



# Chemistry

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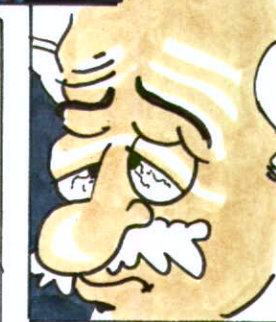
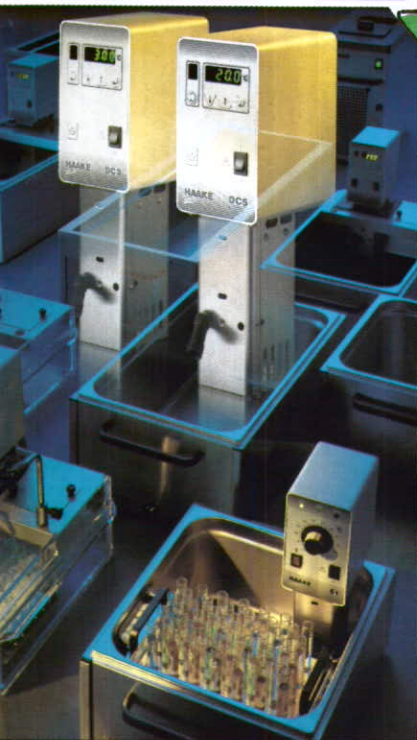
IN NEW ZEALAND

FOCUS ON CHEMICAL PATHOLOGY, FORENSICS, CLINICAL CHEMISTRY

# HAAKE

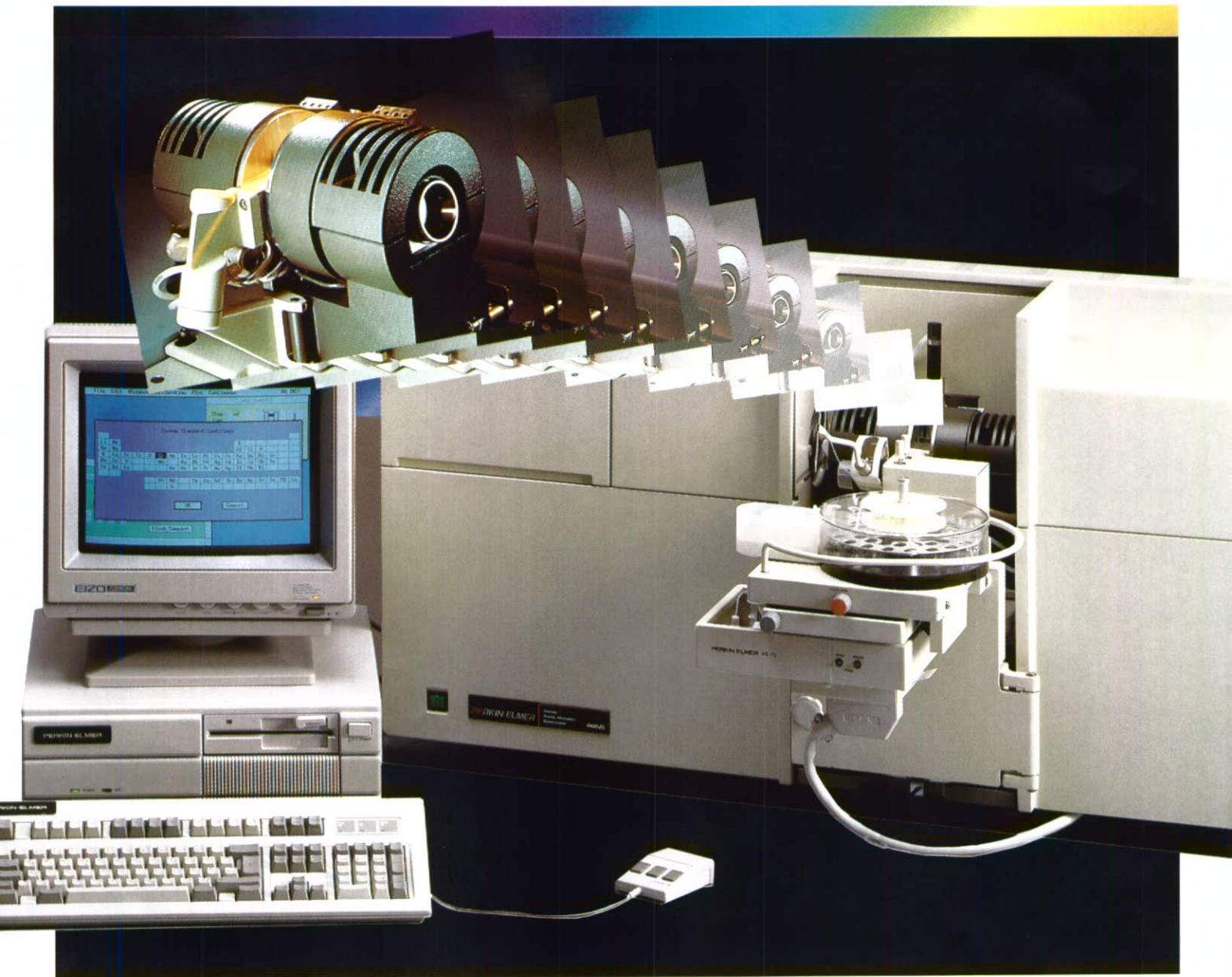
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## UP FRONT...

### HAAKE

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For further details see the cover story on page 2



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## COMING UP ...

September 1994 - Focus on Forestry, Timber,  
Pulp and Paper

November 1994 - Focus on Mining/Steel/Minerals/  
Geochemistry

#### Deadline for material:

10th of the month of publication

#### Contributions and enquiries to:

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## TRULY AMAZING!!!

### THE NEW GENERATION OF HAAKE CIRCULATORS

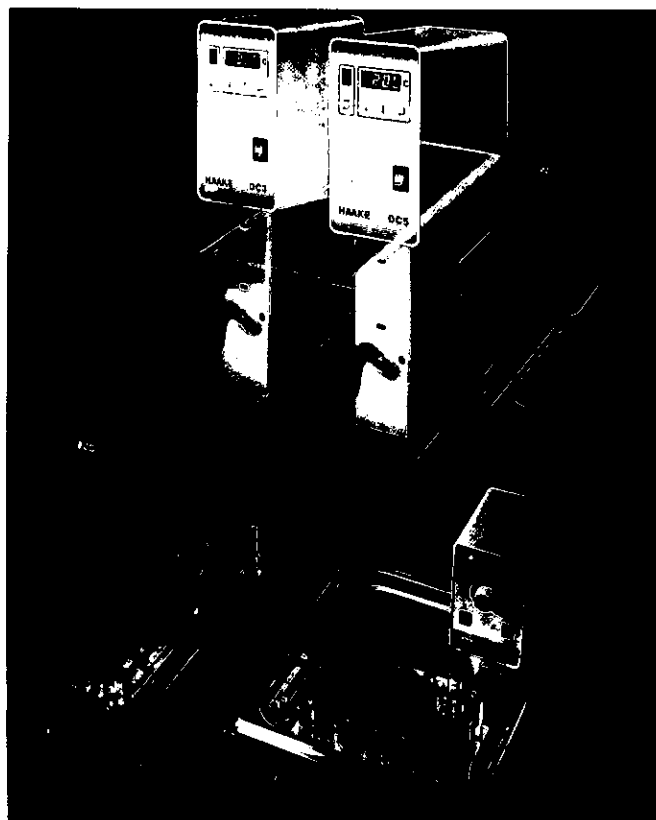
This new range of circulators is based on the simple concept that all circulators and baths consist of a temperature control module and a bath plus special accessories for specific applications wherever necessary.

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Each unit is menu driven, microprocessor controlled and equipped with genuine digital electronics.

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The high temperature settings of the DC3 and DC5 may be limited. The setting range can be defined in advance depending on the heat transfer liquid used and/or the application. The DC models feature different heater capacities of 1000, 1500, or 2000W (for 230V operation).

##### Real Temperature Adjustment

All models include the HAAKE RTA system (Real Temperature Adjustment). Variations between the actual temperature displayed and the real temperature in the centre of the bath or in the external system cannot be avoided. This temperature difference is measured once and then fed to the circulator as a correction value "C". The digital display is then correspondingly adjusted for the course of the application.

##### Fault Identification System

The DC3 and DC5 are equipped with a built-in fault diagnosis system. In the event of a fault, the pump and heating element are switched off and the fault cause is clearly displayed.

##### Computer Controlled (RS232C)

The DC5 model features a built in RS232C serial port. All operating and monitoring functions can thus be computer controlled.

##### The C1 Model

This temperature control module is designed for users who do not require a high degree of temperature accuracy in a cost effective unit.

The unit features analog temperature setting using a rotary dial. The scale is graduated in full degrees with the settings in tenths of a degree being made possible by a fine adjustment potentiometer.

The electronic control system functions via an analog semiconductor sensor. The stable ON/OFF control enables excellent long-term temperature stability.

This unit is designed for use with water only. The cut-out temperature is independently adjustable. All alarms are optically indicated and the unit cannot be restarted until the RESET key has been activated.

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## 1994 ZONTA SCIENCE AWARD

Dr Jacqueline Rowarth has been awarded the biennial 1994 Zonta Science Award by the Wellington Zonta Club. The award recognises outstanding women's research of value to New Zealand. From a field of 41 nominated applicants, Dr Rowarth took top honours - a gold and silver medal, \$5,000 cash and a round-the-world airline ticket.

