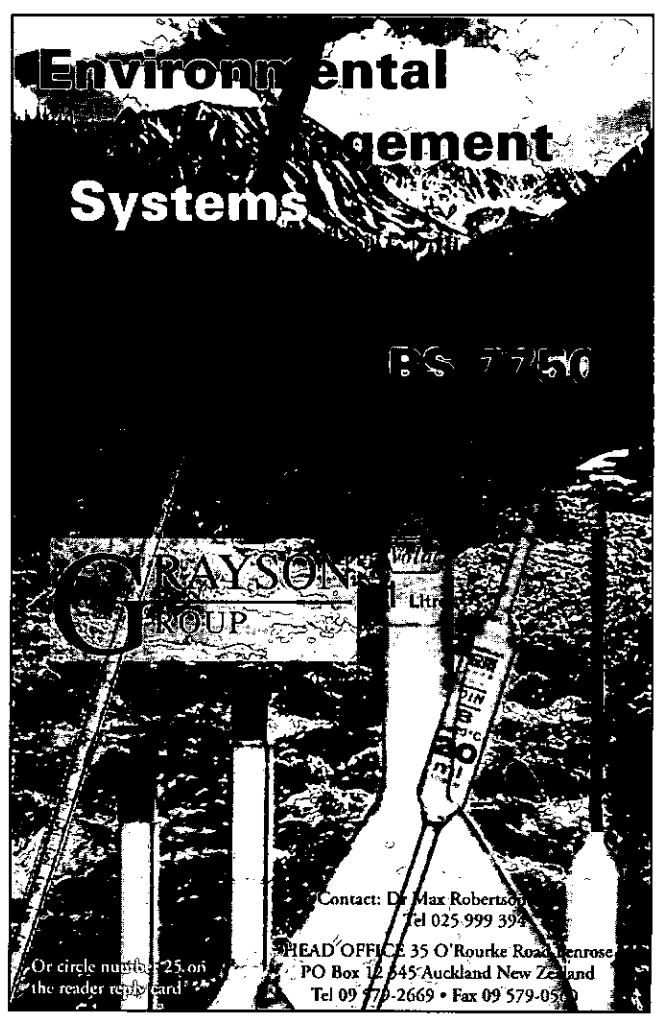
Marketing

- Green image
- Environmentally friendly products and services

An effective environmental management system makes good business sense.

WHERE TO START

The implementation of an environmental management system is a complex and multidisciplinary task. It should not be confused with an "environmental site audit" which is but one small component of the system. Consultants such as those at Grayson's, with experience in both Quality Management Systems and Environmental Science, can transfer the skills necessary for effective implementation.



DR PEAK'S CHROMATOGRAPHY MADE EASY "RECENT DEVELOPMENTS IN THIN LAYER CHROMATOGRAPHY"

By Roger Whiting, Auckland Institute of Technology

New Developments in TLC have resulted in techniques which can perform separations twenty times faster than HPLC.

Thin Layer Chromatography (TLC)is an old technique which traditionally, is thought of as simple to use, requiring little equipment, minimal training but not reliable or quantitative enough for many modern applications. New developments in the field are making it more quantitative and reliable while requiring limited investment in equipment.

MEASUREMENT

One of the biggest changes in TLC has been the development of densitometers to provide accurate quantitative measurement of peaks. The traditional method for quantification in TLC has been to estimate visually or to elute the peaks of the plate. Both methods are slow and prone to poor reproducibility. So the development of *in situ* scanners has greatly improved the accuracy of the technique.

Linear Scanners

In a linear scanner, light passes through the plate and the stationary phase layer to a photomultiplier which gives a signal which can be displayed as a chromatogram using a recorder or integrator. The operation can also be performed in reflectance or fluorescence modes. The sensitivity when using fluorescence detection with fluorescent labeling can be in the sub-picogram range. Some instruments incorporate a monochromator which tends to improve specificity.

Commercial video scanners are appearing in the market. Video detectors represent a significant advance on the linear scanner in that they can acquire an image of an entire TLC plate at once. Again the information can be produced using transmittance, reflectance and fluorescence. The ability to scan an entire plate at one time enables this technique to take in the data for a series of standards and several samples in one operation. This can then be processed mathematically to yield results in the normal way. The speed of the operations enables some routine methods to be performed more than 20 times faster than the equivalent HPLC procedure(2).

Monochromators have not yet been incorporated in video scanners so they tend to lend themselves to routine methods.

MASS SPECTROMETRY

The coupling of mass spectrometers to TLC has created as big a leap forward in TLC as it did in GC and HPLC. The technique (TLC-MS) has become possible due to the development of small high performance mass spectrometers. Mass spectrometry is a much more powerful means of identifying analytes than UV or visible spectroscopy because many analytes have similar UV or visible spectra. The usual methods for TLC-MS are fast atom bombardment, in which the organic molecules are sputtered from the layer by the impact of atoms, and liquid secondary-ion spectrometry, where the ions are produced by high thermal energy laser desorption. The ions formed are usually the same even numbered electron ions that are formed in chemical ionisation and the interpretation is the same.

The operation of a TLC-MS system is much simpler - and faster - if the mass spectrometer is used off- line. This way the chromatogram is developed and the solvent evaporated before the detection of the analyte is started. The time between the development and the detection can be variable so chromatograms can be developed in batches and detected at leisure.

Isotope Detection

One of the areas in which TLC has excelled is the identification of metabolites of pharmaceuticals in various tissues. With radio isotopic labeling it is possible to detect very small amounts of material. Early detection methods used scintillation counters - which require the removal of the analyte from the layer or auto-radiography which tends to be slow. Now the preferred method is direct scanning of the plate.

A common instrument for scanning the TLC plates for radio isotopes is now the imaging proportional counter. Previously detectors were mechanically driven to scan the plate but these have now largely been replaced. The advantage is that the imaging proportional counter covers the entire lane of the plate. This enables it to measure all radioactive components simultaneously resulting in faster detection and better sensitivity.

IR Spectrometry

Infra red detection used in TLC identifies the components from spectral rather than chromatographic information. The coupling of Fourier transform infra-red to TLC has resulted in higher confidence in the identifications than was possible using dispersive instruments. The sample needs only to be compared to a reference spectrum for identification so authentic standards are unnecessary. TLC is often the quickest means of separating complex mixtures of nonvolatile or thermally sensitive compounds for infrared analysis because it is simpler than most other methods.

The analytes on the TLC plate can be measured using diffuse reflectance or photoacoustic spectrophotometry. Interference is possible from band shifts caused by intermolecular interactions between the analyte and the stationary phase of the plate. Thus the spectrum appears different from that of the reference compound prepared by more conventional methods. One means of dealing with this is to transfer the analyte to a IR transparent phase but this loses the advantages of *in situ* detection.

Delayed and Multiple Scanning
One of the big advantages of TLC as a technique is that the developed plate can be stored almost indefinitely. Thus it represents a near permanent record of the sample. Also the scanning process is performed independently of the development which means that a single plate can then be scanned by different detectors without the detectors having to be connected on-line. This allows a degree of flexibility in TLC which is difficult to obtain by GC or HPLC.

STATIONARY PHASES

The heart of any chromatographic system is the stationary phase. Here TLC is undergoing a number of gradual developments which are widening its applications.

Bonded Phases
The availability of bonded phases with C_2, C_8, C_{18} and phenyl residues bonded to a silica support has allowed the use of reverse phase methodologies. The specific properties of the hydrophobic portion of the stationary phase can be adjusted by altering the nature of the organic group attached. Also the degree of coverage of the silica particles and any modification of the remaining silica surface allows yet more control of the analyte-stationary phase interaction. With partially covered highly modified silica supports, highly polar solvents can be used even with reverse phase separations. These systems can be used to separate a wide range of analytes from antioxidants in the food industry to oligopeptides and steroids (1,2). Further modifications of the silica stationary phase are possible by bonding organic groups such as diol, amino and cyano allowing more subtle interactions to form the basis of the separations.

Enantiomers
The availability of stationary phases containing bonded ß-cyclodextrin has enabled the separation of enantiomers in a number of mixtures. This system has been used to separate phenylanaline and tyrosine in amino acid mixtures (3). Another approach to separation of enantiomers is the addition of an optically active reagent to the eluent. With the analyte this can form an addition complex with diastereoisomers which can then be separated using a non chiral stationary phase.

Non-Bonded Stationary Phases
The use of stationary phases with absorbed modifying reagents is finding some application. The advantage of physically absorbed layers is that they allow a more flexible approach to the tailoring of the stationary phase to the analytical application. Coating of the silica with a chiral compound has been used to separate optical isomers. While the absorption of nonpolar liquids has been used to perform reverse phase separations. The disadvantage of this system is that the plates are not available commercially and hence the advantage of readily available plates is lost.

THE FUTURE

Current interest is centring on the development of forced flow systems for planar chromatography. Although not fully realised as yet, the ability to optimise the flow rate of the solvent through the stationary phase layer will allow a great increase in the range of applications for TLC.

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ENVIRONMENTAL SAMPLING AND ANALYSIS - PROTOCOLS AND PITFALLS

Donald J Hannah, John A Taucher, Lawrence J Porter, Simon J Buckland
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Environmental Organic Chemistry, ESR:Environmental, P O Box 30 547, Lower Hutt

Introduction

There has been an increased emphasis in the last few years on determining and controlling chemical contaminants in the environment. This has lead to an increased demand for analytical services to produce the data that the managers in regulatory agencies and industries require. This has occurred at a time where there has been increased accountability in government and local authority scientific services and increased pressure on the performance of consulting laboratories. The danger has arisen that laboratories are vulnerable to using techniques, methods and procedures that they are not adequately equipped for, are not trained in using, and have not validated to meet the immediate needs.

This paper will cover aspects of environmental investigations, particularly related to the determination of organic contaminants, where the correct equipment, the proper training of staff, and the adequate validation of procedures prior to use in real situations is of immediate relevance and importance. Two areas will be focused in detail, namely the sampling and analysis of contaminated soils and the determination of toxic organic compounds in gaseous emissions and air.

Sampling and analysis of contaminated soils

With increasing attention being given to the identification and management of contaminated land in both Australia and New Zealand, the Australia and New Zealand Environment and Conservation Council (ANZECC, 1992) has published guidelines for the assessment and management of contaminated sites. Key aspects of the process contained in these guidelines are:

- the determination of the extent of contamination,
- the determination of the environmental and health impacts of the contaminants by application of risk assessment techniques and
- the comparison of these with relevant environmental guidelines.

None of this can occur if the sites are not adequately sampled, the samples treated properly and the appropriate analytical methods correctly employed.

The process of contaminated site assessment involves the steps of planning - sampling - analysis - interpretation. The uncertainty of the final result depends on the uncertainties at each step. It is incumbent on the scientists, and in particular the analytical chemists involved, to identify, measure, and control these uncertainties as part of the quality assurance programme. Without this being implemented, individual and cumulative errors may compound to produce inaccurate conclusions, resulting either in inadequate attention to an environmental or health hazard, or alternatively causing undue effort and expense to be incurred to regulatory agencies, and site owners and operators.

The steps of the process of particular interest to the chemists are the sampling of the sites and the analysis of the samples. Sampling procedures should ensure that the following features are addressed:

- sampling location (whether systematic, strategic or random techniques)
- sample representativity (number and size of samples, individual or composites)
- complete sampling records (identification, labelling, relationships with other information such as weather and moisture conditions)
- sample integrity and contamination (some contaminants are present at such levels that cross contamination of samples with only trace levels can readily occur)
- sample handling and preservation (type of containers, field blanks, storage temperatures and holding times, use of preservatives, special procedures for volatile organic compounds)
- sample transport and storage (chain of custody forms)

The quality assurance programme that is designed, implemented and reported to demonstrate the level of compliance with the minimum requirements is of utmost importance when conclusions about a particular site are finally drawn and decisions made for action on clean up and remediation, sometimes at enormous expense to the organisations involved.

Once samples have been collected the analytical methods used must also contribute to the quality of the investigation. These methods may be physical methods (moisture, pH, conductivity), gross components (organic carbon, Kjeldahl nitrogen), inorganic and metals (including extractable and leachable components), or organic components ranging from volatile organics (monocyclic aromatic compounds, volatile halogenated hydrocarbons) through semivolatile compounds (PAHs, pesticides, petroleum hydrocarbons, phthalates) to trace and ultratrace components (PCBs, PCDDs and PCDFs).

It is tempting for laboratories to acquire compendiums of USEPA and related agencies methods (APHA (1989), USEPA (1986), and make minor or major alterations to the comprehensive procedures using available equipment, resources, skills and knowledge in attempts to develop cost effective "in-house" methods. These methods, when tested

against the original method, must be shown to be equal to, or superior to the original. Modern instrumental techniques such as capillary gas chromatography have made major advances over some older methods but have not overcome many of the extraction, derivatisation and recovery problems that the original methods were designed to deal with.

This is well demonstrated in the analysis of chlorophenols in soils and related matrices. The actual chromatographic measurement is the easiest part of the method, the consistent recovery of mono to pentachloro isomers, and the quantitative derivatisation are more demanding. Similarly analysis for "EPA Priority Pollutants" is relatively simple in the GC-MS system, but laboratories that do not routinely operate programmes for determining the stability, extraction efficiency and recovery of all 112 components from the matrices concerned are operating in a negligent manner. However, it is the operation of these aspects of the methods that impart the costs, require the skilled analysts, and have the major bearing on the validity of the final result.

The key for any application is the operation of robust quality control and quality assurance procedures, and the use of methods that are validated in the laboratory for the matrices concerned.

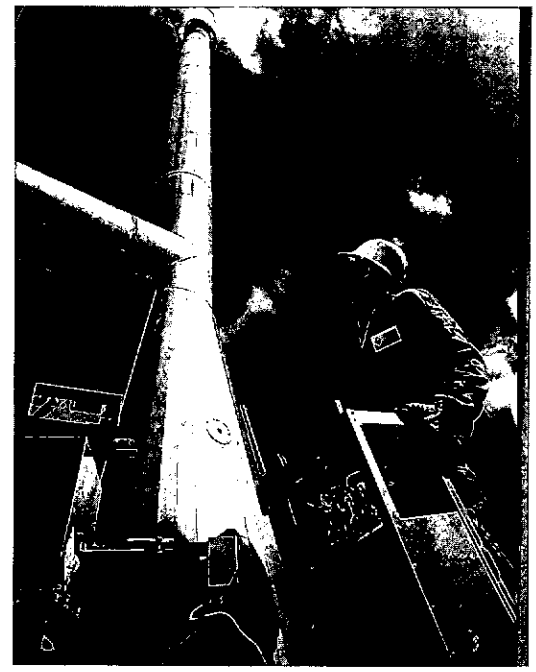
Toxic organic compounds in emission and air samples

Environmental and health requirements necessitate the sampling and analysis of industrial gaseous emissions, eg from stack gases, and ambient air for levels of toxic organic compounds (Winberry, et al, 1990). The organic compounds fall into two general classes, volatile compounds with boiling points from -15°C to 120°C and semivolatile compounds, with boiling points greater than 100°C. Sampling is again a critical issue in these determinations.

Stack gas sampling for semivolatile compounds is a complex and skilled task (see photo). Apparatus such as the USEPA Modified Method 5 sampling train (Schlickenrieder, et al 1985) is required and may need to be applied to stacks that range in diameter from 200 mm to over 6 m. Generally isokinetic sampling where the sample enters the probe at the same rate as the gas is moving in the duct is required. In addition reliable determinations of gas composition and velocity are necessary. The operation of such equipment requires experienced and skilled staff, with a high level of mechanical as well as chemical knowledge, adeptability and resourcefulness. Training is a long term process and ESR:Environmental is one of a few groups in Australasia that has developed this capability.

Samples are collected onto filters, solid phase resins and into impinger liquids. Analysis requires the extraction of all of these media, with appropriate clean up and chromatographic measurement. With the complex series of sampling and analysis processes, quality control procedures must be designed to measure the uncertainities at each stage and to provide a level of confidence in the results.