Dr Rowarth is a lecturer in Plant Physiology in the Department of Plant Science at Lincoln University and is also contracted to AgResearch to continue her research programme in developing alternative pastures for New Zealand farming conditions.

\* \* \* \* \*

## BUDGET 1994 ANNOUNCES A MAJOR RESEARCH BOOST

Increased spending on research announced in the recent Budget is a clear signal, after more than a decade's decline, that the Government sees research and science at the centre of New Zealand's development. The Budget provides for an increase in science spending of \$77 million over three years. The increase is particularly welcome, coming as it does when government spending remains under tight restraint.

Science funding will rise by \$12 million in 1994/95, \$25 million in 1995/96 and the \$40 million in 1996/97 - a combined total of \$77 million. This represents the biggest increase in our research capacity for many years.

Major investment planned in 1994/95 recognises New Zealand's economic reliance on production and processing of plant and animal products. Specific investments will go into environmental management, underscoring the importance of our land and sea resources.

The prime importance of individuals in the research effort is acknowledged by the commitment to the development of current and future researchers and science teachers through fellowship schemes. In the third year, the \$40 million increase is particularly significant, coming in the first year for the implementation of revised national priorities for public good science and technology which are to be reviewed by mid-1995.

The majority of the additional funding (\$8.7 million in 1994/95, a further \$13.5 million in 1995/96, and a further \$23.5 million in 1996/97) will be applied directly to the Public Good Science Fund (PGSF).

The remainder of the funding will be invested in a package of programmes designed to enhance and complement the investment in the PGSF. These include:

- \* Fellowships for human resource development
- \* Improved international science links
- \* Promotion of a science and technology culture
- \* Support for science centres
- \* A new basic science fund

## Key Points

- \* 3 year commitment to a staged increase in science investment:
  - \$77m over 3 year period
  - Increase of \$40m p.a. by 1996/97
  - Platform created for implementation of "Path to 2010"
- \* Major portion of increase to the PGSF:
  - Reinforces PGSF as a major component in Government's science investment portfolio
  - Provides positive platform for 1995 review of science priorities
- \* Other increases will enable
  - Enhancement and extension of human resource development fellowships
  - Additional support for international science linkages, science promotion and outreach by science centres
- \* Commitment given to a new fund for basic science to be allocated from 1995/96
  - \$4m in 95/96 rising to \$9m from 96/97
  - full details developed in consultations with science community

## More Investment in Strategic Science

The Public Good Science Fund (PGSF) is the Government's most highly developed purchase mechanism and the main avenue for public investment in strategic science. The fund is allocated according to stated priorities through a contestable bidding system.

Currently, the bulk of PGSF funding is allocated to Crown Research Institutes and Research Associations. Since 1992, the Universities have had limited access but full access will follow from 1996/97.

The 1992 priority-setting exercise and the Science Area Research Strategies developed subsequently by the Foundation for Research, Science and Technology have revealed considerable opportunities to increase expenditure in areas where scientific capability and the potential to yield benefits are high.

Information generated during the implementation of the 1992 Science Priority Statement indicated that additional funding is necessary to secure key capabilities in some science areas.

It is particularly necessary to secure key competencies (or skill bases) and important scientific data bases, collections and curations that were insufficiently identified at the time of the last priority review. Specific examples include ecosystem databases and scientific competencies in taxonomy, palaeontology, ruminant physiology and indigenous forest management.

The majority of the additional science funding will go to the PGSF. The bulk of the extra PGSF funding will be applied to the high priority outputs identified for increase in the 1992 Priority Statement. The revised targets will be for the 1995/

96 year (the second year of the triennium) as a new priority statement will be in force from the 1996/97 financial year.

There will be a corresponding increase in Non Specific Output Funding (NSOF) for Public Good Science and Technology to maintain this at the fixed 10 per cent of CRI funding from the PGSF. Indicative funding levels will increase by \$275,000 in 1994/95, \$800,000 in 1995/96 and \$1.1 million in 1996/97.

As from 1994/95, the NSOF will be administered by the Foundation for Research, Science and Technology. Additional funding of \$1 million in 1994/95 and \$1.85 million in 1995/96 will go to specific, identifiable problems in maintaining core competencies, with the focus on science areas which were either held or decreased in the 1992 priority statements.

Aggregate increases in funding for high priority outputs are:

- \* \$7.425 million in 1994/95
- \* \$10.850 million in 1995/96
- \* \$20.550 million in 1996/97

#### **Basic Science Fund to be Established**

A major new initiative in the Budget is the Basic Science Fund which aims to support research which is not subject to the socio-economic criteria set for the Public Good Science Fund.

The Basic Science Fund will have two objectives: to increase the flow of top-flight researchers; and to underpin "targeted" strategic and applied research.

To achieve quality, originality and efficiency of targeted research we need skilled basic researchers within the science system available to point directions and highlight fundamental problems.

The Basic Science Fund will be some insurance against research in New Zealand being driven by a single set of socio-economically determined priorities.

The Basic Science Fund, with a \$4 million budget in 1995/96 rising to \$9 million in 1996/97, will be open to all individuals and providers on an equal basis. The fund will start in 1995/96 after full consultation with key stockholders.

#### **Science Fellowship Schemes Expanded**

The Science and Technology Fellowships schemes introduced in 1993/94 are to be extended and expanded with the object of quickly building a larger, high quality human resource base for increased medium and long-term science and technology efforts.

Science and technology activity in the private sector is starting to rise and the Government's commitment to increasing its own science funding to 0.8 per cent of GDP by 2010 will only be practicable if we start now to increase our high quality human capital.

Two new Science and Technology fellowship schemes were introduced in 1993/94 - one aimed at post-doctoral fellows and the other at enhancing the skills of science and technology teachers. Funding for the two schemes totalled \$1.425 million in the first year.

While funding for teacher fellowships remains unchanged this year, funding of post doctoral fellowships will rise from \$950,000 last year to \$1,910,000 this year.

In addition new fellowships - to be known as Research in Industry Fellowships - will be established with \$930,000 in funding. These will provide financial support for postgraduate students (masters, doctors) to take degree - based projects in an industrial setting.

\* \* \* \* \*

#### **REVIEW OF SCIENCE PRIORITY SETTING**

On 10 May 1994, the Minister of Research, Science and Technology Simon Upton announced a review of Government priorities for investing in science and technology. The review which will identify the level of funding for different areas of research, began in June 1994 and will end in mid-1995.

Mr Upton said that the review would be timely for several reasons. He said that apart from ensuring that the \$270 million annual investment through the Public Good Science Fund is properly aligned with the "Path to 2010" goals, the review will take into account the increased commitment to research, science and technology described in that document. It will also take into account other changing circumstances since the current priorities were set in 1992.

The review process will be carried out in several phases by different independent panels with overlapping membership. The first of the panels was nominated in early June and the Ministry of Research, Science and Technology is currently calling for nominations for the membership of the second, the New Priorities Panel.

The New Priorities Panel will produce a final report to the Government before April next year, and the Government will then release its final priority statement a month or two after that, identifying the amounts of funding to be distributed to different areas of science and technology. The priority statement will guide the Foundation for Research, Science and Technology as it develops strategies for funding research at a more detailed programme level.

\* \* \* \* \*

#### **IRRADIATION PLANT NOW LOOKS DOUBTFUL**

The irradiation plant planned for construction in Tokoroa now looks unlikely to proceed, reportedly largely due to public opposition. A spokesman for the investors behind the plant says delays in getting consent to build the plant have led the investors to consider sites outside the South Waikato region.

\* \* \* \* \*

#### **IRL NOTES**

*(Some of the goings-on in chemistry at  
Industrial Research Limited)*

The distribution rights to Invade™ which is exclusively made by Industrial Research Limited's Bioprocess Development Team have been sold by Monsanto to Coated Seed Ltd in Christchurch. Invade is a biological control agent for grass grub.

A polysaccharide additive developed as a result of commercial collaboration between Tasman Forestry and the Carbohydrate Team now saves Tasman Forestry a considerable amount of time and expense in growing Pinus Radiata seedling. The additive controls vitrification in these seedlings.

Regina Blattner and co-workers from the Carbohydrate Team have completed the synthesis of allosamidin, a naturally

occurring insecticide. This compound and three close analogues are to be trialed for activity. Regina, Richard Furneaux and Peter Tyler will attend the International Carbohydrate Symposium in Canada in July.

Gary Evans of the Carbohydrate Team presented a seminar entitled "From manool to bits of taxol" which encompassed his synthetic work carried out at Otago, Oxford and Oxford Asymmetry before joining Industrial Research Limited. Gary together with Barry Dent and Greg Lynch have started a new initiative to market IRL's custom synthesis skills. And not content with this, Gary and Greg together with team leader Richard Furneaux gained considerable publicity recently with a media release on antibacterial agents from totarol. The fact that totarol is a naturally occurring compound in totara wood generated some concern among activists about stealing patent rights to native flora and fauna.

Andrew Falshaw of the Carbohydrate Team on a visit to Malaysia with some of our marketing people investigated opportunities for collaborative work with the Malaysian Rubber Institute. Then onwards, to his home country of England, he made contact with Professor B V Potter of Bath University and Dr P Coe of Birmingham University to establish collaborative research in the area of inositol chemistry.

Joining the Carbohydrate Team for a three month temporary contract is Dr Olga Zubkov a recent immigrant to New Zealand from Rostov in Russia. A temporary contract has also been accepted by Dr Adam Matich to work with the Biochemical Science Team. Adam, originally from Perth, has just completed post-doctoral work with Rod Tilbury at Victoria University. Sue Barret, formerly the Whey Functionality Programme Manager of the Dairy Board, has joined the Biochemical Science Team to lead the meat and food programme areas. Diana Offman of the Biochemical Science Team attended the Australian Food Industry Conference in Canberra in May.

Ken Markham, head of the Plant Chemistry Team is now science consultant to Comvita. He will advise them on flavonoid ingredients in health food products.

There are a number of collaborative projects with overseas groups which use the solid-state NMR facilities at the Gracefield Campus. Collaborative projects include studies on  $MgSiN_2$  and  $MgSiAlN_3$  ceramics with De W Groen at Phillips Research Laboratory in Eindhoven (Netherlands), studies of mullite and spinel formation from gel precursors with Dr A K Chakravarty at Central Glass and Ceramics Research Institute in Calcutta (India), and studies of the structure of ceramic mullite-precursor gels with Dr H. Schneider at the German Aerospace Research Establishment in Koln (Germany). Ken MacKenzie has been awarded a grant under the Federal Republic of Germany/New Zealand Science and Technological Co-operation Agreement (STC) to visit the German Aerospace Research Establishment.

The Ceramics Team recently hosted a visit from Professor H King, Head of Materials Engineering, University of Western Ontario, Canada. He presented a seminar entitled "High Temperature Structures and Properties of Oxides", which included *in situ* harness testing of ceramic cutting tools at  $>1000^\circ C$  and high temperature XRD of ionic conductors.

John Patterson of the Spectroscopy Team has recently finished tests of a portable mass spectrometer to monitor odours at a New Zealand pulp and paper factory, with the end aim of odour reduction.

## LETTER TO THE EDITOR



10 Manly Gardens  
Paraparaumu

13.7.94

Dear Sir,

Cobalt<sub>60</sub> Irradiation

As discussed with you in Auckland recently, I am one of the few members of the NZIC to have been in technical and administrative control of the Upper Hutt irradiation plant, so I believe I can make some comments on the subject.

Firstly I do not believe that Ansell Steritech intended their plant to be used for food irradiation. By clever design it might be possible to design a plant to give medical disposables the necessary dose of 2.5 megarads (minimum) as well as the variable doses needed for food of from say 0.1 to 1.0 megarads. High throughputs of both types would be needed, and the public and political opposition to food irradiation might mean years before such inputs contributed to the cost of the plant. There is also the considerable technical difficulty of ensuring that pathogen-containing food might be submitted without the plant operator's knowledge, and being dangerous even after irradiation. Labelling of treated food is another problem - how do you detect if a food has or has not been irradiated?

Construction and safety of plants is not a real problem, nor is the transport - in or out - of the cobalt. Greenpeace should learn more about these aspects before making silly objections. The same applies to discharges from the plant - what discharges?

Finally, the Nuclear Science section of the current Government laboratory will know more about what the total energy of say 25-100 kilowatts, dispersed over several square metres, could do to break down the molecular species in toxic wastes.

Regards,

Lester Stonyer



## WHATMAN

Whatman have announced that the business of Balston (Far East) Private Limited was integrated into Whatman (Far East) Private Limited on 1 January 1994 and that Whatman (Far East) Private Limited is now known as **Whatman Asia Pacific Private Limited**

This is in line with the Whatman Group strategic objectives to operate its worldwide businesses using a single corporate identity in each country and to make the Singapore operation the regional headquarters for Asia Pacific.

\* \* \* \* \*

### PERKIN ELMER CHEMCORE TO DEVELOP REVOLUTIONARY MICRO-ANALYTICAL INSTRUMENTATION FOR INTEGRATED DNA AMPLIFICATION AND DETECTION

*Joint Technology Will Facilitate Many New DNA Analysis Markets*

The Perkin Elmer Corporation, Norwalk, Connecticut, and ChemCore™ Corporation, Malvern, Pennsylvania have announced a joint research agreement to develop micro-analytical instrument systems that can rapidly amplify, detect, and quantitate specific target sequences of DNA. Based on revolutionary integrated microchip technology licensed to ChemCore, the miniaturised instrument systems will provide a portable, cost-effective real-time DNA analysis tool ideally suited to applied industries, such as human identification, food processing, biopharmaceuticals, agriculture, and environmental testing.

Announced simultaneously with the formation of ChemCore and by Perkin Elmer, the agreement combines ChemCore's licensed, patented micro-analytical technology with the extensive instrumentation resources of the Applied Biosystems Division of Perkin Elmer. Perkin Elmer is a strategic partner of Hoffmann-La Roche, holder of the PCR patent, in the development of DNA amplification and detection technologies.

"Our agreement with ChemCore is part of Perkin Elmer's ongoing effort to collaborate with industry and academia to rapidly expand the applications of biotechnology instrumentation", said Dr. Michael Hunkapiller, executive vice president of Perkin Elmer's Applied Biosystems Division. "This new, integrated technology will take PCR and DNA analysis beyond biotechnology research laboratories, into a wide range of applications that will impact industries such as food processing, biopharmaceuticals, agriculture, animal husbandry, human identification, clinical analysis, and environmental testing".

"Simplification of real-time analysis is one of the most significant practical advantages of a miniature, integrated DNA analysis device", said Michael DuCros, president of ChemCore. "The labor-intensive, time-consuming process of sample gathering, sample preparation, and multiple instrument testing

will be compressed into an easy 'sample-in, result-out' assay performed by a self-contained device immediately, on-site, wherever the analysis is needed."

The portable, micro-analytical instrument systems will allow significantly increased speed and throughput of assays at reduced cost without sacrificing accuracy. In addition to dramatic time and labour economies, the new micro-machined devices will contain consumable, micron-sized channels and chambers in which analytical and preparative procedures are performed, greatly reducing the volume of costly reagents.

Perkin Elmer and ChemCore indicated that they have completed concept testing and that ChemCore had licensed patents and a number of patent applications related to the development of the nucleic acid micro-technology.

The strategic agreement entitles Perkin Elmer to the option for exclusive licensing of micro-products developed for non-diagnostic applications and non-exclusive licensing of products developed for certain *in vitro* diagnostic applications.

ChemCore is a start-up company focused on developing innovative, micro-analytical devices, primarily for the life sciences, including diagnostics and related industries. The University of Pennsylvania's Centre for Technology Transfer coordinated licensing of University-owned technology exclusively to ChemCore and assisted in its formation. ChemCore was established to develop and commercialise a series of inventions by its founders, Dr. Peter Wilding and Dr. Larry Kricka, professors at the University of Pennsylvania School of Medicine. In addition to DNA analysis, the company is also developing technology for the production of devices for fertility testing and *in vitro* fertilisation, and for clinical assays focusing on advantageous applications of point-of-care testing.

Perkin Elmer is the leading worldwide manufacturer of analytical, environmental, real-time, and life science systems for research and related applications. Perkin Elmer is also the global leader in GeneAmp PCR technology, a revolutionary technique that amplifies specific target sequences of nucleic acids.

\* \* \* \* \*

### "ON VACATION" IN CHERNOBYL

Chernobyl, the site of the nuclear power plant disaster in 1986 has been opened up as an attraction to foreign tourists. Foreign visitors only are allowed to enter the 30 km exclusion zone around the nuclear power plant. Members of the specially guided tours are provided with safety gear once they are within 10 km of the plant. Each party carries a Geiger counter and if radiation levels are acceptable the party is also permitted to visit the power station site.

A restaurant especially for the foreign visitors in Chernobyl town serves radiation-free produce grown outside the contaminated area. The Ukraine government pockets half the tour proceeds, the remainder is reported to be used to pay the expenses of Ukrainian scientific delegations to conferences outside the Ukraine on the effects of the Chernobyl fallout.

# THE USE OF AUGER ELECTRON SPECTROSCOPY IN FIRE INVESTIGATIONS

By J B Metson, C M Hobbs

Department of Chemistry and Research Centre for Surface and Materials Science  
University of Auckland

## Introduction

Frequently, the initiation of a fire is attributed to an electrical fault causing arcing and ignition. Thus it is of considerable importance to establish whether evidence recovered from a fire scene, and particularly electrical wiring, can be used to confirm or disprove this contention. The typical scenario is that an electrical short and subsequent arc occur, either as the initiator of the fire, or when the fire is already in progress as insulation burns or melts away from the wiring. It is therefore important to distinguish between the two cases. A novel application of Auger Electron Spectroscopy (AES) has been reported where metal beads formed on the wire during the arc are analysed to distinguish between the two situations outlined above. We have recently been involved in one such investigation.

The theory of this unusual application of AES was originally outlined by Anderson [1,2]. When the arc occurs in the wiring, the metal briefly passes through a high temperature liquid phase forming a small bead at the point where the wire is cut by the arc. Gas solubility in the liquid metal is dictated by Sieverts rule [3], which states that gas solubility in the liquid metal is proportional to the square root of gas pressure and increases with temperature. Because solubility is significant and quenching is rapid, gases are trapped in the metal and the outer surface of the droplet essentially samples the atmosphere in which it is formed. Unless the bead is reheated, this sample is then preserved in the outer surface of the bead.

If the arc occurs preceding the fire, the atmosphere in which it occurs will be relatively clean and oxidising. Thus we would anticipate that there will be minor hydrocarbon contamination of the surface of the bead, but relatively little dissolved material, and it will not persist to any great depth. Thus a depth profile of the outer 10 nm of the material should expose a clean metal

surface. On the other hand, an arc which occurs with the fire in progress, will see a dramatically different atmosphere. The wiring is usually enclosed in a wall cavity and the surrounding atmosphere will be strongly depleted in oxygen and will contain major contaminants released by the melting or combustion of the insulation. With predominantly PVC insulation of modern electrical flex, the "flag" elements from this process are chlorine, carbon and calcium (which arises from fillers and plasticisers). These contaminants should persist to considerable depth (hundreds of nm's) in the bead. Surface analysis without depth profiling is of limited use because in either case the outer surface will be covered with a contaminant hydrocarbon layer.