Contaminants in ambient air samples are usually at concentrations 3 - 4 orders of magnitude lower than in stack gases. High volume sampling techniques must be used to collect up to 1000 m^3 of air onto the filters and solid phase material (usually polyurethane foam, PUF). ESR:Environmental has developed a composite cartridge for this work to allow a wide range of organic chemical classes to be collected (Taucher, et al 1992). This cartridge involves a narrow plug of XAD-2 resin sandwiched between two PUF plugs. Particulate material is collected onto glass fibre filters and the gaseous components are collected on the sandwich cartridge. These media are returned to the laboratory and analysed for levels of organic contaminants. As before the utility of the analytical result is dependent on the demonstrated quality assurance procedures that are conducted in concert with the sampling and analysis.



Stack Gas Sampling Equipment

In this area ESR:Environmental has been at the forefront in Australasia in developing the use of stable isotope dilution techniques to enhance that control of the quality of stack gas and ambient air sampling and analysis.

Stable isotope dilution involves the spiking of the sampling media, usually the resins, with known amounts of stable isotopically labelled (^2H and ^{13}C) contaminants. The analytical scheme then extracts the native and isotope contaminants together and the final separation is achieved by the mass spectrometer as there is usually little or no difference in chromatographic behaviour of the two classes of compounds. Application of this technique to stack gas and ambient air sampling allows for direct measurement of the sampling efficiency and, when coupled with laboratory use of the same techniques, also allows accurate determination of the analytical uncertainties. Both high and low resolution mass spectrometry is required to enable a full suite of organic contaminants to be determined.

As with contaminated soils there is a temptation for laboratories to short cut methods to enable "more cost effective" methods to be developed. However, each step in these methods has been carefully designed to enable high quality data to be produced and alteration of the methods requires thorough validation before the modifications can be employed.

Conclusion

An increasing emphasis on environmental quality requires increased demands on analytical chemists for the determination of chemical contaminants. Important decisions are made based on the data that are produced by analytical chemists. It is essential that appropriate sampling and analytical procedures are followed and that the required quality assurance programmes are not only followed, but are also reported to provide decision makers with the confidence that the data they are using is valid. The temptation for laboratories to implement and modify sampling and analytical procedures without acceptable validation and to reduce or neglect quality assurance programmes in order to produce "cost efficient" analyses, must be avoided.

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ICP-MS: A NEW ERA IN ELEMENTAL ANALYSIS

Kevin Fellows & Lawrence Pickston
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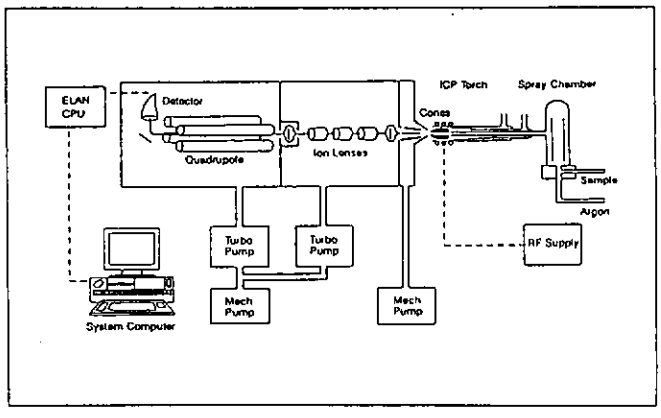
Elemental analysis in New Zealand took a major step forward on 8 December 1993, with the arrival at ESR:Environmental's Gracefield site of the country's first Inductively Coupled Plasma - Mass Spectrometer (ICP-MS) - a Perkin-Elmer Sciex ELAN 5100. This instrument will offer capabilities hitherto unavailable in combination, in sensitivity, wide element range, wide concentration range, and short analysis time.

What is ICP-MS?

An ICP-MS instrument consists of an inductively coupled argon plasma interfaced to a quadrupole mass spectrometer. Samples, usually in solution form, are introduced into the plasma, where they are vaporised, atomised, and ionised. A small portion of the ion stream passes through the interface to the mass spectrometer, where it is analysed according to its mass (or more correctly, its mass-to-charge ratio). The mass spectrometer has a resolution between 0.5 and 1.0 atomic mass units (amu), so all isotopes are separated.

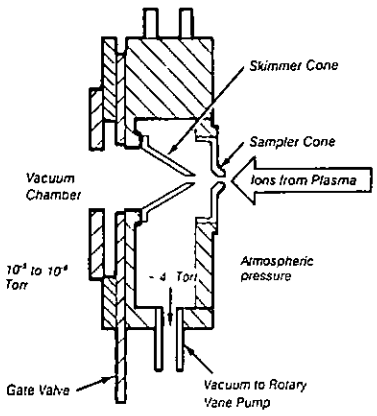


ICP-MS - arrangement of major components

The interface between the plasma and the mass spectrometer is the heart of ICP-MS instrument design. It has to mediate between the plasma conditions (5000 to 8000°C at atmospheric pressure) and the mass spectrometer conditions (ambient temperature and 10^{-5} to 10^{-6} torr vacuum). The interface consists of two water-cooled cones of nickel or platinum, each with a small hole in the centre. The central part of the plasma passes through the first ("sampler") cone, to an area with a pressure of 1-5 torr, where it expands supersonically. Most of the material is pumped out of this area by a rotary vacuum pump. The centre of the supersonic jet passes through the second ("skimmer") cone to the ion optics and mass spectrometer. This area is pumped down by two turbomolecular pumps with a rotary backing pump.

What do the results represent?

Although the mass spectrometer can resolve the ion beam into individual atomic masses, this does not necessarily mean that all the elements are immediately separated. Most elements have more than one isotope, and there is some overlap. For example, cadmium has major isotopes at 110, 111, 112, 113, 114 and 116, while tin has major isotopes at 116, 117, 118, 119, 120, 122 and 124. Fortunately, all elements except indium have at least one useable isotope that is not interfered with in this way.



ICP-MS interface

Elements from the plasma and the solvent can also cause some interference. Although the plasma is operated to produce monatomic ions as far as possible, a small fraction of polyatomics do occur. For example, the argon dimer Ar_2^+ overlaps with the most abundant selenium isotope at mass 80.

These interferences are dealt with by judicious choice of the isotope to use for analysis, and by correction equations based on measuring an interfering element at another of its isotopes, and using the known natural isotopic abundances.

Advantages

The strong points of ICP-MS in elemental analysis are simultaneous determination of many elements, high sensitivity, large dynamic range, short analysis time, and the ability to measure individual isotopes.

1) Simultaneous, highly sensitive determination.

The ICP-MS can determine most elements from lithium to uranium. The other inert gases are not ionised in the argon plasma. Nitrogen and oxygen are difficult to determine because of their presence in the solvent and (to a lesser extent) the atmosphere.

Sulphur, fluorine, carbon, and phosphorus have (relatively) low sensitivities, of about 500, 100, 50 and 20 parts per billion (ppb) respectively. Chlorine, silicon and potassium have medium sensitivities of about 10 ppb (µg/L). All other elements can be determined at sub-ppb levels, and at least 30 elements can be determined at part per trillion (ppt - ng/L) levels or below.

In addition, the determination of the selected elements is effectively simultaneous. The mass spectrometer scans the mass range, or the selected parts of it, at rates up to 100 milliseconds for a full mass scan. The scan is repeated as many times as necessary to get the required precision.

2) Large dynamic range.

The detector in the mass spectrometer of an ICP-MS instrument is an electron multiplier. Saturation of the multiplier determines the highest concentration that can be measured, and that concentration is typically 100 parts per million (ppm - mg/L). Thus from the detection limit to the maximum working concentration represents about 8 orders of magnitude - compared with about 2 orders of magnitude in graphite furnace atomic absorption. In addition, all instrument manufacturers have some means of extending the working range at the upper end. The ELAN 5100 at ESR:Environmental uses a selective defocussing method called OmniRange, which can extend the working range by a further 2-3 orders of magnitude. Thus sub-ppb levels of some elements can be determined in the same measurement as hundreds of ppm levels of other elements.

3) Short analysis time

For most sample types a sample measurement time of 4 minutes gives good analytical precision. Only about half of this is used for data acquisition, with the remainder occupied by autosampler movements and rinsing. With specialised accessories (which are installed at ESR:Environmental) it is possible to operate in a flow injection mode and boost the analysis rate to 100 samples per hour. In all modes, automated unattended runs of over 100 samples can be run routinely.

4) Isotope capability

In most samples the ratios of the isotopic abundances are very constant, but where they are not, the ICP-MS offers the possibility of monitoring individual isotope concentrations and their ratios. Examples of where this is useful include monitoring lead isotope ratios to trace the source of lead contamination, using an artificially enriched isotope to trace element movements, and using the isotope dilution technique, where an uncommon isotope of the element of interest is used as the ultimate internal standard. The control system of the ICP-MS allows spending more time measuring the less abundant isotope, so that all isotopes are measured with similar precision. A precision of about 0.2% RSD in isotope ratio can be achieved with a 10 minute measurement time.

Sample types

The standard sample introduction system uses a nebuliser and spray chamber, similar to those used in flame AA, to produce an aerosol of a solution sample which is introduced into the centre of the plasma. Any sample which can be dissolved in an aqueous or organic solvent can be analysed in this way. The upper limit on total dissolved solids is about 0.2%.

Sample types that ESR:Environmental expects to be analysing in this way in the first few months include environmental water, potable waters, blood and urine (diluted), food and biota (digested), metals in solution, and effluents (sometimes after digestion). In many cases a full elemental scan will replace previous analyses of only one or a few elements. This is particularly useful in troubleshooting, where the problem is not really known or in multiplying up the amount of information that can be gleaned from samples once the effort has been made to collect them.

A Milestone MLS 1200 Mega microwave/pressure vessel digestion system has also been installed to allow dissolution of a very wide range of materials. The ESR:Environmental ICP-MS installation also includes a Perkin-Elmer FIAS 400 Flow Injection System and a CETAC U-5000 AT Ultrasonic Nebuliser, which will allow analysis of higher concentration solutions, automatic dilution, automatic addition of internal standards, even lower detection limits and a range of other advantages. For samples that are very resistant to dissolution, an ultrasonic slurry sampler in conjunction with an Electrothermal Vaporisation Accessory (similar to the graphite furnace of an AA) will still allow analysis to proceed.

Housing

ESR:Environmental's ICP-MS has been installed in a specially prepared laboratory on the Gracefield site. The instrument room has a HEPA filtered air supply, giving Class 350 conditions in the room. The ELAN 5100 was installed in this room on 8 December, and the plasma was lit late the same day. The instrument produced its first spectra two days later.

Auxiliary equipment is housed in appropriate supporting laboratories, including a Class 100 Metal-Free Clean Room and a Class 10 000 Semi-Clean Laboratory. All acids used in sample preparation, sample container cleaning, etc, are purified by sub-boiling distillation to lower their impurity contents.

Support

The ICP-MS will analyse samples from a wide range of sources within ESR. Analyses of greatest interest to readers of this issue of "Chemistry in New Zealand" will be baseline environmental samples and contaminant samples. For baseline environmental work three facets are of equal importance: collecting a representative sample; preserving and transporting that sample without changing its composition; and analysing the sample. Protocols and expertise in all these areas have been developed over several years by the skilled analytical staff of ESR:Environmental, who were previously with DSIR Chemistry, and examples in the organic contaminant area are described in another paper in this issue. Elemental analysis up until now has been by graphite furnace AA with Zeeman background correction. These methods for ultra-trace metals determination are currently being transferred to and validated on the ICP-MS.

Conclusion

The arrival of the ELAN 5100 ICP-MS at ESR:Environmental heralds a new standard of sensitivity, speed, and productivity in elemental analysis. There will be many applications in the environmental area, and also in a wide range of other analytical fields. We look forward to working with potential users to take full advantage of these new capabilities.

THE ELAN 5100 ICP-MS FROM PERKIN-ELMER SCIEX

For over ten years Perkin-Elmer Sciex has set the standard for ICP-MS instruments. To date some 250 ELAN series instruments have been installed in environmental, pharmaceutical, medical and research laboratories worldwide. Recently Perkin-Elmer installed one of the latest model ELAN instruments, the ELAN 5100 at the laboratories of ESR: Environmental in Lower Hutt.

At the heart of the ICP system is a variable power RF generator incorporating the latest free-running 40 MHz design to ensure the lowest possible oxide levels. The free-running generator varies the RF frequency and couples to the plasma impedance quickly and efficiently giving optimum power transfer to the plasma under varying sample conditions. No operator adjustment to the frequency or matching network is required.

"Pinch" discharges have been entirely eliminated by the use of the Perkin-Elmer Sciex patented PLASMALOK™ circuit technology. This modification to the ICP circuit, grounds the load coil at its electrical midpoint greatly reducing the plasma RF potential and eliminating secondary arcing to the sample core, thereby maintaining the plasma discharge at electric neutral potential. This sharply reduces the presence of doubly charged ions. PLASMALOK™ thus decouples the plasma from the ion optics allowing independent adjustment of the ion optic parameters and the plasma conditions. The result is that the overall shape of the response curve does not change over the mass range with the sample matrix (aqueous vs organic solutions, or between wet plasmas (solution analysis) and dry plasmas (laser ablation and graphite furnace).

The ICP-MS interface is a critical feature of any ICP-MS instrument. Years of research have lead to the engineering of sample and skimmer cones to ensure maximum ion transport to the mass spectrometer. A state-of-the-art quadrupole power supply gives unrivalled mass stability and accuracy. Since the ELAN 5100 always knows which mass is being measured the system doesn't need to acquire extra data points around the mass to identify the peak position, so the channel electron multiplier (CEM) detector will only measure the ions of interest.

OmniRange™, a unique feature of the ELAN instruments extends the analytical working rate of ICP-MS without compromising results. Much like a neutral density filter, OmniRange™ filters out a portion of the ions at a specific mass by controlling the potentials of the quadrupole. Now it is possible to determine the elements at high concentrations, and at the same time determine elements at trace level in a single sample.

The ELAN 5100 is controlled by powerful software running on a 386 or 486 industry standard PC. The software includes five easy-to-use applications modules incorporating everything needed to analyse all types of samples - simply select Quantitative Analysis, TotalQuant I, Graphics, Isotope Dilution or Isotope Ratio mode from the convenient dropdown menu. The Quantitative Analysis mode provides complete quantitation of up to 250 analytes, fitting the calibration curve with up to 10 standards. Spectra can be viewed using the Graphics mode.

TotalQuant I is a marvellous screening tool for the busy analytical laboratory. Using sophisticated "heuristics", TotalQuant I interprets your spectrum, and decides which peaks are important and which are not, and quickly gives you a very accurate semi-quantitative analysis for up to 78 elements allowing you to quickly characterise samples prior to performing a complete quantitative analysis. TotalQuant I automatically corrects for interferences without requiring elemental equations.

The ELAN instruments have been designed to take advantage of a variety of sampling systems for both solid and liquid samples including autosamplers, ultrasonic nebulisers, laser samplers, electrothermal vaporisation (graphite furnace), corrosion resistant sample introduction systems and sampling systems for organic samples.

Perkin-Elmer New Zealand full supports the ELAN 5100 instruments with factory-trained service personnel based in Auckland and Wellington. With a network of applications specialists and research scientists worldwide, Perkin-Elmer provides applications back-up, method development and customer support for all ELAN users.

Perkin-Elmer Sciex ELAN ICP-MS instruments offer superb detection limits, and unbeatable reliability and sample throughput. To explore further the possibility of getting the power of ICP-MS in your laboratory contact: Perkin-Elmer New Zealand, P O Box 22 159, Otahuhu, Auckland, Ph (09) 276 2230, Fax (09) 276 5602 **or circle no. 29 on the reader reply card**

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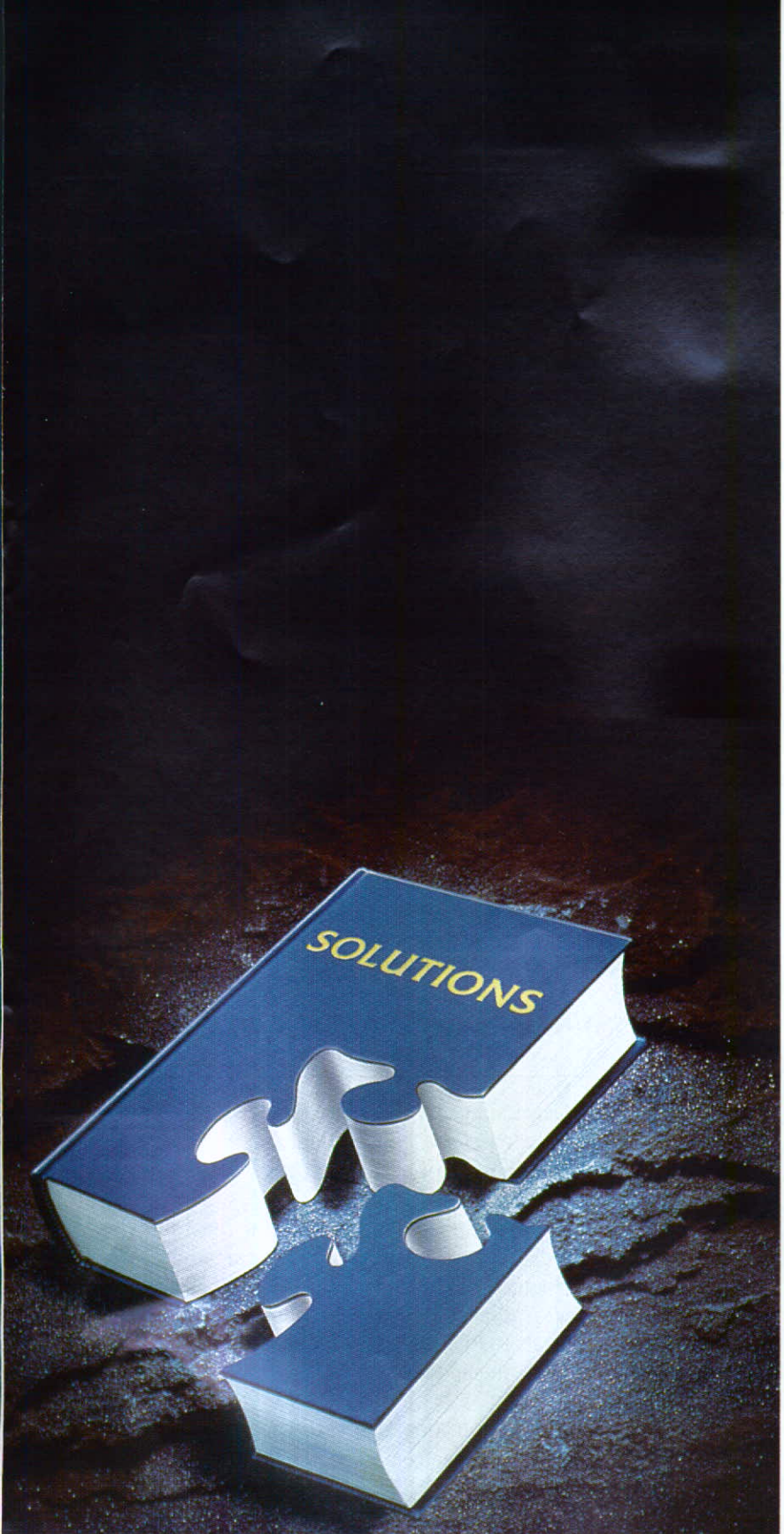

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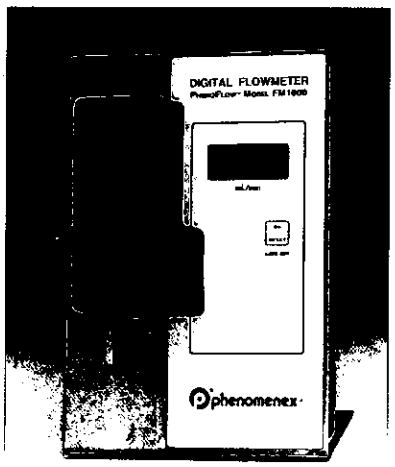

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Compared to the GC/flame ionization detector and other conventional GC detectors, which provide quantitative and chromatographic information, the GCD provides a third dimension of structural information - an electron impact (EI) mass spectrum.

For organic chemists who perform synthesis of chemicals and pharmaceuticals, the GCD can help shorten product development cycles. Compound structural data provides feedback on organic syntheses that helps direct subsequent syntheses and helps troubleshoot problem syntheses. This frees chemists to spend less time exploring dead-end solutions and more time developing useful new compounds.

The GCD also can help quality assurance/quality control laboratories in chemical and petroleum companies rapidly detect and characterise unknowns in raw materials and final products. Compound structural data can provide definitive raw-material characterisation and can help solve manufacturing process problems such as the identification of unknowns detected in final products.

Key benefits of the HP GCD system include the following:

Confident compound identification - The GCD system's detector, the electron ionization detector (EID), generates structural information in the form of an EI mass spectrum. In addition to the abundance and the retention time, this mass spectrum provides a third dimension of data for each peak in a chromatogram. Because most compounds possess a unique mass spectrum, the GCD can identify unknown peaks in a chromatogram without the use of standards. Co-eluting peaks and their components can be identified without using additional columns. Also the chemist doesn't need to re-inject standards when retention times shift.

Universal detection - the GCD can identify most compounds volatile below 400°C and with a molecular weight below 425 amu.

Selective detection - when operating in the selected ion monitoring (SIM) mode, the GCD measures a small number of preselected masses specific to the compounds the chemist wishes to monitor.

High confidence quantitation - the GCD provides high-confidence quantitation results, even for unresolved mixtures, because it quantitates by measuring the peak area of the ions characteristic of the compound being quantitated.

Ease-of-use - An easy to use software design with a graphical user interface based on Microsoft® Windows 3.1, computer-based training (CBT), and on-line help with modules that incorporate digital videos, reduce familiarisation time so chemists can begin generating useful information soon after installation of the instrument.

Simple data interpretation - The GCD's data review tools simplify data interpretation by automating the tasks commonly used to analyse data.

Self diagnosis - self diagnostics assure the chemist that the GCD system is operating properly. Automation of diagnostics and maintenance makes it easy to establish and implement protocols for these tasks.

Contact: Medtec Products Limited, P O Box 38 543, Wellington, Ph (04) 567 0011, Fax (04) 567 2821 **or circle no. 33 on the reader reply card**

NEW FEATURES ADDED TO EMC PROGRAMMABLE CONTROLLERS

The EMC 480 series, programmable controllers have been manufactured in New Zealand for ten years and are widely accepted for their ease of operation and complete reliability.

Six new features have been added to the standard EMC controllers making them more versatile by retaining up to eight standard programmes which, when recalled, can be operated by just pressing the START key.

Although the EMC programmable controllers were originally designed for pottery kilns, the new features make them suitable for many other industrial applications, particularly with the 0.1°C per hour ramp rate resolution. The controllers can also be set to use either, J, K, R or N thermocouples.

Contact: Electric Measurement & Control Ltd, Ph (09) 444 9229, Fax (09) 444 1145 **or circle no. 34 on the reader reply card**

ELIMINATE DANGEROUS AND INCONVENIENT GAS CYLINDERS WITH BALSTON GAS GENERATORS

Now available in New Zealand, the Balston range of laboratory gas generators produce high purity gases for analytical instrumentation. Balston provides the safest and purest source of >99.9998+% purity hydrogen, 99.9995% purity nitrogen and purified air for GC, FT-IR, TOC, AAS, NMR and other techniques.

Balston Gas Generators eliminate the need for dangerous and inconvenient cylinders and free up valuable laboratory floor space. All the systems are easy to install, operate and maintain, even by personnel not trained in instrumentation.

Also available are explosion-proof models suitable for instruments located in potentially explosive environments.

Contact: Labsupply Pierce (NZ) Ltd, P.O. Box 34-234, Birkenhead, Auckland. Ph. (09) 443 5867 Fax (09) 444 7314 **or circle no. 35 on the reader reply card**

A&D - A GROWING FORCE IN PRECISION, INDUSTRIAL, AND BALANCE WEIGHING

There are many good reasons why A&D has become Japan's largest, and the world's third largest, manufacturer of electronic balances in the space of a few short years.

Leadership in this field has come through adherence to A&D's tradition of aggressive innovation and devotion to high quality-control standards in manufacturing. Behind features such as one-touch automatic self-calibration, clear fluorescent displays, large weighing chambers and ergonomic designs, is thorough research, product development and testing. Through these combined efforts, A&D produces balances that deliver consistent, reliable weighing results year-in and year-out.

Many A&D balances incorporate features such as counting and percentage weighing to shorten work tasks that used to require hours. Whether your application is in the lab or on the assembly line, the advantages of full interface options are apparent in today's computerised world. A&D have found that human engineering is more than a matter of convenience: to deliver optimum results, weighing must be fast and simple if operator errors are to be kept to a minimum. To meet this need, A&D builds a broad range of models and capacities to suit virtually any application.

By applying forward technologies with our extensive research and development, we are able to produce balances with superior price value and lowest life cost.

A&D's rapid progress in the fields of weighing and measurement can be largely attributed to the importance it places on research and development. These efforts have led to design breakthroughs for Balances, Weighing Indicators, Medical and Health Care Products, and FFT Analyzers and Non-destructive Testing (NDT) devices. Twenty five percent of the entire company staff are engaged in design and development work. While appreciating the value of proven designs, original thinking is strongly encouraged at A&D. A 'ground-up' philosophy when designing new products makes it possible to offer better performance for a better value. In the end, better engineered products pay for themselves, both to the user and the manufacturer.

For further information on any of A&D's balances or other products contact: Advantage Data Systems Ltd, P O Box 68 281, Auckland, Ph (09) 360 0916, Fax (09) 360 0074 **or circle no. 36 on the reader reply card**

TOTAL HYDROCARBON ANALYSIS

Buck Scientific have developed the HC-404 to analyse both volatile and nonvolatile oily material using EPA methods 413.2 or 418.1.

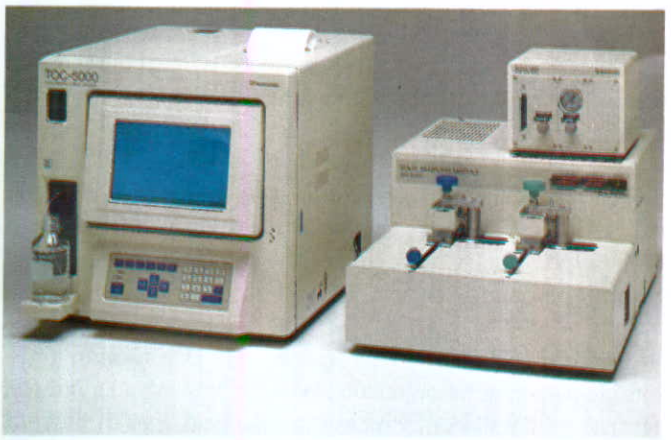
Using an Infra-red technique, the standard 10 mm cell can analyse to 1ppm or use of a cell up to 100 mm permits lower level analysis. The built-in linearizer allows higher concentration samples to be easily calibrated in direct ppm readings on the digital display.

For laboratories trying to comply with the Montreal Protocol, Horiba offer an alternative to EPA 413.2 and 418.1 for hydrocarbon extractions with their Type S-316 Solvent which exhibits absolutely no interference in this area of the infrared.

Contact: Peter Hassan, Alphatech Systems Limited & Co., P O Box 37 583, Parnell, Auckland, Ph (09) 377 0392, Fax (09) 309 8514 **or circle no. 37 on the reader reply card**

TOC ANALYSIS OF SOLID SAMPLES NOW AVAILABLE WITH THE SHIMADZU TOC-5000

The new SSM-5000A Solid Sample Measurement Unit has been developed by Shimadzu for the TOC-5000 analyser to enable users to analyse a variety of different types of sample easily with the one instrument.



The SSM-5000A enables environmental laboratories to analyse not only liquid samples but also the TOC content in samples such as soil, sludge and sediment. Even liquid samples with a large amount of suspended material are easily measured using sample boats.

READER REPLY

PRODUCT INFORMATION REQUEST CARDS

Dear Reader,

These postage paid cards are provided so that you can request further information on the products and services listed in this publication. Please answer all questions on the cards. Alternatively you may wish to contact the supplier(s) directly. Please tell your supplier you saw their product in CHEMISTRY IN NEW ZEALAND.

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1 SURNAME: INITIALS: TITLE:

INSTITUTION OR COMPANY:

DEPARTMENT:

ADDRESS:

TEL: FAX:

2 YOUR FUNCTION (please tick)

- MANAGEMENT ☐
- RESEARCH/DEVELOPMENT ☐
- PRODUCTION ☐
- QUALITY CONTROL/ ASSURANCE ☐
- PURCHASING ☐
- CONSULTING/ADVISORY ☐
- OTHER (please specify) ☐

3 WHAT EQUIPMENT/TECHNIQUES DO YOU USE? (Please Tick)

GC/GC-MS	☐	HPLC/LC	☐
UV/VISIBLE SPECTROSCOPY	☐	FLUORESCENCE SPECTROSCOPY	☐
AA SPECTROSCOPY (FLAME)	☐	AA-GRAPHITE FURNACE	☐
NMR	☐	POLYMERASE CHAIN REACTION	☐
THERMAL ANALYSIS	☐	FTIR/IR SPECTROSCOPY	☐
MICROSCOPY	☐	OTHER (Please Specify)	
pH/ELECTROCHEMISTRY	☐		
ELECTROPHORESIS	☐		
CENTRIFUGES	☐		
XRF	☐		

4 I WOULD LIKE TO KNOW MORE ABOUT BECOMING A MEMBER OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY. PLEASE SEND ME DETAILS Please tick ☐

5 I AM INTERESTED IN FURTHER INFORMATION ON THE FOLLOWING NUMBERED PRODUCTS. (CIRCLE THE CORRESPONDING NUMBER FROM THE BASE OF THE ADVERTISEMENT OR ARTICLE).

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31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56				

CHEM NZ JAN 1994

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- PRODUCTION ☐
- QUALITY CONTROL/ ASSURANCE ☐
- PURCHASING ☐
- CONSULTING/ADVISORY ☐
- OTHER (please specify) ☐

3 I WOULD LIKE TO SUBSCRIBE TO CHEMISTRY IN NEW ZEALAND ☐

SUBSCRIPTION: $NZ35.00 IN NEW ZEALAND
$NZ45.00 OVERSEAS

PLEASE COMPLETE THE NAME AND ADDRESS DETAILS ABOVE.

☐ I ENCLOSE A CHEQUE FOR NZ$
☐ PLEASE BILL MY CREDIT CARD.

VISA ☐ MASTERCARD ☐ BANKCARD ☐

EXPIRY DATE NO.

SIGNATURE

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31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56				

CHEM NZ JAN 1994

Solid samples of up to 1g and a carbon quantity of 30mg are able to be measured reducing the possibility of error encountered with smaller sample quantities due to non-uniform distribution of carbon throughout the sample.

A tandem cell enables one TOC-5000 to measure TOC in ultra pure water in the range of several tens ppb through to solid samples with 10% TOC. The process of changing from liquid to solid samples and back is achieved simply by a setting on the large LCD display of the TOC-5000.

Measurement of inorganic carbon in the solid samples is also easily accomplished using the SSM-5000A and the TOC-5000.

Contact: Douglas Scientific, P O Box 45 027, Auckland 8, Ph (09) 837 5447, outside Auckland Ph (0800) 735 725, Fax (09) 836 0668 **or circle no. 38 on the reader reply card**

AUTOMATE SOLID PHASE EXTRACTION AND MAXIMISE YOUR LABORATORY'S PRODUCTIVITY

EPA Method 525.1 and other SPE sample preparation tasks on liquid samples can be automated using the Zymark AutoTrace™ SPE Workstation.