Table 1 lists typical results from Anderson [2] from the profiling of two beads representative of the two cases. The AES analysis indicates that by the time 5 nm has been removed from the surface, the wire fused in air shows essentially no contamination, while the bead from the fire environment shows substantial and persistent levels of carbon, chlorine and calcium. The evidence of the "clean" surface can always reflect some ambiguity, however the persistence of chlorine and calcium to depths of greater than 10nm provides persuasive evidence that the fire was well underway when the arcing occurred.

## Analytical Methods

The crucial two steps in analysing the beads formed during arcing, are firstly a detailed analysis of the bead surface, followed by a depth profile of the elements of interest to a depth of up to 100nm. Auger Electron Spectroscopy (AES) combined with argon ion sputtering, and Secondary Ion Mass Spectrometry (SIMS) are the two techniques of choice for this purpose and the primary literature has been developed around the use of AES. Auger provides a surface analysis with an

Table 1

AES ANALYSIS IN ATOMIC PERCENT OF TWO COPPER ARC BEADS								
Distance Below Surface (Angstroms)	Wire No. 1				Wire No. 2			
	Cu	C	Cl	Ca	Cu	C	Cl	Ca
0	72	24	4	0	63	22	11	5
25	92	7	1	0	63	21	11	5
50	99	0	0	0	65	20	10	5
100	99	0	0	0	67	20	9	4
150	99	0	0	0	68	19	9	4
200	99	0	0	0	70	19	8	3

absolute sensitivity of typically 0.5% to a depth of around 3nm and with a lateral resolution of better than a micron for our instrument [4,5]. Analysis can be coupled with cycles of sputtering with an argon ion beam, thus a depth profile of the surface is generated.

In our case the instrument used was a Kratos XSAM800 X-ray photoelectron, Auger Electron Spectrometer, located in the Research Centre for Surface and Materials Science at the University of Auckland. The samples analysed were from sections of standard PVC insulated copper twin and earth electrical flex, which had been recovered from the wall cavity at a fire scene. The wires were bare, exposed by the loss of the insulation during the fire, and sub-mm sized beads formed by arcing between wires were visible. Samples were mounted by cutting the wire below the bead and clamping it into a sample holder with the bead then supported at the tip of the wire, above the surface of the sample holder. The area to be analysed was selected from the secondary electron image of the surface with due care to avoid porous areas where the metal appeared to have foamed during the arc.

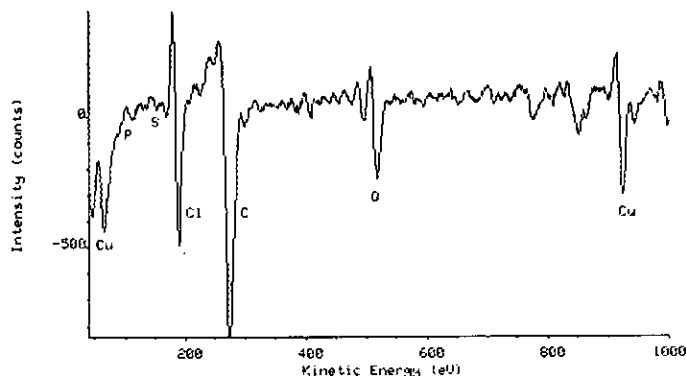
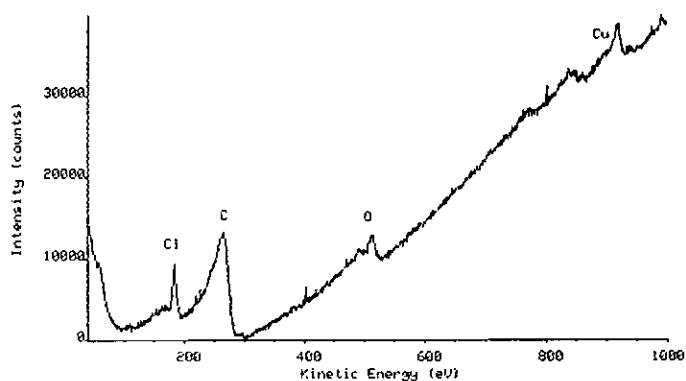
Auger electron spectra were then collected and the surface sputtered with 3kV argon ions in cycles to effect the depth profile. The sputtering rate is between 3 and 5 nm min<sup>-1</sup> under the conditions we used, but is not critical in the interpretation of the data produced. Because of the oblique angle of incidence (45°) of the ion beam, it is possible to repeat the depth profile on the same bead by rotation and tilt to expose the initially shadowed side.

#### Interpretation of the Spectra and Depth Profiles

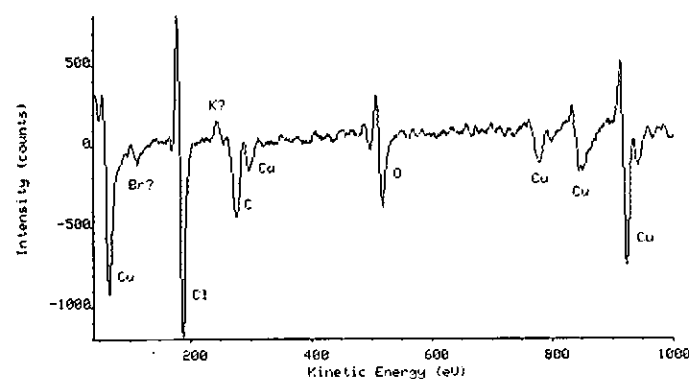
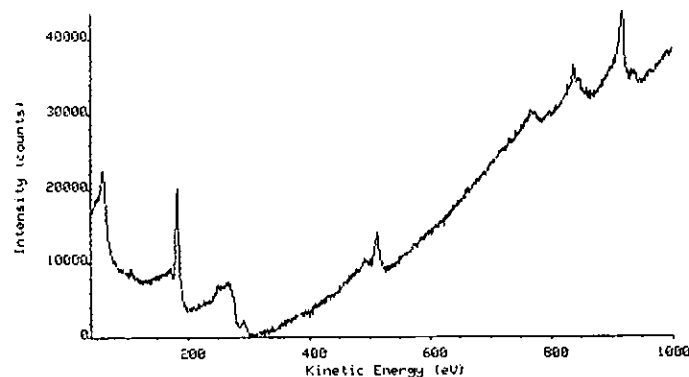
A typical Auger Electron spectrum from the surface of a bead we have analysed is shown in figure 1. The surface shows extensive hydrocarbon contamination which although Cl, O and Cu are detected, essentially masks the potentially contaminated zone beneath. The first sputtering interval, corresponding to removal of ~15nm reveals a significantly different spectrum. Surface carbon has been substantially reduced, calcium appears in the spectrum and chlorine is strongly enriched (figure 2). Further sputtering cycles continue to attenuate the carbon signal, with a corresponding increase in copper intensity, but both chlorine and calcium are undiminished and clearly persist to depths greater than 60nm.

The composite depth profile of the Cl, C and Ca region of the Auger spectrum is shown in two sections (figure 3). After the initial environmental cap is sputtered from the surface a deep and persistent contaminated zone is observed. This matches very closely with the depth distribution and composition of the second bead from Andersons Table 1. A repeat analysis from the opposite (unsputtered) side of the bead and a second bead from the same location confirm the same behaviour. Because of the complex geometry and roughness of the sputtered zone it is difficult to predict the actual sputtered depth from this type of sample. However the persistence of elements such as calcium to depths well beyond those reported by Anderson flags this bead as having formed with a fire already in progress.

Anderson [1] applies the same theory to alternative wiring materials, in particular aluminium, where the same principals apply although the depth of penetration of the modified "gas sampling" zone is approximately seven times as deep. There



**Figure 1.** The Auger electron spectrum from the surface of a bead recovered from a fire scene. The surface is dominated by carbon but also shows significant chlorine, oxygen and copper. Traces of phosphorus are also detected in the differentiated spectrum (b).



**Figure 2.** After a total of 15 minutes sputtering with 3kV argon ions, the region analysed in figure 2 now shows dominant chlorine, with carbon, calcium, oxygen and copper.

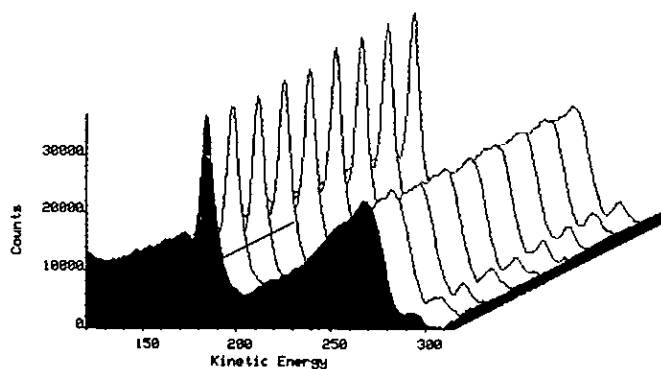


Figure 3a

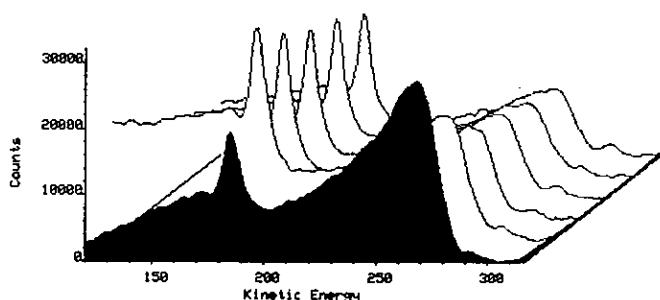


Figure 3b

Figure 3. A composite depth profile of the Cl, C and Ca region of the Auger spectrum, with depth receding into the page. The sputtering rate was changed slightly between the two sets of data. Note the initial decrease in carbon levels (265 eV) and the steady growth of the calcium peak just above 290 eV and chlorine (185 eV).

are also a number of circumstantial factors with regard to the location of the wiring which must be taken into consideration. For example, wiring in a ventilated duct space may give a false "clean" surface even though the arc occurs with the fire in progress. In this respect it is easier to be confident about the sort of samples described above where a substantial contaminated zone is observed.

## CONCLUSIONS

The use of surface analytical methods and particularly Auger electron spectroscopy, appear to provide a very elegant method of defining the time of electrical arcing in the history of a fire. Metal beads formed on electrical wiring during the arc sample the gaseous environment in which they are formed and essentially freeze this sample for later analysis. The use of Auger

electron depth profiling can then distinguish between arcs occurring in a clean atmosphere and those occurring with a fire in progress.

In the samples examined here, the presence of a heavily contaminated zone persisting tens of nanometers into the surface, and containing elements associated with the melting and combustion of the PVC insulation, provide persuasive evidence that a fire was well advanced before the arcing occurred.

## Acknowledgements

We would like to thank Linda Boyd for providing the initial reference to this work.

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# DOCTOR PEAK'S CHROMATOGRAPHY MADE EASY

## SOLID PHASE EXTRACTION - NEW DEVELOPMENTS

By Roger Whiting

Auckland Institute of Technology, Private Bag 92006, Auckland

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### Introduction

The development of rigid disk systems has made preconcentration procedures much quicker, simpler and safer.

### SOLID PHASE COLUMNS

Solid phase extraction columns were developed in the 1970s. The aim of solid phase extraction is to concentrate trace analytes to the point that they can be quantified when analysed by Gas or High Performance Liquid Chromatography. A large volume of sample is passed through the column which retains the analyte of interest. The column is then washed and the analyte eluted either directly into the instrument or into a small volume of solvent which can then be injected. This technique has been a great improvement on the liquid-liquid extraction procedures previously used for trace analysis both in terms of speed and simplicity.

The first columns were comprised of a barrel packed with modified silica or alumina particles held in place by plastic or metal frits. The changes since that time have been relatively minor.

These columns have proved to have limitations. The manufacturers have difficulty packing the loose particles which can result in channeling when they are used. When channeling occurs the analyte is not completely retained so, to counter this, the bed is made larger. However when the bed is made larger it is usually made longer which can reduce flow rates through the column. Also the addition of more material into the system increases the void volume of the column and increases the risk of contaminants being carried over. This has become more of a problem as the demand for parts per trillion analysis has increased. The flow rates of the columns tend to be quite low due to their having a small cross-sectional area. This makes the preconcentration step longer thereby losing some of the advantages of the solid phase extraction concept.

In the early 80s a number of instrument manufacturers developed instruments with built in preconcentration columns, for example Kontron. These drew a large volume of sample through the preconcentration column and then using an automated switching system eluted the collected analytes off the preconcentration column and passed it onto an analysis column. The system worked but could require a long time to pass the sample through the preconcentration column which tied up the instrument for a significant time especially as the column had to be flushed thoroughly before it could be used again. Another problem could be the collection of analyte on the plumbing leading to the preconcentration column causing a degree of carry over from one sample to another. The tendency now is to separate the preconcentration step and the analysis step. The samples are preconcentrated into small amounts of solvent which can then be loaded onto an autosampler carousel and analysed later.

### RIGID DISKS

The rigid disk extraction system uses a rigid glass fibre disk with the silica bonded phase on it. The disks are now available with most of the chemistries employed in the packed column systems. The disks come in a variety of diameters with a range of porosities and thicknesses which give various bed masses.

Designed as a self supporting disk there is no requirement for frits used in the column based systems to hold the particles in place. This results in lower void volumes and reduced opportunities for contamination from the frit material. The lower void volumes of the rigid disks means that extraction processes can be carried out using smaller amounts of solvent. Washing, elution and conditioning normally require three to five void volumes each. For a 7.9 mm disk with a void volume between 10 and 50  $\mu\text{L}$  this amounts to 750  $\mu\text{L}$  at most.

The disk configuration greatly increases the flow area, allowing much higher flow rates of the sample through the disk as compared with the column configuration. The nature of the disk material eliminates the possibility of channeling and hence reduces the amount of material needed to ensure complete retention of the analyte. This then means that less pressure is needed to maintain a given flow rate. Combining the higher flow rate due to the increased flow area with the reduced back pressure due to the reduced bed volume, results in the samples being processed much more quickly using a rigid disk than using a packed column. The analytes are found to spread evenly over the disk and be retained in the top surface. The reduced bed volume also aids any drying steps required as they dry quickly under reduced pressure.

Some disks are available with built in glass fibre filters to prevent them clogging with particulate matter. This is useful in extracting analytes from environmental samples which often contain some suspended solids. This, coupled with the higher flow rates generally make extraction using a rigid disk system much faster than a column system.

Multiple disks can be used as the reduced pressure allows the liquid to be passed through several disks in succession. The advantage of this is that the sample can be extracted using several different chemistries at once and then each one can be eluted to collect different types of analytes as an initial separation. The normal procedure is to start with the most selective extraction chemistry and finish with the least.

### ANALYSES USING RIGID DISK EXTRACTION SYSTEMS

#### THCA ( $\pm$ )-11-nor-9-carboxy- $\Delta$ -tetrahydrocannabinol (1)

The principle of the method is to hydrolyse the metabolite of tetrahydrocannabinol in a urine sample and absorb this on a disk (or column), wash away the urine and elute the metabolite with hexane/ethyl acetate. Once collected the solvent solution can be evaporated and the analyte derivatised and analysed using GC-MS.

Using rigid disk extraction the sample volume required is 2mL compared to 5mL using a column. The first step is the hydrolysis of the tetrahydrocannabinol metabolite in basic conditions then the addition of an internal standard and acidification to make the hydrolysis products more hydrophobic by protonating them. This gives a total volume of 2.6 mL which is passed on to the disk. The disk is then washed with 1 mL of acetic acid to remove weakly retained compounds. It can then be dried by drawing air through it and the analyte eluted using 0.5 mL of hexane ethyl acetate mixture. This mixture can then be evaporated and derivatised to give a 100  $\mu$ L sample solution of which 1  $\mu$ L is injected

To perform the same process using a packed column requires a significantly larger number of steps. The first difference is the use of several conditioning steps to avoid the column being full of methanol (the conditioning solvent) when the sample is first introduced. In the rigid disk system the void volume is so small that very little of the sample is used to flush out the methanol from the disk. If methanol was left on a column this would require a significant portion of the sample. Then the washing of the column requires the use of water followed by acetonitrile and then hexane to result in a dry column while the disk can be dried in air. Finally the analyte is eluted using 3 mL of hexane ethyl acetate mixture as opposed to 0.5 mL in the rigid disk system.

Overall the rigid disk system uses 5 steps while the column system uses 9. This difference makes the rigid disk approach significantly simpler and less prone to contamination.

#### Organic Contaminants in Drinking Water

The EPA method 525.1 (3,4) specifies the use of either a packed column or a disk extraction system to collect trace organic contaminants in drinking water. These can then be eluted and analysed. Using a packed column the method requires approximately 2 hours to process a 1 L sample. This is with a column having an internal diameter of 12.5 mm. If a disk with a diameter 47 mm is used then the time reduces to 8.5 minutes which represents a major saving in time. This is coupled with a reduced chance of contamination from plastic parts of the extraction system.

#### Organochlorine and Organophosphate Pesticides in Soil Samples(2)

The use of solid extraction with rigid disks has been demonstrated in the determination of pesticide residues in soils. The normal method employs a dichloromethane / acetone (300 mL) extraction after sonication of the soil sample. The solvent volume is then reduced by evaporation on a steam bath with a Kuderna-Danish apparatus. An alternative to this process is desirable as dichloromethane is a potential carcinogen.

The method developed involves the sonication of the soil sample with either methanol or acetonitrile (5 mL) which was then filtered and made up to volume with water. The pesticides were then extracted onto a C18 disk and eluted with methyl tert-butyl ether. The amount of the pesticide in the extract was determined using GC with an electron capture detector.

The recovery of pesticide was found to be sensitive to the amount of water used in the solvent mix for the extraction step. Recovery was good for pp'-DDT, endrin, endrin aldehyde,

tetrachloro-m-xylene, parathion and ronnel. Overall the use of the rigid disk extraction system offers advantages both in terms of safety and flexibility of operation.

#### CONCLUSION

The development of rigid disk extraction techniques are giving significant improvements in analysis of trace analytes in a wide range of samples. The improvements are in speed of analysis, smaller sample volumes and the reduced use of potentially hazardous organic solvents.