Used with 47 mm SPE disks or Syringe Barrel SPE columns the Zymark AutoTrace™ SPE Workstation provides rapid, efficient solid phase extraction with;

- High recoveries
- High flow rates and minimal clogging
- Economical price
- Unattended operation
- Reduced costs
- Improved precision and accuracy

Contact: Steve Lawson at Alphatech Systems Ltd & Co, P O Box 37 583, Parnell, Auckland, Ph (09) 377 0392, Fax (09) 309 8514 **or circle no. 39 on the reader reply card**

QUIET, CFC FREE, ULTRA-LOW TEMPERATURE FREEZERS

Finally an ultra-low temperature freezer with quiet operation. Compressor units that are not overdriven by New Zealand's 50Hz power supply mean quiet (less than 60dbA), trouble free operation. You don't need to store the freezer outside of the lab just to have a peaceful work place, which means your samples are right there when you need them. An overdriven compressor means breakdowns and costly repairs - something you should not have to face with NuAire's new range.

You needn't worry about the refrigerants your freezer uses. With NuAire you are protected from any future regulations imposed on CFC compounds because NuAire now uses CFC-free refrigerants and insulation in their freezers.

At the same time your safety is not compromised as the refrigerant used is non flammable.

The NuAire range of upright and chest ultra low temperature freezers also include the following standard features;

Easy to read digital display
Micro-processor control system
Power failure alarm
High temperature alarm
Security key lock
Platinum Resistance temperature sensor
Double insulated walls

Contact: Douglas Scientific, P O Box 45 027, Auckland 8, Ph (09) 837 5447, outside Auckland Ph (0800) 735 725, Fax (09) 836 0668 **or circle no. 40 on the reader reply card**

ALPHATECH INTRODUCE THE SMALLEST HIGH OVEN TEMPERATURE (HOT) CAPILLARY GC

HOT GC's simplify the analysis of even very long chain hydrocarbons, and the 9300 Capillary GC is just half the size of its predecessor the SRI 8610. A direct computer link eliminates A/D converters, and the 9300's control parameters and data handling are managed by SRI's Peak Simple II software accomodated on any notebook computer making it truly portable, at a budget price. Laboratory bench space is expensive but you don't need to hesitate to add more GC capability when the SRI 9300 takes up about the same space as a laboratory balance. Or load the 9300 into a van and take your analysis direct to your customer's site.

For complete information contact Stuart Tyler, Alphatech Systems & Co. Ltd, P O Box 37 583, Parnell, Auckland, Ph (09) 377 0392, Fax (09) 309 8514 **or circle no. 41 on the reader reply card**

SOLID PHASE EXTRACTION CARTRIDGES

Medtec Products Limited is pleased to announce their exclusive New Zealand distributorship of the Applied Separations range of Solid Phase Extraction Cartridges and equipment.

The Applied Separations range is extremely comprehensive with standard cartridges ranging from 1 ml to 60 ml volume capacity packed with 100 mg to 20g of a wide range of sorbents.

Applied Separations also manufactures specialised cartridges such as those for drugs of abuse and for vacuum manifolds which can be automated with Applied Separations "Speed Wiz" preparation system.

Samples and technical papers outlining the use of solid phase extraction are available free of charge on request.

Contact: Medtec Products Limited, P O Box 38 543 Wellington, Ph (04) 567 0011, Fax (04) 567 2821 **or circle no. 42 on the reader reply card**

es^{2}c ENVIRONMENTAL ANALYSIS SOFTWARE

Europa
Scientific Software
Corporation

Available through Alphatech Systems es^{2}c offer the following packages of interest to the environmental analyst;

Electronic EPA Methods; 500 Series, 600 Series, Water and Waste, Solid Waste, Air Toxic, EPA CLP, NIOSH, OSHA Inorganic, OSHA Organic, Metals in Environmental Samples.

CLP Forms Templates; Volatile Organic (11 forms), Semi-Volatile Organic (15 forms), Pesticide Analysis (17 forms), Inorganic Analysis (18 forms), Anal. of Classical Wet Chem. (12 forms).

Material Safety Data Sheet Manager; includes a template for OSHA 174 forms and custom Excel toolbar.

NPDES Discharge Monitoring Report Form; Excel template easily configured to your individual reporting requirements.

Many other titles available for all areas of scientific investigation.
Contact: Conway Bishop, Alphatech Systems Ltd & Co, P O Box 37 583, Parnell, Auckland, Ph (09) 377 0392, Fax (09) 309 8514 **or circle no. 43 on the reader reply card**

GC STATIONARY PHASE FOR VOLATILE ORGANIC COMPOUNDS

To meet the growing requirements of environmental monitoring laboratories J&W Scientific has specifically engineered a GC stationary phase DB-VRX for the analysis of Volatile Organic Compounds (VOCs) which can be used for the US EPA method 502.2.

DB-VRX exhibits the least coelutions of any GC column commercially available for this method, enhancing peak identification for volatiles analysis. The selectivity of the DB-VRX phase has been "tuned" to provide adequate separation of the six "gases" included in the 60 compounds specified in EPA Method 502.2. This is done without sacrificing performance over the entire range, eliminating the added cost and hassle of cryogenics.

J&W Scientific ensures column-to-column reproducibility of this new phase by individually testing every DB-VRX column specifically for VOC analysis. Partition ratio (k), resolution and retention index (I) values are maintained within narrow ranges. Cross-linked and bonded for extended life, DB-VRX can be solvent rinsed. The combination of these features results in an easy to use column that requires no special expertise to achieve a high degree of confidence in results.

DB-VRX is available in several lengths, internal diameters and film thicknesses to address virtually an GC system configured for volatiles analysis.

Contact: Douglas Scientific, P O Box 45 027, Auckland 8, Ph (09) 837 5447, outside Auckland Ph (0800) 735 725, Fax (09) 836 0668 **or circle no. 44 on the reader reply card**

FIELD PORTABLE X-RAY FLUORESCENCE ANALYSER

With greater emphasis on environmental monitoring a need for systems to measure hazardous materials rapidly and inexpensively yet with uncompromised accuracy is becoming more apparent. In addition most of the critical testing has to be done in the field rather than in laboratory conditions if the program of environmental monitoring is to be timely and cost-effective.

Outokumpu electronics' field portable X-Ray Fluorescence Analyser HAZ-MET is designed specifically for this purpose. Using X-Ray Fluorescence the instrument is capable of simultaneous, multielemental, non-destructive analysis over a dynamic concentration range with excellent precision.

Battery powered, lightweight, with its own on-board microprocessor and software HAZ-MET is a tool capable of real time, field measurement of inorganic contaminants in the environment. It is able to provide hundreds of field measurements in a short time with drastically reduced cost.

HAZ-MET detects the majority of priority pollutant elements in solids, slurries, liquids and powders.

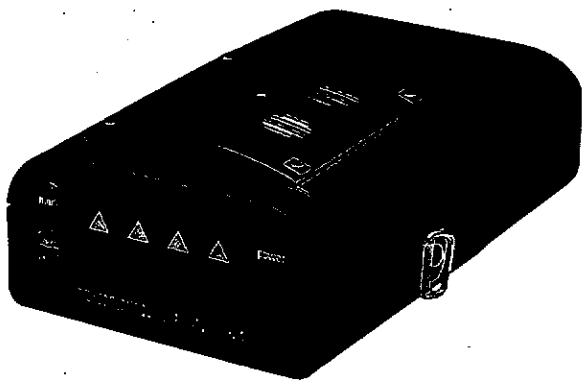
Other systems in the Outokumpu range include ARC-MET mobile optical emission analysers, and X-MET XRF analysers.

Contact: Douglas Scientific, P O Box 45 027, Auckland 8, Ph (09) 837 5447, outside Auckland Ph (0800) 735 725, Fax (09) 836 0668 **or circle no. 45 on the reader reply card**

A NEW CONFINED SPACE GAS MONITOR

Bacharach have recently released the upgraded version of the highly successful Sentinel 4 for confined space monitoring. The Sentinel 44 can be user upgraded from two gases to three or four in a matter of minutes by simply adding toxic gas sensors.

When activated, the built-in data logger can record peaks STELS, TWA's and exposure histories for each gas. Alarms are hierachial and if activated by external conditions will be displayed in order or importance i.e. most immediate threat to safety of workers first, after that condition is acknowledged, the next most immediate threat is displayed.



The Bacharch Sentinal 44 continues the tradition of rugged and reliable equipment with high impact ABS case sealed against dust and moisture.

Contact: Environmental Technology Limited, P O Box 101 260, Auckland 10, Ph (09) 444 5927 **or circle no. 46 on the reader reply card**

NEW MODEL AA SPECTROMETER FROM PERKIN-ELMER

The new Model 3110 Atomic Absorption Spectrometer from Perkin-Elmer offers cost-effectiveness, analytical power, operational simplicity, automation, flexibility and reliability in a single system.

If you have a limited budget and need a high performance atomic absorption instrument that will allow you to expand your analytical capabilities in the future, the model 3110 has been designed specifically to meet your requirements. The 3110 combines Perkin-Elmer's decades of technical leadership in atomic absorption with the latest innovations in product design and manufacturing techniques.

The Model 3110 features a double-beam optical system to produce the stability for quality analyses. A high light throughput monochromator, with a dual-blazed grating and extended range photomutiplier insures quality results at all AA wavelengths from arsenic (189nm) to cesium (851 nm).

The Model 3110 AA can be controlled from its built-in state-of-the-art microcomputer with custom keypad and vacuum fluorescent display. All operating parameters are displayed by the screen or indicator lights. Ease of keyboard operation was an important design requirement and comprehensive programming has been built into the instrument resulting in minimum keystroke operation, even for control of autosampler or graphite furnace accessories.

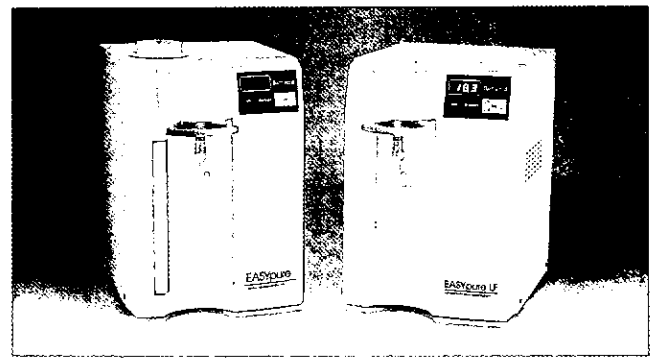
For those users wanting computer-control and data processing, the Enhanced Data System (EDS) operating from an industry standard PC gives you complete computer control over the instrument and all accessories including graphite furnace as well as giving you sophisticated data processing and report generation capabilities.

The model 3110AA is compatible with all Perkin-Elmer atomic absorption accessories including graphite furnace, autosamplers, mercury hydride and flow injection analysis systems (FIAS).

Contact: Perkin-Elmer New Zealand, P O Box 22 159, Otahuhu, Auckland, Ph (09) 276 2230, Fax (09) 276 5602 **or circle no. 47 on the reader reply card**

EXTREMELY LOW TOC LEVELS FROM NEW WATER SYSTEM

Barnsteads new range of water systems called Easypure are specifically designed for very critical applications requiring small volumes of high purity water on a daily basis. The units produce from 0.5 to 1.5 litres per minute of type one ultrapure water with a maximum resistivity of 18.3 megaohm/cm and extremely low TOC level. The Easypure is designed for many critical procedures such as HPLC, AA, TOC, GC/MS, ICP, and others. Pictured are the Easypure reservoir feed which has a 7 litre reservoir which is filled with pre-treated water, and the Easypure line feed which can be connected directly to a reservoir of either reverse osmosis or distilled water.



Soon to be released is the Easypure UV, which is a system similar to the line feed system but with a UV lamp. The lamp operates at two wave lengths, 185nm to cleave organics, and 254 nm to control bacteria. This unit will be able to achieve TOC levels unheard of previously. The unit is shown to be able to consistently produce less than 3ppb TOC, and on a regular basis beneath 1 ppb. Barnstead are planning further extensions of the Easypure range with the introduction of an Easypure ultra filter system for life science applications and an Easypure reverse osmosis system which will have a built-in pre-treatment step.

Contact: Medic Corporation Ltd, Private Bag, Lower Hutt, Ph. (04) 569 3539, Fax (04) 569 7984 **or circle number 51 on the reader reply card**

DUAL COLUMN BY J&W FOR ENVIRONMENTAL MONITORING DOUBLES SAMPLE THROUGHPUT

The need to stay competitive is a growing concern in environmental testing labs. The need for higher productivity and increasingly rigorous performance criteria is driving analytical innovation.

J&W has designed the new DB-171/1701 column assembly to help meet these needs. The DB-17/1701 is a single injection, dual capillary column system specially tested for pesticide, herbicide, PCB and other applications. J&W's unique dual 0.32 mm I.D. assembly provides increased speed of analysis by cutting run time in half and doubling sample throughput compared to 0.53mm I.D. columns used for the same analysis. Split, splitless, or on-column installation is easy, because the inlet end of the J&W Dual Column Assembly is standard 0.53mm I.D. (Megabore) and no inlet conversion is required.

The kit comes completely assembly and pretested, eliminating the tedious and tricky task of coupling and testing columns. A generous 10 meters of guard column lengthens column life and simplifies routine maintenance for less downtime and lower cost per test. J&W's new dual columns are specially tested using a mixture of pesticides with tight specifications to ensure resolution, calibration and verification requirements.

Contact: Douglas Scientific, P O Box 45 027, Auckland 8, Ph (09) 837 5447, outside Auckland Ph (0800) 735 725, Fax (09) 836 0668 **or circle no. 48 on the reader reply card**

HOARE RESEARCH SOFTWARE

Hoare Research Software is a firm that has recently been formed by Dr Ray Hoare, to provide distribution, sales and support of technical computer programmes, too sophisticated and too infrequently used to be of interest to the major software distributors. Dr Hoare has been distributing SYSTAT statistical products for 5 years, and now also supplies Mathcad, Mathematica, Lindo, and a selection of market research, forecasting, and other mathematically based programmes.

Statistical programmes can be used for data presentation and many modelling tasks, and not only for analysis of variance. (For instance, you can do non-linear curve fitting.) Mathcad can let you write down mathematical equations or matrices, just as you would on a sheet of paper, and perform algebra on them, solve them, or substitute numeric values for symbolic variables. Much more straightforward and powerful than using a spreadsheet, and easy to check.

Mathematica allows you do similar things to Mathcad, but because it works with a language based on functions, it can be used to build programmes for handling very complex tasks. Lindo is used for linear or quadratic programming, where you want to find an optimum solution to a problem in which many equations constrain the relationships between resources.

Your enquiries will be welcomed by Dr Hoare.

Contact: Hoare Research Software, P O Box 4153, Hamilton, Ph. (07) 856 2675, Fax (07) 856 2797 **or circle no. 49 on the reader reply card.**

LEGIONELLA ENVIRONMENTAL TEST KIT FROM PERKIN-ELMER

The new EnviroAmp™ Legionella kits offer rapid, sensitive and specific detection of both the genus Legionella and the species *L. pneumophila* in environmental water samples. Using polymerase chain reaction (PCR) technology the kits provide a fully integrated system consisting of 3 co-optimised modules for sample preparation, PCR amplification and PCR detection.

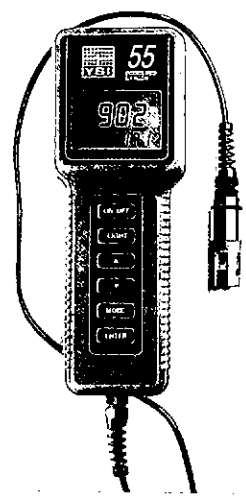
The reverse dot-blot format is employed with visual detection by PCR product hybridisation to strip-bound DNA probes enabling detection of the presence or absence of specific amplified DNA sequences. This methodology is non-radioactive and based on colorimetric development. An internal synthetic positive control is included to indicate whether or not the amplification procedure was properly performed. For additional reliability, the kit also includes a negative control dot on each test strip and a pre-PCR sterilisation procedure to prevent possible carry-over of PCR products from previous amplification reactions.