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- 4 *Methods for the Determination of Organic Compounds in Drinking Water* (US EPA, Cincinnati, Ohio, 1988)

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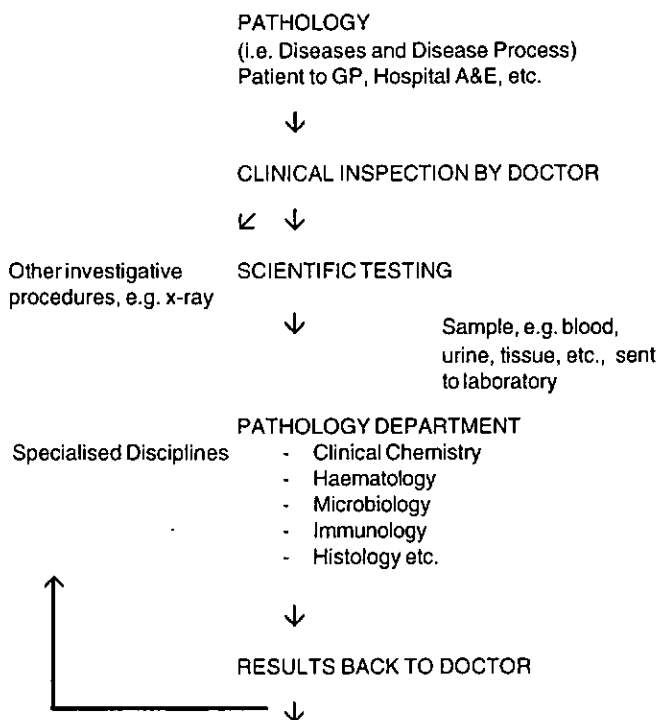
# CLINICAL CHEMISTRY TODAY

## WHERE DOES CLINICAL CHEMISTRY FIT IN?

Steven Martin and Marian Nouwens  
Medlab, 125-129 Grafton Road, Auckland

Clinical Chemistry is one of a broad range of scientific disciplines that help to diagnose pathologies, monitor the disease process and monitor recovery during and after treatment.

### A FLOW CHART OF THE DIAGNOSIS PROCESS



A large modern clinical chemistry laboratory, such as Medlab in Grafton Road, is further specialised according to the technical requirements involved in the measurement of a particular analyte.

Analytes measured (typically in serum) range from the Na<sup>+</sup> ion to large proteins and in concentrations that range from pmolL<sup>-1</sup> (e.g. free thyronine) to mmolL<sup>-1</sup> (e.g. glucose).

Methods are chosen that measure analytes with sufficient accuracy and precision to make clinical decisions. The method or technique of choice is arrived at after consideration of cost, turnaround time, specificity, sensitivity and robustness. Automated analysers have lowered costs and improved turnaround times without compromising specificity and sensitivity.

At Medlab, the Hitachi 717 (soon to be upgraded to a 747) measures electrolytes (Na<sup>+</sup> and K<sup>+</sup>) by ion selective electrodes (ISE), and enzymes (rate reactions) and metabolic products, etc., colourimetrically. The 717 has 30 channels (i.e. it is possible to measure 30 analytes) so most of the routine analytes are measured colourimetrically on this analyser.

### GENERAL PRINCIPLES OF OPERATION OF THE HITACHI 717

#### • Sampling

Barcoded tubes of blood (previously centrifuged to separate serum from cells) identify the sample and match it to the tests required by a link to the laboratory computer. Once the required tests are identified the serum is aspirated by a sample probe and is dispensed directly into one of 120 cuvettes. The sample size can be varied and is typically in the 1-20μL range.

#### • Addition of Reagent

Two reagent compartments and probes allow for the addition of two reagents to the cuvette at varying intervals, depending on the requirements for optimal reaction. Reagents used are mostly commercially prepared but "in-house" reagents are made if required.

ANALYTE MEASUREMENT	
Analytes Commonly Measured in Serum	Techniques for Measurement
<b>ELECTROLYTES</b> Na <sup>+</sup> , K <sup>+</sup> , Cl <sup>-</sup> , Ca <sup>2+</sup> , PO <sub>4</sub> <sup>3-</sup>	Emission Spectroscopy*, Atomic Absorption, Ion Selective Electrodes*, Colourimetric*
<b>ENZYMES</b> Creatine Kinase, Lactate Dehydrogenase (heart) AST, ALT, GGT (liver)	Colourimetrically* measured rate reactions, electrophoresis, mass measurement of protein
<b>METABOLIC PRODUCTS, etc.</b> Glucose, cholesterol, uric acid, urea, creatinine, albumin, total protein, etc.	Colourimetric* Electrophoresis, nephelometry
<b>DRUGS</b> Ethanol, anticonvulsants, etc.	Colourimetric*, radio nuclides, fluorescent*, chromatography
<b>HORMONES</b> HCG, T <sub>4</sub> , TSH	Radionuclides, chemiluminescence*

\* Commonly automated

### • Incubation

Sample and reagent can be incubated at various times for optimum reaction, usually around 10 minutes. A second reagent can be added and incubated again or used to stop the reaction and produce a coloured solution. Incubation is at 37°C (can be changed) which improves reaction times without destroying enzymes that we wish to measure.

### • Photometric Measurement

Wavelengths are selected to best measure colour intensities and measurements are taken every 12 seconds to follow the course of the reaction.

### • Data Analysis

The absorbance readings are compared with stored standard curves for the particular analyte and results are downloaded to patient files in the laboratory computer. The performance of each chemistry is checked with commercial control material to ensure the chemistry is performing to satisfaction. The patient results are also checked and released for reporting to the doctor.

To measure lower concentrations of analytes routinely in clinical chemistry has in the past been difficult. Radio assay has tended to be the method of choice because of its sensitivity. The downside has been lack of robustness, difficulty in automating, and the well documented problems with radioactive materials. At Medlab there has been a shift away from manual radioactive label methods to alternative label (e.g. chemiluminescent and fluorometric) semi- and fully automated methods.

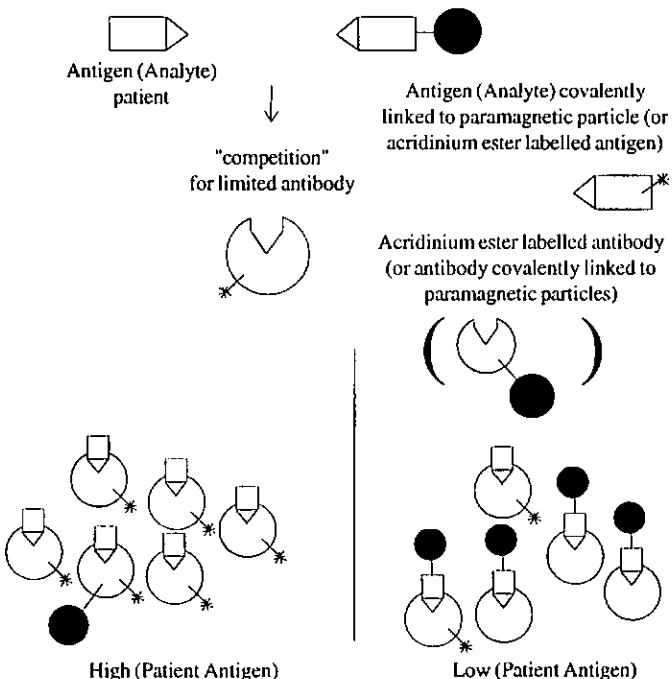
## THE CIBA CORNING ACS 180 ANALYSER

Medlab has two ACS 180 analysers that measure most of the routine hormones and tumour markers, and some vitamins.

The ACS, or (fully) Automated Chemiluminescence System, uses acridinium ester as a chemiluminescent marker rather than the traditional radioactive marker. It uses a solid phase of paramagnetic particles to separate the desired components for measurement via chemiluminescence.

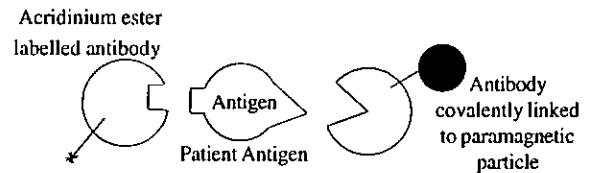
There are two systems currently used:

### 1. Luminescent Immunoassay (LIA)



Paramagnetic particles are held in a magnetic field while patient antigen-antibody complexes are aspirated to waste. Reagent is added and reacts with the acridinium ester to produce chemiluminescence. The amount of light emitted is measured. In this system the light emitted is inversely proportional to the antigen concentration in the patient sample.

### 2. Immunochemiluminometric Assay (ICMA)



With more antigen in the patient sample, more acridinium ester labelled antibody will sandwich to the antibody linked to the paramagnetic particle. The paramagnetic particles are held in a magnetic field and excess acridinium ester labelled antibody is aspirated to waste. Reagent is added and reacts with the acridinium ester to produce chemiluminescence. The amount of light emitted is measured. The concentration of the antigen is proportional to the light emitted during the oxidation of acridinium ester in the cuvette.

The advantages of these systems are:

- (i) Better sensitivity than radioactive methods as signal (i.e. light emission) to background ratio is relatively much higher.
- (ii) Automated system which has improved turnaround times and improved precision.
- (iii) Non-radioactive materials.

### QUALITY CONTROL

Quality and documented evidence of quality is the catch cry of industry today. Clinical chemistry has always been concerned with the quality of the reported results for very good reason. Clinical decisions that affect the lives of patients are made with those results.

There is quality control at every step from collection of the sample to the final report. Medlab has recently attained full ISO 9002 and ISO Guide 25 certification which gives documented evidence of quality throughout the testing process. The actual chemistry is controlled by using commercial controls. The control is analysed in the same way as the patient serum, and if the result is within an acceptable deviation from the mean, the patient results are considered valid.

### SUMMARY

Clinical chemistry is not totally about analyte measurement but also positive and negative testing, e.g. pregnancy testing or occult blood testing in faeces. There is also qualitative and interpretive testing such as with serum protein electrophoresis.