For further information contact: Perkin-Elmer New Zealand, P O Box 22 159, Otahuhu, Auckland, Ph (09) 276 2230, Fax (09) 276 5602 **or circle no. 50 on the reader reply card**

NEW HANDHELD DISSOLVED OXYGEN SYSTEM FROM YSI

The YSI 55 is a complete system including meter, probe and cable, for measuring dissolved oxygen.

The handheld meter features easy pushbutton calibration, built-n calibration chamber and simultaneous display of oxygen and temperature. The meter reads in mg/L or % oxygen and offers direct salinity compensation from 0 to 40 PPT. The large backlit display is easy to read and a low battery indicator tells the user when power is running low. The probe, with stainless steel weighted body, has a 12 foot or 25 foot permanently atttached cable.



Contact: John Morris Scientific Ltd, P O Box 6348, Wellesley Street, Auckland, Ph (09) 444 5836, Fax (09) 444 0974 **or circle no. 52 on the reader reply card**

A DIFFERENT WAY OF LOOKING AT ICP

Continuing in its tradition of offering the finest in ICP emission instruments, Thermo Jarrell Ash introduces an ICP instrument that will change the industry forever. Following in the footsteps of the ICAP™ 61E, the ICAP 61E Trace Analyzer will become the new benchmark against which the analytical capability of all other ICP emission instruments will be measured.

The most visible difference between the ICAP 61E Trace Analyzer and a conventional ICP is the way in which the torch is mounted. The Trace views the plasma axially, and the plasma is actually mounted on its side. This improves the light emission significantly, and with the proper changes to the torch, does not alter the basic plasma source properties of resistance to chemical interferences and robustness that have made ICP the mainstay of elemental analysis. A sophisticated and patented set of optics perfectly matches the axially viewed plasma to the rugged Paschen-Runge polychromator optical mount used by TJA for over 25 years.

With a typical pneumatic nebuliser, the ICAP 61E Trace Analyzer routinely exhibits detection limits ten to thirty times lower than the conventional ICP instrument - for all the elements normally determined by ICP. The Trace is guaranteed to perform at or below the limits shown in the table below.

Trace Guaranteed Detection Limits
Multi-Element Configuration (3σ)

Element (Wavelength)	Limit (µg/L)	Element (Wavelength)	Limit (µg/L)
Ag3280	0.75	Mo2020	0.75
As1890	2.0	Na5889	1.5
Au2427	0.9	Na3302	150.0
B2496	1.0	Ni2316	0.75
Ba4934	0.09	Pb2203	2.0*
Be3130	0.09	Sb2068	2.5
Bi2230	3.0	Sc3613	0.075
Ca3968	0.05	Se1960	2.0*
Cd2265	0.15	Si2881	2.5
Co2286	0.75	Sr4215	0.05
Cr2677	0.6	Ti3349	0.15
Cu3247	0.5	Tl1908	3.0
Fe2599	0.5	V2924	0.75
K 7664	25.0	Y3710	0.6
Mg2795	0.05	Zn2138	0.15
Mn2576	0.1	Zr3391	0.9

* Using Crawford/Kunselman Background

Improving detection limits in clean solutions is not enough for most applications. In addition to providing a much greater signal/background ratio in standard solutions, the Trace Analyzer also minimizes the effects of both interelement interferences and high levels of background in real samples. High quality optics supply less than 0.008 nm resolution to resolve most common spectral interferences and the hand-selected blazed holographic grating reduces the high background found in some samples to manageable levels.

Many applications that now require the extensive use of graphite furnace atomic absorption are now within the reach of the Trace's detection limits. For these applications, the Trace Analyzer can save on labour costs while substantially increasing productivity. An example is the elemental analysis required by the US EPA Contract Laboratory Program. The detection limits required for four elements (As, Se, Pb and Tl) have traditionally required graphite furnace analysis. Eighteen additional elemental determinations required by the program can be done with a conventional ICP. The Trace Analyzer can now bring these furnace determinations to the ICP and perform the simultaneous analysis of all CLP elements, including these four, in one half the time required for a single element on the graphite furnace. For the analysis of the four CLP elements, the sample throughput of the Trace Analyzer is greater than eight graphite furnace AA's. In addition, a separate sample digestion is eliminated along with all the expensive consumables and maintenance costs that go along with multiple graphite furnaces.

Contact: Sci Tech, P O Box 663, Dunedin, Ph (03) 477 7860, Fax (03) 477 7870 **or circle no. 53 on the reader reply card**

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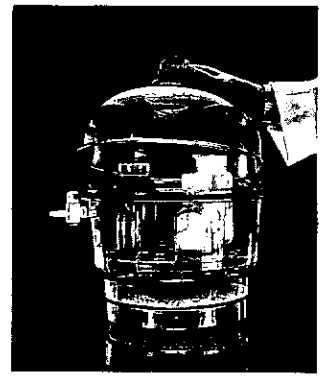

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Contact: Medic Corporation Ltd, Private Bag, Lower Hutt, Ph. (04) 569 3539, Fax (04) 569 7984, **or circle no. 54 on the reader reply card**

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Contact: John Morris Scientific Ltd, Ph 0800 651 700, Fax (09)444 0974 **or circle no. 55 on the reader reply card**

THE NATIONAL CHEMICAL RESIDUE ANALYTICAL LABORATORY - AN OVERVIEW

By John C Turner, Manager

The National Chemical Residue Analytical Laboratory based on the Wallaceville Animal Research Centre campus is part of MAFQuality Management. The lab specialises in chemical residue testing, an area it has been involved in since the early 1960s.

Originally the lab only serviced the meat industry and carried out pesticide research but recent years have seen a rapid expansion of the lab's activities to include residue testing services to other organisations, e.g. Agricultural Chemical Companies, Drug Companies, Regional Authorities, District Councils, Health Authorities etc.

The increase in staff numbers and the increased expenditure on capital equipment has placed the lab in a good position to provide new and better services. The residue testing for the meat industry, carried out to United States Department of Agriculture (USDA) and European Commission (EC) standards, has also positioned the lab as a leader in the field of residue testing, particularly for veterinary drugs, pesticides, herbicides, environmental contaminants and trace elements.

The requirement to measure residues below the maximum residue limits set by regulatory authorities and the necessity to modify and improve methodology has resulted in a strong R&D capability which is now available to clients. The lab staff are experienced in developing and using methods validated to USDA and EC standards and also presenting results of trials etc. to the exacting standards demanded by overseas regulatory authorities. The last three years have seen an expansion of activities to include the analysis of horticultural products for pesticide residues and multiresidue methods specially designed for clients wanting broad-spectrum tests have been developed. One of these tests detects and measures over 120 pesticides commonly used by horticultural producers.

Public concern about environmental pollution has lead to an increase in testing water, soil etc. for environmental pollutants, particularly heavy metals, organochlorines and herbicides.

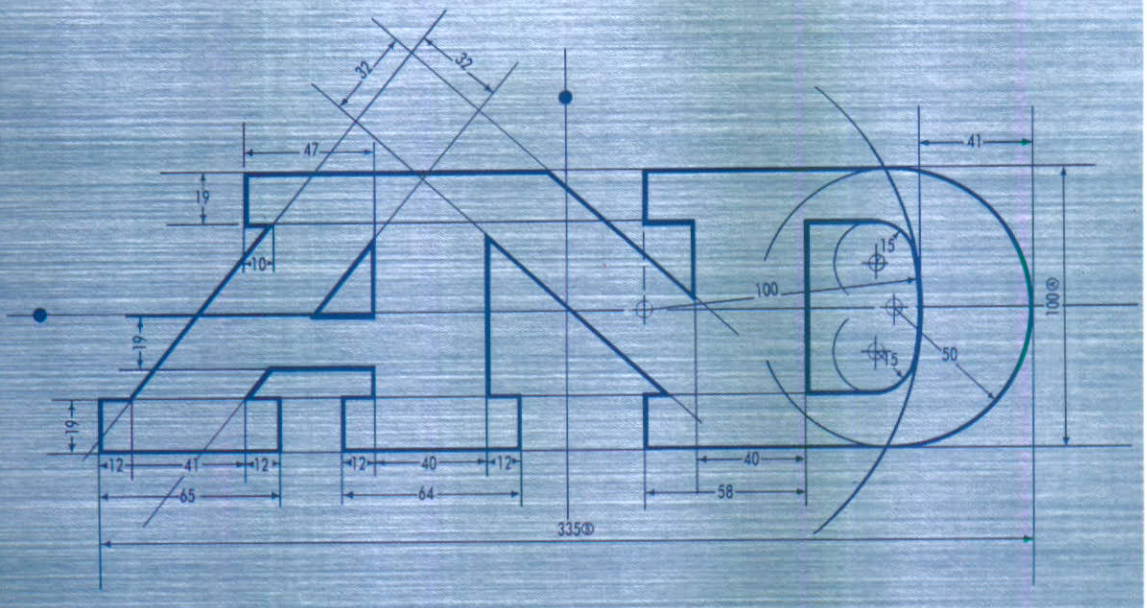
State of the art equipment is used and the lab has several HPLCs, several GLCs, two atomic absorption spectrometers and two mass spectrometers (one purchased in 1993 with LC interface). All major items of equipment are computer-controlled and automated for rapid throughput. With access to gamma and scintillation counters the lab is able to use radiolabelled compounds if necessary. The use of NMR facilities can also be arranged.

The lab's consulting expertise is in demand and one senior staff member is shortly to spend 1-2 months in Turkey, as part of a World Bank-funded project, helping that country to develop its pesticide testing capability.

Although the lab has operated to international standards for many years and has been audited regularly by the USDA, it has been preparing for ISO 9000 accreditation which it hopes to get in 1994. As part of its quality procedures the lab participates on a regular basis in several international inter-laboratory check programmes and has taken part in stability studies with the Australian Government Analytical Laboratories for the development of better inter-laboratory check samples. The lab has also participated in method validation studies for the Codex Alimentarius Commission (a subsidiary body of the Food and Agriculture Organisation of the United Nations and the World Health Organisation.

For more details on the services offered by the laboratory contact: Dr John Turner at the address in the advertisement below.

Balances and Weighing



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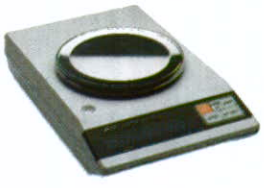

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CONFERENCES AND SEMINARS

3-4 February, 1994. **NZIC Chromatography Group "Supercritical Fluid Extraction, Solid Phase Extraction and other Advances in Chromatographic Analysis"**
Venue: Rotorua, New Zealand.
For further information contact:
Dr. Peter Robinson,
R. J. Hill Laboratories Ltd,
P.O. Box 4048,
Hamilton East, New Zealand.
Ph. 64-7-8552266
Fax 64-7-8549886

8-9 February, 1994. **Second New Zealand Symposium on Biosensors and Chemical Sensors.**
Venue: Bishop Julius Hall,
University of Canterbury,
Christchurch, NZ
For further information contact:
Wendy Collier,
AgResearch Grasslands,
Private Bag,
Palmerston North, New Zealand.
Ph. 64-6-3568019
Fax 64-6-3561130.

13-18 February, 1994. **8th International Conference on Surface and Colloid Science.**
Venue: Adelaide Convention Centre,
Adelaide,
South Australia.
For further information contact:
The Secretariat,
Techsearch Incorporated,
GPO Box 2471,
Adelaide,
South Australia 5001.
Ph. 61-8-2671755
Fax 61-8-2674031.

20-22 February, 1994. **Australian Chemical Industry Council (ACIC) Convention 1994**
Venue: Fairmont Resort,
Lewa, Blue Mountains,
NSW, Australia

28 April - 1 May, 1994. **4th Joint Conference of the Australian and New Zealand Societies of Cosmetic Chemists**
Venue: Conrad Jupiters Hotel,
Gold Coast, Australia
For further information contact:
Grant Binney,
Unit Pack Pty Limited,
P O Box 423, Mt Ommoney,
Queensland 4074,
Australia
Ph. 61-7-376 6700
Fax. 61-7-376 6532

3-8 July, 1994. **RACI Division of Organic Chemistry 14th National Conference**
Venue: University of Wollongong,
Wollongong, Australia
For further information contact:
Professor John Brenner (Chairman),
University of Wollongong,
Department of Chemistry,
Locked Bag 8844,
South Coast Mail Centre,
NSW 2521, Australia
Ph. 61-42-214 255
Fax. 61-42-214 287

11-15 July, 1994 **MACROAKRON '94, 35th IUPAC International Symposium on Macromolecules**
Venue: Akron, USA
Contact: Cathy Manus-Gray
Institute of Polymer Science,
University of Akron
Akron, OH 44325-3909, USA
Fax. 1-216-972-5463

24-29 July, 1994. **30th International Conference on Co-ordination Chemistry.**
Venue: Kyoto International Conference Hall,
Kyoto, Japan.
For further information contact:
Professor Koji Taraka,
Secretary of XXX ICCC,
Coordination Chemistry Laboratories,
Institute of Molecular Science,
Myodaiji, Okazaki, 444
Japan.
Ph. 81-564-55-7252
Fax. 81-564-54-2254

25-29 July, 1994 **Polymer Networks 94, 35th Microsymposium on Macromolecules**
Venue: Prague, Czech Republic
Contact: Dr B Valter
Institute Macromolecular Chemistry
Academy of Sciences of the Czech Republic
Heyrovskeho Nám 2, 162 06
Prague, 6-Petriny, Czech Republic

1-4 August, 1994. **9th International Drying Symposium (IDS '94)**
Venue: Gold Coast, Australia
The NZIC is co-sponsoring this conference and further information can be obtained from:
Alan Turner,
General Secretary/Executive Officer NZIC,
P O Box 12 347,
Wellington
Ph. 04-473 9444
Fax. 04-473 2324

13-17 November 1994 **3rd North American Research Conference on Organic Coatings Science and Technology**

Venue: Hilton Head, South Carolina, USA

Contact: Dr A V Patsis
Institute for Materials Science
SUNY, New Platz NY 12561
Fax. 1-914-2550978

14-16 November 1994 **IUPAC International Symposium on Functional and High Performance Polymers**

Venue: Taipei, Taiwan

Contact: Prof. Ging-Ho Hsuie
National Tsing Hua University
Department of Chemical Engineering
Hsinchu Taiwan 300
Fax. 886-35-726825
Email: ipst@nthu.edu.tw

CHROMATOGRAPHY '94

Following on from the success of CHROMATOGRAPHY '92, the Australia wide consortium of scientific equipment suppliers in conjunction with the RACI Analytical Group (NSW) are pleased to announce the launch of:

CHROMATOGRAPHY '94
JULY 19-21, 1994
AUSTRALIAN JOCKEY CLUB
ALISON ROAD
RANDWICK, NSW

Australian and overseas speakers will be presenting the latest developments in both the theory and practice of Chromatography over the three days of the Conference.

PLUS more than 26 instrument and accessory suppliers will be mounting displays for a Chromatography exhibition of working instrumentation which will be FREE for all to attend. Mark it in your diary now - **July 19-21, 1994** - and look for more details in coming issues of :

'CHEMISTRY IN NEW ZEALAND'

Contact: Dr S Grant Wyllie
RACI Analytical Group
(NSW)

Pacifichem '95

1995 International Chemical Congress of Pacific Basin Societies

Honolulu, Hawaii, USA • December 17-22, 1995

Were you there in '89? If you did not attend Pacifichem '89 in Honolulu then you should start planning now for the 1995 meeting, because you won't get another chance until 2000! If you *were* there then you'll need little encouragement to return in 1995.

Pacifichem, the International Congress of Pacific Basic Chemical Societies, 17-22 December 1995, provides the only forum for Pacific Basin chemists and biochemists to meet centrally, exchange information and assess the state of their discipline. The Congress opens on Sunday 17 December, the scientific session runs until lunch time on Friday 22 December, and you can get home for Christmas if you wish! The five day congress is being organised under the following ten thematic areas:

01 AGROCHEMISTRY - including agriculture, cellulose, carbohydrate, pulp and paper chemistry.
02 ANALYTICAL CHEMISTRY - including clinical, electrochemical and trace analysis
03 BIOSCIENCE AND TECHNOLOGY - including microbial and pharmaceutical chemistry
04 CHEMICAL ECONOMICS AND BUSINESS
05 CHEMICAL EDUCATION
06 ENVIRONMENTAL SCIENCE AND TECHNOLOGY
07 INORGANIC CHEMISTRY - including nuclear and geochemistry
08 MACROMOLECULAR CHEMISTRY
09 ORGANIC AND MEDICINAL CHEMISTRY
10 PHYSICAL CHEMISTRY

The Congress will operate with something in excess of 400 different half-day sessions grouped into some 150 symposium topics ranging through all major modern aspects of chemistry and much biochemistry. For those interested, the Branch Secretaries and the Victoria University Chemistry and Biochemistry Departments have a list of these. Planning is now well under way and some 48 meeting rooms and accommodations in the Sheraton and Hilton properties on Waikiki beach have been booked. From the symposia already proposed some 25 NZIC members appear to be involved even at this early stage. The presentation of work will be by both invitation and submission. In addition to the many specialised symposia, general sessions will be held in each of the ten broad subject areas.

Sponsorship to the Congress of 30 'Young Scholars' from the emerging nations of the Pacific Basin has been agreed to. If you know of anyone in South America, South East Asia etc, likely to be interested please have them contact:

The Pacifichem Office
American Chemical Society,
1155 16th Street, NW,
Washington DC 20036, USA.

For New Zealand PhD student members (Chemistry and Biochemistry), we now advise that one among you will receive sponsorship from the Ministry of Science and Technology and the NZIC to present a poster for the Student Poster Presentation Award of Merit (the actual presentation will be within the selected congress symposium). Details for application/selection will be available from the NZIC Office and Heads of Departments early in 1994.

Deadlines:
Abstracts for contributed/invited papers: 31 March 1995.
Registration: $US 275.00 by 1 November 1995.

Anyone interested in attending ***Pacifichem '95*** is urged to make contact with *Prof. B Halton, Chemistry Department, Victoria University, P O Box 600, Wellington.*

CAUSTIC COMMENT

By Ian J Miller

At our latest NZIC dinner meeting I made what could be considered an outrageous statement, namely that the teaching of chemistry at universities fails in as much as some of the basic understanding is sacrificed to learning facts. Students may know a mind-boggling array of information, but they do not understand enough of the underlying fundamentals, and consequently may not be able to understand new concepts in their own discipline. Worse, it is not their fault because they were not taught some of the physics that underlies chemistry. Alan Turner immediately challenged me to put this, provocatively to a larger audience. So be it, but before I reach for the lash, cover the underlying text, then try these three questions which at least stunned our table:

1. What is quantized?
2. What is the relevance of phase in theoretical chemistry?
3. What is the difference between **D** and **E**?

Notice the outright sadism of no multiple choices!

My inability to at least explain (3) adequately once led to remarkably little comprehension for some papers I wrote. Let me explain. When an electric field polarizes a medium, in effect a polarization charge ρ_p is generated such that $\rho_p = -$ divP. Suppose one does work on a molecule, with the work effecting a change of electron distribution. Now one has a forced polarization; my argument was that the electric field associated with the molecule should be altered in accordance with $\mathbf{D} = \varepsilon_o\mathbf{E} + P$, which answers (3) above. The flux density D is given by div $\mathbf{D} = \rho$, where the volume integral of ρ=q, the more familiar charge. The relevance? Well, this reasoning led me to the conclusion that a strained ring, such as cyclopropyl, should stabilise positive charge, and destabilize negative charge, adjacent to it, while the more conventional argument would have both stabilized. (The argument related to whether a 3-membered ring could conjugate, whatever you understand by that!) This topic was too minor to make an impact, it is extremely difficult to put a negative charge adjacent to a cyclopropyl group (which does not surprise me) so it is hard to find evidence, and for one reason or another nobody has pursued the obviously related topics; anchimeric assistance, molecular mechanics, and so-called non-classical ions to name a few. For example, the fact that an equatorial substituent solvolyses faster than an axial one in the same place could be a consequence of **P** being a vector. Does it matter? In my opinion, yes. We should try and understand what we are doing!

To the other two questions, action is quantized. Remember the strange units for h? Energy times time? Since angular momentum can be considered as action we see why the Bohr theory was successful. The phase is the angular aspect of the wave, which you all knew, and for the stationary state wave function (of interest to chemists), is determined by the action. I even once produced some evidence to suggest that ground state orbitals have different phase relationships to those usually assumed, and if true they have no radial nodes. Does this matter? I fondly imagined that if you wished to carry out quantum mechanical calculations for orbitals which nominally have radial nodes, e.g. 2s, 3p, 4d or greater, it might matter to have the correct wave function.

Now, whether I was right or wrong is fairly unimportant. Whether anybody cares what is right or wrong seems to me to be more important. But in my view, the fact that hardly anybody has the facility to care is an indictment on chemistry teaching. The first examples (**D** vs **E**) involves some of physics' greatest achievements, yet despite chemistry being, basically, the consequences of electrons and electric charge, chemistry students learn virtually nothing of the electrodynamics of James Clerk Maxwell. In the same vein, how can a student understand quantum mechanics when they do not know what is quantized, and what are the consequences of the quantization? Why throw terribly complicated mathematics at them when there is no physical meaning imparted?

So I have led with my chin. But I have done this not to criticise anybody in particular, but rather to stir up some action, and preferably more than a quantum. For if we do not really care about the fundamental understanding of science, why should the public care to fund us? And with what right do we criticise the spoonbenders, astrologers, etc, if we stand on non-comprehended dogma? And who's ever going to sit at my table again?

CHEMISTRY IN THE NEW ZEALAND CURRICULUM

Comment from the New Zealand Institute of Chemistry on the new Chemistry Draft Curriculum

NEW ZEALAND INSTITUTE OF CHEMISTRY
INCORPORATED

Ph: (04) 473-9444 PO Box 12-347,Wellington Fax:(04) 473-2324

Rose Tasker,
Curriculum and Contracts Management,
Ministry of Education,
Box 1666,
Wellington.

Dear Rose,

Enclosed is a paper setting out the comments of the New Zealand Institute of Chemistry on the draft document *Chemistry in the New Zealand Curriculum*. We trust you and your advisers will give very serious consideration to the comments made here as they represent views widely held by the country's practising chemists.

Yours sincerely,

A G Williamson
President,
New Zealand Institute of Chemistry.

The New Zealand Institute of Chemistry welcomes the opportunity to comment on the Chemistry Draft Curriculum. This curriculum must be suitable for those students who will become the country's scientists and technologists and who will make a major contribution to the wealth and wellbeing of the country in the future. Thus, while it should be attractive and interesting it must also be suitably rigorous so as to be a sound foundation for tertiary study. A problem of the past is that there has only been the bursary syllabus for seventh formers and this has not been suitable for many students. We believe that now a general science curriculum has been developed, those studying science as part of a general education rather than for vocational purposes can take that route and that the prime purpose of this new chemistry curriculum should be to lay the foundation for tertiary studies.

It is with this philosophy that we make our comment and suggestions. We shall publish our submission in our two publications CHEM NZ and Chemistry in New Zealand so that our members are informed and will be able to see what note has been taken of our comments when the final curriculum is released.

We realise that a curriculum is a general philosophical statement, and that the content of senior school chemistry will become more clearly defined when courses written to deliver the curriculum are produced and when examination prescriptions are developed. However we are very apprehensive that this document over emphasises process and under emphasises basic content.

PAGE 5. ***What is Chemistry?***
The important introductory statement does not answer the question and reduces "chemistry" to just one section of the subject, namely material science. We are sure this is not the intent of the writers and suggest the following alternative.

Chemistry is the study of matter, its composition and properties, and the changes it undergoes. Chemistry has developed and is still developing from people investigating matter in both living and non-living systems.

In light of the above the word "materials" in line 3 of *General Aims of Chemistry Education* should also be changed to "matter".

PAGE 6. ***Approaches to Teaching and Learning in Chemistry***
We strongly recommend that the following sentence be added to the end of the second paragraph: **However it is ultimately the teachers' responsibility to ensure that currently accepted explanations and appropriate knowledge are made available to the students.**

Immediately following this is the statement that *Learning is further enhanced when:* followed by four conditions. This would appear to be a reasonable hypothesis, but has research shown definitively that it is so and that such a bald statement is warranted? There have been occasions in the past when major educational changes have been based on hypotheses later shown to be flawed, with dire results. In the spirit of truth and scientific method we suggest that at this time the statement should also read: **It is possible that learning in chemistry is further enhanced when:**

PAGE 9. ***Achievement Aims***
Immediately after the box giving the achievement aims the sentence "To achieve these aims, students will become familiar with the language of chemistry, including the use of formulae, equations, and models to represent the composition of substances, and changes during reactions "occurs". We do not consider this sentence forceful enough. Unless students learn and master the basic language of chemistry these aims will not be realised. The word "will" should be changed to "MUST". We believe this is so important that a statement to this effect should become the first of four achievements aims. Thus we recommend aims 1-3 become 2-4 and the new 1 reads: **to master the basic language of chemistry;**

PAGES 10-11. In light of this a new section entitled *Achievement Aim 1* should be written and the current 1-3 should be renumbered 2-4. The suggestion for the new 1 should be on the following lines: **Students will become familiar with and learn the language of chemistry. This will include, at the appropriate level, the symbols of the common elements, the various meanings of formulae and equations, and the important quantities and units used in chemistry.**

Adoption of this recommendation will require alterations to the boxes of *achievement objectives* at each of levels 6, 7 and 8 on pages 12, 18 and 24 respectively. The new 1 would replace the rather vague statements at the bottom of the current boxes and give a more definitive indication of the level of language expected at each level.

Under the current *Achievement Aim 3,* we suggest three changes to the important ideas section and one change to the major patterns section: In the important ideas section, (a) that the third idea be re-worded to **the concept that the chemical behaviour of an element is largely determined by the electron configuration of its atoms;** (b) that the word "the" be dropped before kinetic theory; (c) at the end a further statement **the concept of the rate of a chemical reaction** be added. In the *major patterns* section, that **the classification of bonds as ionic, covalent and metallic** be added after the classification of compounds as ionic and molecular.

Rates of reaction and bonding are so central to the understanding of chemistry that they should be mentioned here.

We further believe that these central ideas should be spelled out in more detail under each of levels 6, 7 and 8 indicating the expected degree of knowledge and sophistication.

We strongly support the statement at the bottom of page 9 that by the time students have completed Level 8 they should have carried out at least one extended practical investigation.

Many of the suggested contexts by which students might learn are innovative and challenging, which we applaud, but they would need to be chosen with care. Any one class of students would have time for relatively few and we would warn against spending too much time going into relatively few topics at considerable depth at the expense of reasonable breadth. Time would only permit the one very extensive practical investigation.

PAGE 30. ***Developing Scientific Skills and Attitudes in Chemistry***
The intent of this aim could surely be more succinctly put by deleting the words "use their developing scientific knowledge, skills and attitudes to". One important skill a chemist needs to acquire is the ability to express him/herself precisely and clearly. The wording of the curriculum statement should reflect this.

General.
The many laudable aims and objectives of this curriculum can only be met if the basic language and concepts of chemistry are mastered at the appropriate stage of the students' course. To have an official curriculum document in place which would allow some teachers to leave out this basic material and turn the course into a social or economic commentary without understanding the essential scientific principles would be folly of the highest order. We believe the document in its current form could well result in this.

As the organisation of professional chemists in this country, the New Zealand Institute of Chemistry considers that it should play an official part in the development of the country's chemical education. We thus believe that the Ministry of Education should consult the Institute as it produces the final version of this important curriculum document. We also believe we should play an active and official role in the next stages of writing syllabi or prescriptions. It is currently actively engaged in preparation of resource material on chemistry in New Zealand.

THE ROYAL SOCIETY OF NEW ZEALAND NEWS

The Royal Society is an independent national academy of sciences and a federation of scientific and technological societies, with 17,000 members.

ROYAL SOCIETY OF NEW ZEALAND ELECTS ITS FIRST WOMAN PRESIDENT

Philippa Black, Professor of Geology at the University of Auckland, was elected President of The Royal Society of New Zealand at the Society's recent Annual Meeting. She is the first woman to be elected to this office in the 126 year history of the Society and the New Zealand Institute from which the current organisation arose.

Professor Black is a Fellow of The Royal Society of New Zealand and a Fellow of the Mineralogical Society of America. She was appointed to a Personal Chair in Geology at the University of Auckland in 1986 and is currently Deputy Dean of the Faculty of Science and a member of the Auckland University Council.

Born in Hamilton and educated at New Plymouth Girls' High School and the University of Auckland, Professor Black's research specialities are petrology, geochemistry and mineralogy. She has worked extensively in the field of resource assessment and particularly on coal, clays and roading aggregates. She has also held US National Science Foundation Fulbright, Alexander von Humboldt and Japan Society for Promotion of Science Fellowships.

ROYAL SOCIETY ANNOUNCES THREE PRESTIGIOUS AWARDS

Three New Zealand scientists of international eminence have been awarded prestigious national awards by The Royal Society of New Zealand.

The three awards are:

HECTOR MEMORIAL MEDAL - This award is made annually to the investigator working in New Zealand who has done most to advance a particular branch of science. It is awarded in rotation for work in plant sciences, chemical sciences, human sciences, solid earth sciences, mathematical, physical and engineering sciences, and animal sciences. In 1993 the award is being made in solid earth sciences.

The recipient is Richard I Walcott FRS, FRSNZ Professor of Geology at Victoria University of Wellington. Professor Walcott has been internationally recognised for his fundamental contributions toward understanding the active tectonics of the continental crust and the deformation of the lithosphere. For these contributions he has been admitted to the Fellowship of, The Royal Society of New Zealand in 1982, of The Royal Society of London in 1991, and of the American Geophysical Union in 1993.

Professor Walcott's broad involvement in earth sciences began with geological work on Antarctica and the Red Hill complex in the Nelson region. He next undertook extensive research on the crustal deformation of the Earth. More recently he has become the principal authority on horizontal deformation in the axial tectonic belt of New Zealand.

HAMILTON MEMORIAL PRIZE - This prize is awarded annually to encourage researchers at the beginning of their scientific careers. It rewards work published over the previous seven years, including the recipient's first substantive research publication.

The 1993 recipient of the award is Dr Neville W Pankhurst, senior lecturer at Auckland University's Leigh Marine Laboratory. Dr Pankhurst was educated in Nelson, attended Otago and Bristol Universities and initially worked at the MAF Fish Research Centre in Wellington. Since 1986 he has published more than 40 papers and he is one of New Zealand's leading marine biologists with an international reputation in the area of reproductive endocrinology of fish. One of his major contributions has been to document the links between behaviour and endocrine status in wild fish under natural conditions. His major work, using a technique of steroid radio-immunoassay which he developed, is technically very demanding as it requires scuba equipment to take plasma samples from fish on the nesting site.

NEW ZEALAND SCIENCE AND TECHNOLOGY GOLD MEDAL - This medal was instituted in 1990 by the New Zealand Government to recognise those who have made a significant contribution to the advancement of science and technology in New Zealand. The first recipient was Professor Vaughan F R Jones. The recipient of the Gold Medal in 1992-93 is Roy P Kerr FRSNZ, Professor Emeritus of Mathematics at the University of Canterbury. Professor Kerr is internationally known for discovering the mathematical solution of Einstein's equations which represents a rotating black hole. He was awarded the Hughes Medal of the Royal Society of London in 1984 for his paper describing the discovery which has become known as the Kerr Solution. His solution has had a profound effect on theoretical physics. Professor Kerr now lives in Auckland.

ROYAL SOCIETY ELECTS ELEVEN NEW FELLOWS

Eleven eminent scientists have been elected to the Fellowship of The Royal Society of New Zealand.

Election to the Fellowship is an honour conferred on individuals for outstanding achievement and distinction in scientific research and the advancement of science. With the election of the new Fellows the Fellowship now number 183. The eleven new Fellows are:

PETER J BARRETT: Reader in Geology in the Research School of Earth Sciences, Victoria University of Wellington, Peter Barrett is a leading Antarctic geologist.