As with all information gathering, it is the interpretation that determines whether it is useful. Medical laboratory technologists have to understand the chemistry behind the methods of choice with their associated pitfalls and apply them to the clinical condition of the patient. The result is quality information that medical practitioners can rely upon.

### INFORMATION SOURCES

- (1) Boehringer Mannheim (Hitachi 717).
- (2) Ciba Corning (ACS 180)

# FREE RADICAL RESEARCH AND THE SOCIETY FOR FREE RADICAL RESEARCH

Free radical biochemistry is a burgeoning field of research which encompasses numerous areas of biology. Along with reactive oxygen species, such as hydrogen peroxide, singlet oxygen and hypohalous acids, free radicals have a multitude of effects in biological systems. These effects can be detrimental or beneficial. For example, there is now compelling evidence that free radicals promote lipid peroxidation of low density lipoproteins which ultimately leads to atherosclerosis. Neutrophils, the predominant white blood cell, generate vast amounts of superoxide when they engulf invading pathogens. This free radical is converted to hypochlorous acid which plays a prime role in killing micro-organisms and preventing infection. It is now becoming apparent that reactive oxygen species activate transcription of specific genes. In particular, hydrogen peroxide activates a transcription factor that promotes replication of the AIDS virus. Free radicals are also intimately involved in the reaction mechanisms of several enzymes including ribonucleotide reductase, peroxidases, and cytochrome P<sub>450</sub>. In 1992 *Science* named the free radical nitric oxide as its molecule of the year. In the past few years it has become one of the more studied and fascinating molecules in biology. This inorganic gas functions as a biological messenger in an astonishing range of physiological processes. These include neurotransmission, blood clotting and blood pressure control. It also augments the immune system's ability to kill tumour cells and bacteria.

Up until 1969 most biochemists outside the field of radiation biology had little interest in free radical chemistry. A notable exception to this was Professor Trevor Slater of Brunel University, UK, who early recognised the probable importance of free radicals as intermediates in biological systems. The discovery of the role of an enzyme now known as superoxide dismutase that year changed all that. By the end of the 1970s free radicals in biochemistry was flourishing as a major research field. However there was little contact between these scientists and two other groups which had long been interested in radicals, namely the aqueous radiation chemists (with strong links to the radiation biologists) and organic chemists working mainly in non-aqueous systems. Dr Robin Willson, a radiation chemist and biochemist, whom Professor Slater had recruited in 1973, decided it was time to remedy this situation and was instrumental with Professor Slater in founding an organisation to bring these disparate groups together, as they had so much to offer each other. Starting with their research colleagues from a number of laboratories in Europe and America they founded a new society which adopted the name *The Society for Free Radical Research*.

Since then the Society has grown rapidly and now has over 2000 members and four regional organisations, SFRR (Australasia), SFRR (ASIA), SFRR (Europe), and the American section called the Oxygen Society. (Our Australasian society has about 100 members). It is dedicated to the study of all aspects of free radical chemistry and effects, covering the disciplines chemistry, biochemistry, immunology, medicine, food technology, pharmacology and physics. One of the great strengths of the society is diversity of the scientific expertise and background of its members because the Society's activities promote the exchange of information and ideas between all

people at all levels of free radical research, from basic physics and inorganic chemistry of radical reactions to the study of complex biological systems such as energy metabolism and disease processes.

The international society organises biennial conferences, the seventh of which will be in Sydney from 6-10 November next. Regional societies organise numerous meetings on specific areas; for example the Australasian Society is organising two satellite meetings around the November conference, one in Queenstown on "Cellular Oxidants" and one in Melbourne on "Radiation Chemistry".

The NZ research group with the largest number of members is undoubtedly that led by Christine Winterbourne at the Christchurch School of Medicine. Radicals play a major part in cancer research in Auckland, and the development of a pulse-radiolysis facility in the Chemistry Department of the University of Auckland is going to make a technique which has been at the centre of free radical research for three decades available to Australasian free radical scientists.

How to you find out more on SFRR (Australasia)? Write to the Secretary, Dr Wendy Jessup, Heart Research Institute, 145 Missenden Road, Camperdown, NSW 2050, Australia, or contact one of the authors of this item:

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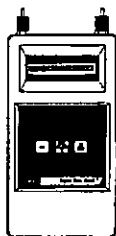


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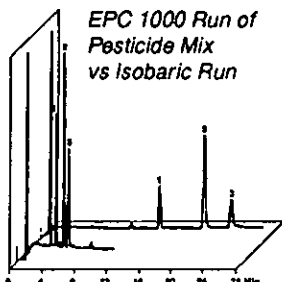
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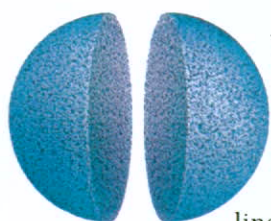
# Alltech

## Alltech New Zealand

P O Box 100-352, N.S.M.C., Auckland 10  
Phone: 09-444-3230 • Fax: 09-444-2399  
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# BIO-RAD



Whether you need an affinity support or empty columns to pack, Bio-Rad is ready with a full line of chromatography

products. We can take you from

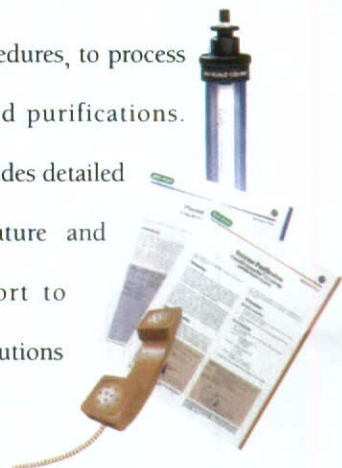
bench top separations and sample

preparations with prepacked columns,



through scale-up procedures, to process scale separations and purifications.

Bio-Rad also provides detailed applications literature and technical support to help you find solutions for your research.



## Your Chromatography Supplier

### NEW Bio-Scale Medium Pressure Columns



- Prepacked with 10  $\mu$ m Macro-Prep<sup>®</sup> Q and Macro-Prep S support
- Four column sizes available: 2, 5, 10, and 20 ml
- Completely biocompatible to preserve protein integrity
- Top-off resin kit extends column life

For more information, request bulletins 1880 and 1881.

### BULK Disposable Polypropylene Columns



- Purchase in bulk and save up to 37% off list price
- Completely autoclavable
- Pack them with the support of your choice
- Bio-Spin columns - 1.2 ml capacity
- Poly-Prep<sup>®</sup> columns - 2 ml capacity with a 10 ml reservoir
- Econo-Pac<sup>®</sup> columns - 20 ml capacity with a 10 ml reservoir

For more information, request bulletin 1887.

### IMPROVED Bio-Spin<sup>®</sup> 6 and 30 Spin Columns



- Improved cap design: easy opening, eliminates leaks
- Prepacked with Bio-Gel<sup>®</sup> P-6 or P-30 gel
- Completely autoclavable
- Desalt protein and nucleic acid samples
- Remove unincorporated radiolabels

For more information, request bulletin 1726.

### NEW Econo-Pac Cartridges



- Now prepacked with: Macro-Prep high Q supports  
Macro-Prep high S supports  
Macro-Prep t-butyl HIC supports
- Specially designed for use with low pressure chromatography systems
- Protein purification sampler packs include five different Econo-Pac cartridges

For more information, request bulletin 1894.

**Toll Free 0508 805 500**

**BIO-RAD**

Bio-Rad  
Laboratories

Life Science Group

US (800) 4BIORAD • AU 02-805-5000 • AT (1) 877-89 01 • BE 09-385 55 11 • CA (905) 624-0713 • CN (01) 2563148 • FR (1) 49 60 68 34 • DE 089 31884-0 • IT 02-21609 1 • JP 03-3534-7515 • HK 7893300 • NL 08385-40666 • NZ 09-443 3099 • SG (65) 443 2529 • ES (91) 661 70 85 • SE 46 (0) 8-735 83 00 • CH 01-810 16 77 • GB 0800 181134

SG 09303

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# CLINICAL CHEMISTRY/CHEMICAL PATHOLOGY PRODUCT FOCUS

## AUTOMATIC COVERSLIPPING

The *Shandon (Life Sciences International) Consul* automates the laborious and time-consuming task of manual coverslipping.

It dispenses with problems of poor consistency and the hazards created by over-exposure to xylene fumes. Without changing your existing laboratory procedures, you can efficiently automate the complete coverslipping cycle and make better use of your laboratory resources. You will benefit from increased consistency in the quality of coverslipping and enjoy greater productivity in a safer working environment.

Slide-mounted specimens are automatically coverslipped with high precision and consistency using routinely accepted coverslips and commercially available mountants. The *Consul* accepts up to 40 standard glass slide-mounted specimens at a time and batches of up to 200 coverslips (sizes:40, 50 or 60 mm).

Volumes of mountants are adjustable to nine levels and can be fine tuned through simple pressure adjustments to suit your individual requirements. State-of-the-art electronics and microprocessor control enable you to select and program your individual coverslipping parameters with complete ease.

Once you have tested and verified your routine you can leave it stored for instant access in the program memory. All functions are clearly and simply identified for speed and easily accessed on the angled display using touch sensitive controls.