JOHN T BOYS: Professor of Electrical and Electronic Engineering at the University of Auckland.

CAROLYN W BURNS: Professor of Zoology at the University of Otago, Carolyn Burns is one of this country's most highly regarded limnologists.

DEREK A HOLTON: Professor of Mathematics at the University of Otago, Derek Holton is a pure mathematician specialising in Graph Theory an area of Mathematics which has gained in importance since the advent of computers.

MURRAY J McEWEN: Reader in Chemistry at the University of Canterbury, Murray McEwen is distinguished internationally for his work in the field of gas-phase ion-molecule reactions, and specialises in experimental studies of reaction rates which lead to increased understanding of the nature and dynamics of the involved processes.

JOEL I MANN: Professor of Human Nutrition at the University of Otago, Jim Mann is an innovative international authority with expertise spanning the fields of nutrition, epidemiology and clinical science, as well as a physician with special experience in diabetes, atherosclerosis and disorders of lipid metabolism.

JOHN MARBROOK: Professor of Molecular Medicine at the University of Auckland School of Medicine, John Marbrook has over a period of many years developed a series of novel and innovative methods for studying in vitro the cell populations involved in the immune response and their interactions.

WARREN MORAN: Professor of Geography and Dean of Arts at the University of Auckland, Warren Moran is an international scholar who has made many important contributions in geographical science to our understanding of the changing social and economic conditions of rural areas, both in New Zealand and overseas.

RAYMOND K RALPH: Professor of Cell Biology at the University of Auckland, Raymond Ralph's research career has centred on the chemistry and biochemistry of nucleic acids. In his early career he made fundamental contributions to the structure, isolation and organic synthesis of DNA.

RICHARD H SIBSON: Professor of Geology at the University of Otago, Rick Sibson has an international reputation for his work on the structural characteristics of crustal fault zones as they pertain to the mechanics of shallow crustal earthquakes.

JEFFERY L TALLON: Distinguished Scientist at Industrial Research Ltd, Lower Hutt, Jeffery Tallon has worked on a number of topic areas in solid state physics including phase transitions, defect properties of crystals, fast-ion conductors, materials science of ceramics, zeolites and superconductivity. He has established licensing and research contract agreements with the Boston-based American Superconductor Corporation which will ensure New Zealand will continue to have a major role in the practical implementation of high Tc superconductors. Highlights of his research include the discovery of several key new superconductors; the achievement of the highest reproducible superconducting transition temperature, 128K; he has unified the superconducting phase behaviour of all Tc superconductors. Dr Tallon has also made significant developments in the physics, chemistry and materials science of high-Tc superconductors, including thermoelectric power, muon spin relaxation, pair breaking, magnetisation, flux pinning, oxygen diffusion and properties at ultra-high pressure.

In recent years he has received a number of awards, including the Michaelis Memorial Prize for Physics from the University of Otago and the Sesquicentennial 1990 Commemoration Award for research in Physical Sciences.

NZIC NEWS

FROM THE PRESIDENT

Some Comments on the Institute

This essay was prompted by a request made at the 1993 AGM for statistics about the membership of the Institute. That apparently simple request prompted me to consider a number of matters more or less related to the fact that the Institute is its members. However let me deal with the initiating question first.

Since the appointment of our Executive Officer in 1989 we have been able to review the membership list more rigorously than before. In that review a number of members were identified who for various reasons were in arrears with their subscriptions. Some of these were members who have become incommunicado, some were members who rather than formally resign had simply let their subscription lapse. All these members have now been traced and/or had their names removed from the list or have resumed regular subscription.

As a result of this "purge" of the membership list the number of members has decreased but all those listed in the accompanying table (other than life members) are now subscription paying and (hopefully) active members.

Membership of NZIC

Year	Hon Fellows	Fellows	Members	Associates	Student Members	TOTAL
1989	42	334	870	200	161	1601
1990	40	330	820	180	155	1525
1991	38	323	794	170	148	1484
1992	36	327	779	168	176	1486
1993	37	321	743	148	158	1407

Nevertheless the numbers give us no cause for complacency and we should ask ourselves yet again why the membership is relatively low given that each year there are about 250 new graduates in chemistry from the Universities and possibly a similar number qualifying from the polytechnics.

Maintaining our membership is something of a chicken and egg situation.

The ability of the Institute to serve the profession as a whole and it's individual members depends on maintaining a firm financial base from subscriptions and a large enough membership to ensure that people are available to do things. On the other hand the support by individuals will only be justified if the Institute does promote useful services to the Chemical Community.

Let us begin by looking at the services the Institute does provide or promote at the present time.

Educational Activities

CHEM NZ: One of the most successful of the Institute-generated educational activities is CHEM NZ. While this would not be possible without the collaboration of a number of school teachers, it is provided by the Institute free of charge to schools, and is popular with schools. It also provides a vehicle to bring together people involved in chemical education at all levels and chemists in industry. It is worth mentioning at this stage that starting in 1994 when the contract to provide 875 copies of each issue to the Science Education Divisions of the Royal Society of Chemistry begins, the overseas circulation will be slightly larger than the New Zealand circulation!

Olympiad: Another activity promoted and supported by the NZIC is the Chemical Olympiad Programme. This is another activity that only succeeds because of the enthusiasm and hard work of secondary school teachers, pupils and a few university teachers. However it also depends crucially on the Institute for its support and coordination. In 1993 all four members of the NZ team won medals - awarded to the top 15% of competitors. This was an outstanding effort.

Chem13 Exam: The NZIC Chem13 exam for F6 and F7 secondary school students is coordinated by the Institute. We also act as a clearing house for the RACI National Chemical Quiz.

Chemical Processes in NZ: This highly successful publication was made possible through an excellent collaboration involving the Institute, University staff, school chemistry teachers and industries whose processes were described. A new edition of this is to be produced and a questionnaire about the proposed content is currently being circulated among potential contributors.

Visiting Speakers

The NZIC has for some years sponsored and planned visits from overseas chemistry educators - the most recent being the tour by Roy Tasker and Kris Basden.

Several other programmes for collaborative educational activities (including a "Chemistry Week" to be organised by the Canterbury Branch) are currently under discussion.

I believe that the educational case is an indicator of a situation which is not uncommon for people whose discipline is chemistry. People graduate in chemistry and then enter the teaching profession where the focus of their attention is on teaching organisations such as the PPTA and Science Teachers Association. Membership of NZIC becomes a secondary concern and the subscription seems high for membership of an organisation whose Branch meetings and regular journal do not appear to provide a great deal of direct interest to secondary school teachers.

However I believe that the Institute does, as has been outlined above, provide a very significant input to the teaching of chemistry in secondary schools and that it would be appropriate for many more chemistry teachers to become members of the Institute. One of the things I hope to do over the next few months is to explore ways of promoting such membership.

The Journal

Of recent years the cost of producing "Chemistry in New Zealand" has been a major concern to the Council and has been a major drain on our finances.

Subscribers cannot have missed the transformation which has taken place this year with the change of publisher and the change of editorial structure. This transformation has been accompanied by a huge reduction in cost to the Institute. It is not overstating the case to assert that without this change we would have been faced with the alternatives of a massive increase in subscription or disbanding the Institute within a year!

While the Journal has been transformed it still has a way to go to completely fulfil its function as a means of communication among members. The other professional journal to which I subscribe has a vigorous "Letters to the Editor" section which I never fail to read and to which I often contribute. I would like to see a similarly active correspondence section in "Chemistry in New Zealand". There are certainly enough topics on which chemists hold strong views (atmospheric pollution, toxic chemicals storage, energy conservation, funding of research, science curricula to name but a few). Indeed with the journal running issues on particular themes one might expect the correspondence columns of any one issue to be heavily loaded with letters on the theme of the previous issue.

I would also like to see a "personal" column with brief biographies of chemists who have received honours and awards. We should also provide a showcase for the work of award winners. Margaret Brimble's superb Easterfield Award lecture at this year's conference is an example of something which should be available to all chemists.

The Journal is currently commercially viable but it must not become simply a commercial vehicle. Nor must it be left to the Editorial Board to "find" material and authors. It is up to readers and members of the Institute to expound their view publicly.

Conferences

One of the functions of the Institute is to arrange regular conferences. The most recent one at Auckland was, from my point of view, an outstanding success. The plenary lectures alone were worth attending.

The joint sponsorship between the NZIC and the Medicinal and Agricultural Division of RACI worked well with about 20% of the listed enrolment coming from Australia. Even more interestingly a further 12% came from other overseas countries. The new timing of the Conference seemed to meet with general approval.

One wonders which of the various factors was most significant - change of timing, combined Australian/New Zealand sponsorship or the two year gap from the previous conference. Among the people I spoke to all three factors were regarded positively and I think that we must certainly consider them all in planning for the next conference. Again it would be interesting to have member's views on this.

Another feature of the conference was the fact that a large number of those attending were not members of the NZIC. While we cannot expect overseas enrollees to be members and indeed we welcome their attendance in adding to the value of the conference as a forum for exchange of ideas, I do believe that, if New Zealand chemists see the Conference as being worth attending they should recognise that maintaining the infrastructure that enables such conferences to be organised is also important. That infrastructure is in turn dependent on the subscriptions of NZIC members. Many of those who attend are chemists by origin but now perceive their allegiance to be with an applications group (Medicine, Forensics etc) rather than with chemistry per se.

The Allegiance of Chemists

I have already alluded to two situations in which groups of chemists might see their primary loyalty being to another professional group but who nevertheless accept benefits credited by NZIC. This raises the question of whether the Institute is correctly structured to serve the needs of the "chemists" of today or the chemists do not recognise where their benefits come from and suffer from partially misplaced loyalties. Is this a real phenomenon and if so are there ways in which the NZIC can claim some of the allegiance of these chemists without engaging in fruitless competition with other professional bodies? I would certainly like to hear from Institute members (and others) on this topic.

Arthur Williamson
PRESIDENT, NZIC

NZIC COUNCIL NEWS

Prior to the 1993 Conference, Council took the opportunity to hold its Spring Meeting in Auckland; the following are some of the more salient points arising from the meeting.

FINANCE: The Treasurer presented a good news / bad news report. The good news is that a surplus of income over expenditure is now expected this financial year. This reversal of the loss making trend over the past few years has been brought about largely through a new arrangement to publish the Journal. Savings of some $30,000 per year are expected from the contract we have with the new Publisher - Ancat Holdings Limited. However there is no room for complacency. Because of the losses over the last three years, our cash reserves have fallen. Our other sources of income (i.e. interest) are also declining and as there is unlikely to be a Conference until 1996, there will be no conference surplus as a contribution to overall funds.

PUBLICATION: "Chemistry in New Zealand" The Journal is now back on track and fulfilling one of its main functions - being informative and readable for the Members. Thanks are due to the Editorial Board and the Publishers for their

enthusiastic approach in preparing and producing a good quality Journal.

"CHEM NZ" This publication for teachers of chemistry continues to go from strength to strength. It now has international recognition, with a contract to supply copies to the Royal Society of Chemistry for distribution internationally.

YEAR BOOK: A full list of members will be published every two years with the next edition scheduled for mid 1994. Members will be asked to update the records especially business addresses.

INSTITUTE PRIZES: The following winners of the Institute Prize were confirmed by Council for announcing at the AGM.

Shell Prize for Industrial & Applied Chemistry:
Dr Barry Dent, IRL, Lower Hutt

SGS Prize for Excellence in Research:
Dr Peter Schwedtfeger, Chemistry Department, University of Auckland

Chemical Education Award:
Associate Professor Sylvia Rumball, Chemistry Department, Massey University

CONFERENCES: Because the "Pacifichem '95" conference will be held late in 1995, it is not feasible to hold an NZIC conference which could clash with this international event. Therefore although Council would like to have a conference every two years (if not yearly) it will have to be postponed until 1996.

Council has a proposal from the Otago Branch to host a conference in 1996 - it will coincide with 125th Anniversary of the founding of the Chemistry Department of the University of Otago.

NZIC BRANCH NEWS

OTAGO

A new committee has been appointed and has started to plan for 1994.

Chairperson: Dr Melville Carr — Chemistry Department, University of Otago, Ph (03) 479 7932

Dr Melville Carr is a senior lecturer in Chemistry at the University of Otago where he has kept the flag of geochemistry (silicate equilibria, coal liquefaction, silver and gold extraction, and clay mineral interactions) flying since the mid sixties. He was elected to Associate Membership of NZIC in 1959 and has served on the Otago Branch committee in various capacities from 1960 onwards including Secretary (1965-69), Treasurer (from 1987) and Chairman (1970, 1993-)

Secretary: Mr George Morris — John McGlashan College, 10 Baker Street, Dunedin

Treasurer: Dr Melville Carr

Committee:

Mr Paul Croucher	Chemistry Department, University of Otago
Mrs Barbara Duncan	Chemistry Department University of Otago
Dr Rob Ledger	School of Pharmacy University of Otago
Dr Jim McQuillan	Chemistry Department University of Otago
Ms Christine Ogilvy	Cadbury Confectionery Dunedin

Branch Delegate: Dr Melville Carr

Branch Editor: Mrs Barbara Duncan

Welcome to new staff at the University of Otago for 1994:

DR PAUL ADDISON as a lecturer in Chemical Technology. Paul hails from Te Awamutu and received his B.E. (Hons) and PhD from the University of Canterbury. Since 1991 he has had a post-doctural fellowship at Loughborough College of Technology. Past research experience includes exchange equilibria, production of ethanol from whey, and he plans to look at the extraction of chitin from fish waste and axial gas-phase dispersion.

DR WILLIAM DUCKER as a lecturer in chemistry. William obtained his BSc (Hons) and PhD from ANU. Since 1991 he has been a post-doctural fellow at the University of California, Santa Barbara. His research expertise is in intermolecular and surface forces and in general interfacial physical chemistry involving liquids. The atomic force microscope will feature prominently in his work.

MR GRAEME CAYGILL as an Assistant Lecturer in the Chemical Process Science area. He has a BSc (Hons) and MSc (Hons) in Chemistry and a BE (Hons) from the University of Canterbury and has been working at DSIR IPD and Industrial Research Limited since graduating. He will be carrying out research towards a PhD.

MANAWATU

Our last meeting of 1993 was the AGM held on the 1st of December. Alan Furness was elected Chairperson, Melanie MacDonald - Treasurer and Mike Boland - Secretary. After an enjoyable pre-Christmas dinner we settled back to listen to Gill Norris talk on "Sweetness and life - adventures with sugar, scissors and small lattices".

Gill talked about the fascinating field of glycobiology. Worldwide research is aimed at identifying what is the information contained in your sugar biopolymers and how it is transmitted. Gill's team has been investigating the sugar chains attached to lactoferrin and her enthusiasm for her work shone through the lecture. The function of the chains is unknown but, after a successful year as branch Chairperson, Gill is obviously going to enjoy investigating their role.

Grant Boston

New Literature and Media

The following two books are published by: VCH Verlagsgesellescaft, P O Box 101161, D-69451, Weinheim, Germany

Further details from the Editor, Chemistry in New Zealand

(i) **SCIENCE AND TECHNOLOGY OF PHOTOGRAPHY**
260 pages, hard cover, DM 220.00
This book is a short up-to-date survey of the science and technology of photography. Modern photographic chemistry and physics is highlighted with emphasis given to current photographic processes and the structure of photographic materials. All technical professionals using photography will find this book of enormous value as it is unique in its concise, detailed presentation of the subject.

(ii) James A Cowan
INORGANIC BIOCHEMISTRY, AN INTRODUCTION
Inorganic Biochemistry is an introductory text that demonstrates the relationship between classical inorganic chemistry and the chemistry of metal ions in biology. Written specifically as a teaching text, rather than a review, it presents clearly and concisely many physical and chemical methodologies, yet it assumes little prior knowledge of the field.

Building from a firm basis in inorganic coordination and reaction chemistry, the author develops the biological chemistry of metal ions by consideration of biochemical topics (e.g. transport and storage; cellular regulation; respiratory pathways; bioenergetics; cell toxicity; chemotherapeutics, etc) rather than employing a description of the chemistry of specific metals, cofactors, or enzymes.

Essential background material in solution chemistry, physical methods and molecular/cell biology is clearly presented from first principles. Each topic is introduced with an outline of its biological context. The text also features figures and illustrations that highlight key concepts. It will prove to be of great value to senior level undergraduates and beginning graduate level students.

Inorganic Biochemistry is also a valuable reference for biological, inorganic and organic chemists; biochemists; chemical and environmental engineers; specialised researchers in molecular biology and medical sciences; and biophysicists.

NATURAL PRODUCTS - NATURE'S PRECIOUS GIFTS

Dictionary of Natural Products, published December 1993, 9,500 pages in seven volumes, 280 x 210 mm.

Skin of Frog and bark of Yew - this sounds like the ingredients of a witches brew; however the natural products isolated from these, and many other species, are finding applications as food flavourings and colours, cosmetic perfumes, natural pesticides and, perhaps most importantly, pharmaceuticals.
Flora and fauna species have been used for medicinal purposes for hundreds and sometimes even thousands of years. Historically the Chinese were first to take advantage of medicinal plants and over 11,000 plant medicines were used in China for thousands of years. Ephedrine, which is believed to be the oldest example of a pharmaceutical drug from medicinal plants, has been used to relieve asthma and hay fever in China for over 5,000 years.

The medicinal properties of frogs have also been known for centuries, with African tribes using them to treat warts by strapping them, back down, onto the offending disorder. More recently drugs derived from frog secretions have shown promise in treating health problems ranging from bacterial infections to schizophrenia, for example, caerin peptides isolated from the skin of the Common Green Tree Frog are effective antibiotics, especially potent against *Staphylococcus aureus*.

With the increasing importance of natural products to human life and activities, scientists are intensifying their study on the 99% of the 250,000 flowering plants (and an even greater number of fauna species) that have not been thoroughly investigated for natural product activity.

To help these scientists in their research Chapman & Hall have published the Dictionary of Natural Products. This comprehensive work is the first dictionary to survey the whole field of natural product chemistry and provides physical, structural and bibliographical data, including activity and use information, on over 100,000 natural products and related compounds. It covers natural products isolated from all classes of species, including plants, animals, marine organisms, fungi and bacteria.

All entries are arranged alphabetically by name to facilitate browsing and an extensive indexing system allows easy access by alternative routes. The Dictionary is indexed by name, molecular formula, CAS Registry Number, species and type of compound. The dictionary will be updated annually by means of supplements.

For a free 64 page sample and further information contact: Tanya Reardon, D A Books, 648 Whitehorse Road, Mitcham, Victoria 3132, Australia

DIRECTORY OF SCIENCE AND TECHNOLOGY FUNDING AGENCIES IN NEW ZEALAND

The Ministry of Research, Science and Technology will publish a directory which contains basic information about the various agencies which allocate funds to research and development in New Zealand, and is about to contact funding agencies with a request to verify information provided for an earlier draft version, or to provide new material.

It is important to clearly focus the directory and avoid overlap with other documents. The publication will therefore concentrate on listing New Zealand agencies which contestably allocate funds for the purposes of research and development

to other science providers within New Zealand (but not including agencies funding only scholarships and fellowships).

Each agency will be described in terms of its role and mission; structure and decision making processes; sources of funding; amount of money allocated; types of programmes funded; eligibility criteria and application procedures.

The target readership is expected to include research and development managers, scientists, members of science user groups, funding agency personnel and policy managers and analysts. The directory will be published as part of the Ministry's publication series early in 1994. Enquiries should be directed to Malcolm Menzies or Melissa Turner at the Policy Division of the Ministry of Research, Science and Technology..

WORLD PATENTS INDEX AND BIOTECHNOLOGY ABSTRACTS NOW AVAILABLE ON STN INTERNATIONAL

Derwent Publications and STN International are pleased to announce the release of the World Patents Index database and Biotechnology Abstracts on the STN service.

The file design for World Patents Index includes many innovative features and has been developed for maximum compatibility with the patent database collection on STN together with Chemical Abstracts. For the first time, World Patents Index and the complete Chemical Abstracts database will be available through STN, affording greater searching opportunities for patent and scientific information. The STN Messenger search software has also been enhanced to enable more extensive crossfiling capabilities. There are two file access names for World Patents Index to ensure that Derwent World Patents Index subscribers are able to take advantage of their preferential online rates.

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Integration of the Biotechnology Abstracts Thesaurus
A new FAM command to append patent family information from World Patents
Index without crossfile searching

Derwent and STN have jointly produced a User Manual for World Patents Index, together with further database support documentation. Orders for materials or requests for training details should be directed to local Derwent or STN offices. STN International, the scientific and technical information network, is jointly operated by FIZ Karlsruhe, Chemical Abstracts Service (CAS) in Columbus, Ohio, USA and the Japan Information Centre of Science and Technology (JICST) in Tokyo. Further Derwent databases - the Derwent Drug File and Registry, Derwent Crop Protection File and Registry, Derwent Veterinary Drug File and CRDS will become available on STN during 1994.

Contact: Shirley Bailey-Wood, Marketing Department, Derwent Publications Ltd, Derwent House, 14 Great Queen St, London WC2B 5DF, Tel 44-71-344 2800, Fax 44-71-344 2821.

BOOK REVIEW

KINETICS AND MECHANISM OF REACTIONS OF TRANSITION METAL COMPLEXES

R G Wilkins
VCH, Weinheim, Germany, 1991

An initial flourish of texts on Inorganic Reaction Mechanisms in the 1960-70 period [J O Edwards (1964), C H Langford and H B Gray (1965), A G Sykes (1966), F Basolo and R G Pearson (1958, 1967, 1981 with J W Moore), D Benson (1968), M L Tobe (1972),] was followed by an almost 15 year hiatus until D Katakis and G Gordon (1987) and now (1991), R B Jordon and R G Wilkins have independently produced new volumes. It must be admitted, however, that M V Twigg's series, sesquianual "Mechanisms of Inorganic and Organometallic Reactions" (Vol. 1, 1983) has kept the subject alive through this period of text-book drought. It is also interesting that Wilkins' production is a 17 year later, second edition of his 1974 classic. Few authors would have the energy for such an undertaking, but what a wonderful job has been done.

It would be unfair to compare this "revision" with the 1974 edition and the current volume must be regarded as a new text.

The approach is traditional, with an introductory chapter on rate laws of increasing complexity, but always with a judicious reference to the literature. Then follows a chapter on the application of the rate law and kinetic parameters (H#, S#, V#, salt effects, LFER) to postulate a mechanism. Chapter 3 deals with monitoring techniques and this is followed by chapters overviewing substitution process, redox process, reactions of coordinated ligands and steric changes. Each chapter concludes with 10-20 problems (138 in all) taken from the literature and Hints to Solutions are provided just before the index. Literature References (up to and including 1989) are also chapter related at the rate of 100-200 per chapter.

All this is exciting enough, but there are additional highlighted points of explanation (eight in total) with headings like **Protein surface "patches"; Diffusion-controlled reaction** and **Comparison of intra-vs intermolecular reactions.**

For this reviewer, however, the jewel in the crown is the final chapter "A survey of the transition elements". Here is a beautiful kinetic and mechanistic summary of transition metal oxidation states, Ti^{3+} through to Hg^{2+}, and is a mine of information on the current thinking for any particular oxidation state. Occasionally, however, the summary is too brief. The only entry under Pd(IV) is "Substitution in Pd (IV) is generally fast" with no literature reference.

The text is remarkably free from errors and misprints. There are one or two places where a reference in the original manuscript has not been raised to a superscript (p. 175, p. 222, p. 411) and a related problem appears in the legend for Fig 3.5.

Something has also gone wrong in the equations at the bottom of p. 103 and there are occasional errors in typesetting (MeOH in Table 4.13 and Selected Bibliography p. 252)

The high quality of VCH publications is maintained in this edition, from the modern holographic logo on the cover to the compact printing style that has been used on acid free, low chlorine paper.

Unfortunately, the only information not available to me was the New Zealand price. My local book seller quoted $120.00 (paperback) which, while not excessive by todays standards, may sadly put this excellent publication well beyond the pocket of most students.

D A House
Chemistry Department
University of Canterbury

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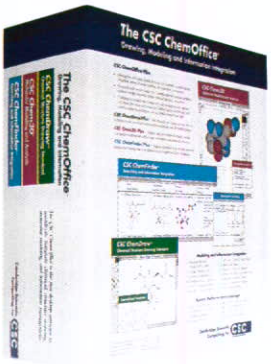

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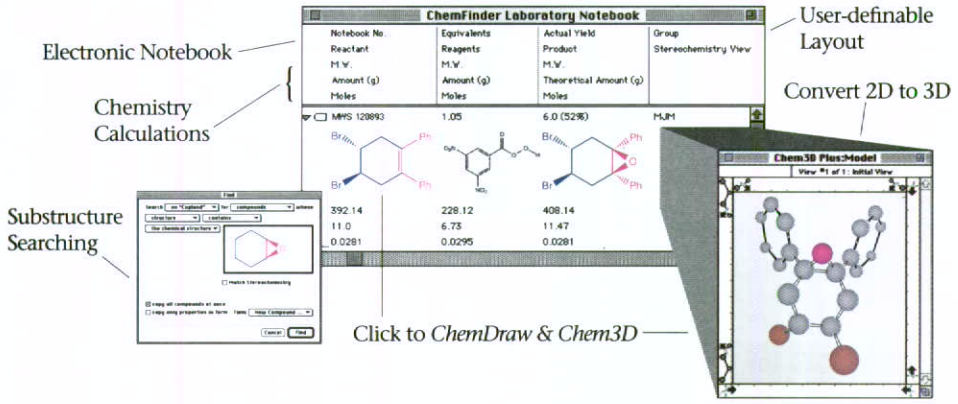

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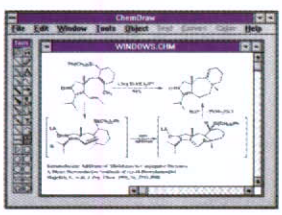

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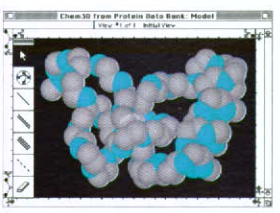

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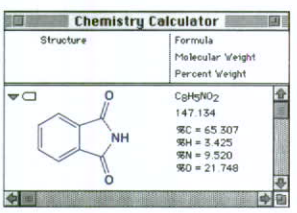

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- Calculate MW, % weight and theoretical yield
- Find structure-activity correlations
- Search over networks by substructure - *Office*
- Search and store chemical reactions
- Search and sort by any alphanumeric field
- Link with *Excel, JMP, FileMaker* and *4D*
- **Requires:** Mac Sys 7 – 5 MB or Windows 3.1*

Information Integration

- Chemical Abstracts via SMD - *DrawPlus/3DPlus*
- Merck Index online via PSI* - *FinderPlus*
- Questel DARC* - *FinderPlus*
- Beilstein via Dialog - *FinderPlus/3DPlus* (export-only)
- Brookhaven Protein Data Bank - *3D*
- Cambridge Structural Database - *3D*
- MACCS via MDL MOLFILE - *DrawPlus/3DPlus*
- Tripos UNITY - *FinderPlus* & SYBYL - *3DPlus*
- Daylight SMILES - *FinderPlus*/DrawPlus*
- Chem-X* and BioCAD* - *FinderPlus*
- Biosym Files via Brookhaven Files - *3D*
- CAChe Scientific - *OfficePlus*
- MSI MOLFILE - *DrawPlus/3DPlus*
- MacroModel and MOPAC Formats - *3D*
- EPS, PICT and Windows Metafile - *Draw/3D*

Platforms and Languages

- Mac 6, 7 & PowerPC* and Windows* & NT* 3.1
- SunOS 4.1*, SGI IRIX 4.0* & DEC NT 3.1*
- IBM PowerPC AIX 3.2* & HP 9000/700 8.0*
- English, Japanese, French and German

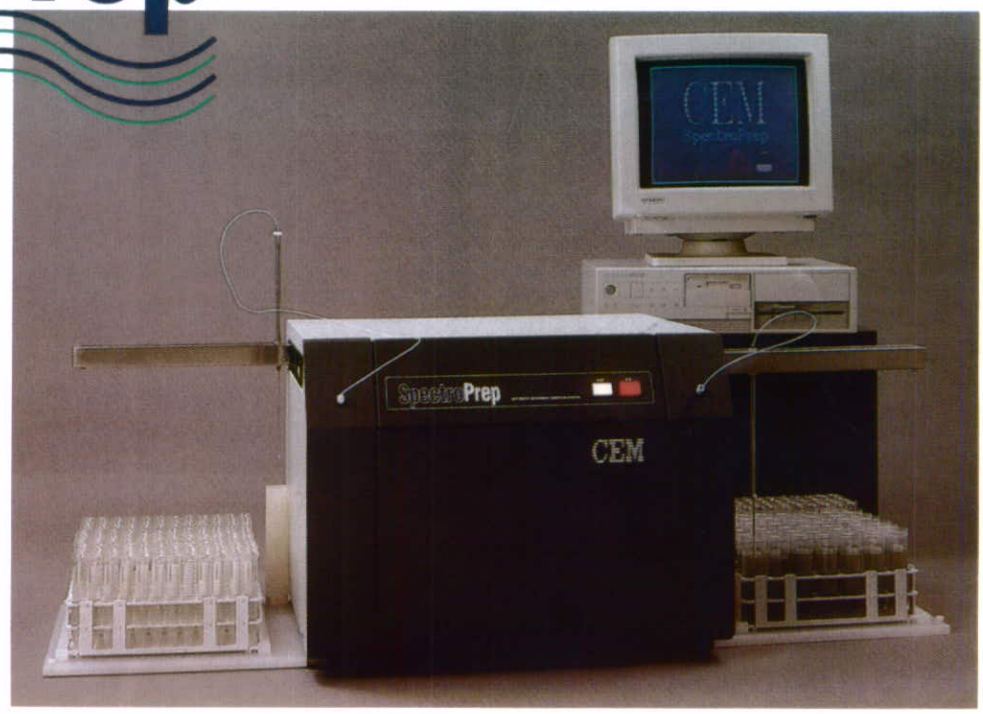
* Ship-date to be announced

CEM *Innovators in Microwave Technology*

SpectroPrep™

Automated Microwave Digestion System

CEM, the world leader in laboratory microwave technology, has pioneered the first fully automated, continuous flow microwave digestion system. Simply load the samples in the sample tray, press start and walk away. SpectroPrep does the rest!



NEW! SpectroPrep Automated, Continuous Flow Microwave Digestion-System features unattended operation.

Benefits:

- **Unattended operation:** You load the samples and go on to other tasks or leave for the evening. Once the samples are loaded, the SpectroPrep system takes up the sample, moves it through the system and collects it when the process is complete. The digested samples are now ready to be introduced to your AA or ICP spectrometers.

- **Rapid and complete sample digestion:** The continuous flow microwave digestion system digests samples such as wastewater, soil, sediment, tissue, biologicals, etc. rapidly and completely and presents them for further analysis.

- **Reproducibility: Every sample is temperature monitored and pressure controlled** by active electronic and fluid components to ensure the reproducibility of all digests.

- **Self cleaning:** The system is self cleaning, eliminating vessel clean up and sample carry over. No need to worry about cross contamination of samples or time spent on cleaning vessels.

- **SpectroPrep automatically cools and filters the digested sample:** The samples are collected at the sample tray, ready for injection into your AA or ICP. Digestion has never been easier.

- **Low acid concentrations:** Acid concentrations as low as 5-10% can be used to digest samples improving recoveries for lower detection limits with higher sensitivity and less contamination. A consistently low acid matrix is therefore presented to your AA or ICP system leading to improved reagent efficiency and a safer working environment.

- **Easy to use:** The SpectroPrep System interaction is through a user-friendly, menu driven computer system operated with ease and simplicity.

- **Methods library:** More than a thousand sample preparation methods can be stored for convenience and flexibility.

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or circle no. 4 on the reader reply card