The *Shandon Consul* with its new microprocessor controlled mountant dispensing system ensures repeatable, high quality slipping. Slides can be transferred directly from *Varistain* automatic stainers to maximise throughput and to benefit from the consistency of an integrated slide production system. The *Shandon Consul* - so safe, efficient and easy-to-use, that once



[ ] HEAD OFFICE  
165 Sunnybrae Road, Glenfield,  
P.O. Box 34-234, Birkenhead,  
Auckland 10, New Zealand.  
Tel: (09) 443-5867  
Fax: (09) 444-7314

[ ] WELLINGTON BRANCH  
26 Fitzherbert Street,  
Petone, Wellington,  
New Zealand.  
Tel: (04) 568-9440  
Fax: (04) 568-8991

## MISTRAL 3000i REFRIGERATED CENTRIFUGE

- BRUSHLESS INDUCTIVE DRIVE
- TRUE COILED BOWL REFRIGERATION WITH 'D' SHAPED COILS
- CLEAR EASY TO READ DIGITAL DISPLAYS
- PRECOOL FACILITY
- FULL 3 LITRE CAPACITY
- 10 SELECTABLE ACCELERATION RATES
- FULLY PROGRAMMABLE OPERATION WITH A 9-RUN MEMORY

### Labsupply Pierce (NZ) Limited

[ ] CHRISTCHURCH BRANCH  
30 Sheffield Crescent,  
P.O. Box 20-035, Bishopdale,  
Christchurch, New Zealand.  
Tel: (03) 358-7410  
Fax: (03) 358-9598

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loaded and programmed, you can confidently 'walk away' and concentrate on more demanding tasks.

For further information please contact:

Watson Victor Ltd,

P O Box 1180, Wellington

Phone: (04) 385 7699, Fax: (04) 384 4651.

Or one of our offices in:

AUCKLAND Phone: (09) 579 3039

CHRISTCHURCH Phone: (03) 366 9282

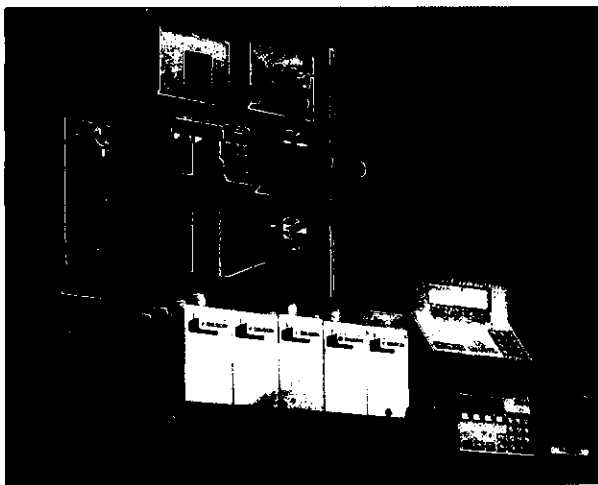
DUNEDIN Phone: (03) 477 7291

or circle number 28 on the reader reply card

### HOSPITAL AUTOMATES PREPARATION OF PATIENT SAMPLES FOR THERAPEUTIC DRUG MONITORING

The Midwestern Hospital, USA was manually preparing between 50-80 samples a day to monitor patient dosages of tricyclic antidepressants. They began looking at automation for a number of reasons. First, manual preparation of biological fluid samples increases the risk of exposure to HIV and hepatitis viruses. Second, the hospital was aware of the high costs associated with occupational problems such as carpal tunnel syndrome and shoulder and neck injuries due to repetitive pipetting. The hospital also felt that by relieving workers of repetitive tasks and allowing them to concentrate on data interpretation and method development, job satisfaction would increase.

The laboratory began searching for an instrument to automate sample preparation on solid phase extraction columns. They had a number of requirements. One related to bench space. Space in a laboratory is always at a premium, and this lab was no exception. They also wanted an instrument which would accommodate different sized vials so they wouldn't have to replace all their existing glassware. And, they wanted an instrument with software that would enable smooth transition from manual to automated operation. Because of the large number of samples being prepared, the instrument would be running 7 days a week, approximately 16 hours a day. They needed a proven, hard-working system.



The hospital initially purchased two ASPEC Systems from Gilson and since that time has purchased another two. With the increased demand for sample throughput and an expanded

protocol to test for a full complement of antidepressant drugs, ASPEC robots are running virtually all the time. Unattended operation allows significant "walk-away" time which eases labour scheduling in the lab. Previously, one person was dedicated to one assay. Now that person works on several assays simultaneously. The hospital estimated a 40% reduction in workload and a significant saving in medical-related expenses. Plus, reliability has improved due to reduction of human error. Sample after sample, hour after hour, year after year, the ASPEC System performs efficiently and accurately. In fact, the lab testified they've never had a service problem with any of the four ASPEC instruments.

ASPEC performs all liquid handling in solid phase extraction without operator intervention. The system can easily be tailored to other types of column-based analyses, such as immunoaffinity columns, and can also be used as an auto-injector, or for other sample preparation tasks such as sample dilution, internal standard addition and reagent mixing. Because of its flexibility, the ASPEC System is being used in pharmaceutical laboratories, environmental agencies for extraction of pesticides and herbicides, food and agricultural control labs and chemical industry laboratories to isolate additives and unreacted monomers in polymers.

For further information please contact John Morris Scientific, P O Box 6348, Wellesley Street, Auckland, Phone (09) 366-3999, Fax (09) 366-3060 or circle number 29 on the reader reply card

### MULTI PROGRAM ROBOTIC SLIDE STAINER

Varistain and automated slide staining have been synonymous since the mid-1960's. Now comes the Varistain XY, the new high-technology instrument that combines outstanding quality with the ultimate in staining consistency, time savings, plus operator and specimen safety. It all takes place within the one instrument that has its own integrated fume control system.

Varistain XY is state-of-the-art batch staining for histology, cytology and haematology laboratories.

With this robotic stainer the movable arm travels quickly left-to-right and front-to-back, then lowers the carrier of up to 70 tissue specimens into the reagent of choice.

Varistain XY provides a 20 program memory capacity, 19 staining stations, a choice of five languages, and three levels of specimen agitations.

Now you can duplicate your regular and special staining routines, using your own stains and your own procedures, to achieve superb uniformity.

For further information please contact:

Watson Victor Ltd,

P O Box 1180, Wellington

Phone: (04) 385 7699, Fax: (04) 384 4651

Or one of our offices in:

AUCKLAND Phone: (09) 579 3039

CHRISTCHURCH Phone: (03) 366 9282

DUNEDIN Phone: (03) 477 7291

or circle number 30 on the reader reply card

## SOLVENT RECYCLER

The safe and sensible new approach to solvent use

The Life Sciences International (Shandon) Varisol effectively and economically recycles commonly used stable laboratory solvents including xylene and alcohol. By using a Varisol, laboratories in hospitals, universities and industry will save money on new solvents, reduce the cost, inconvenience and danger of toxic waste disposal and contribute towards the protection of the environment.



### FEATURES:

- \* Simple tilt action for easier, safer filling and cleaning after use. (Can be filled direct or fitted with recovery bags).
- \* Easy-to-use controls with international symbols - no special technique or training required.
- \* Recovers stable solvents with boiling points between 40°C and 180°C.
- \* Twelve litre capacity with diverter valve system automatically, separates at two boiling points.
- \* Integral stand with drip tray contains accidental spillages.
- \* A safe system operating under normal atmospheric pressure with safety cut-outs to prevent overheating and ensure cooled solvent delivery.
- \* PTFE lined lid provides air-tight seal with insulated cover to prevent overheating of outer surface.

For further information please contact:

Watson Victor Ltd,

P O Box 1180, Wellington

Phone: (04) 385 7699, Fax: (04) 384 4651

Or one of our offices in:

AUCKLAND

Phone: (09) 579 3039

CHRISTCHURCH

Phone: (03) 366 9282

DUNEDIN

Phone: (03) 477 7291

or circle number 31 on the reader reply card

## PACIFICHEM '95

### WILL YOU PRESENT A PAPER?

Pacificchem '95 will provide a unique opportunity for New Zealand chemists and biochemists to meet with like-minded professionals from around the Pacific Basin and to learn of the major developments in their disciplines. The congress is planned for the week immediately preceding Christmas (Dec. 17-22) next year and is being organised under ten thematic areas as listed below:

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 organising committee has accepted proposals for in excess of 150 different symposia to be run under these thematic headings. The symposia titles have been forwarded to all University Chemistry/Biochemistry Departments and to the Head Offices of relevant CRIs. Apart from the Congress symposia each subject area will have a range of general sessions. Papers for are now sought before the deadline of:

**Abstracts for papers: March 31, 1995.**

**Advance Registration/Accommodation November 1, 1995.**

**Advance Member Registration Fees:**

**Full: \$US295 Student: \$US25**

Submission of an abstract for consideration for presentation **must** be on the approved form which can be obtained by writing to the NZIC Office, or the Congress Manager, Pacificchem '95, American Chemical Society, 1155 16th Street, N.W., Washington D.C. 20036, USA, or the undersigned and include a long abstract of 500-1000 words including critical tables, formulae, structures etc.

The Congress is sponsoring a limited number of Young Scholars from developing nations bordering the Pacific Basin. Applications to be made to the Washington office by 31 March 1995. If you are aware of any likely candidates please encourage them to apply.

Sponsorship gained from the Ministry of Research, Science & Technology and NZIC will ensure that two NZ postgraduate students (Chemistry/Biochemistry/Pharmacy) are able to attend the congress and present posters in relevant sessions. Criteria are with all Chemistry and Biochemistry Departments for local nomination and national selection. Anyone interested in attending *Pacificchem '95* is urged to make contact with Professor B Halton, Chemistry Department, Victoria University, P O Box 600, Wellington from whom relevant application forms and further information is available.

# NEW PRODUCTS

## J & W SCIENTIFIC CATALOGUE AND REFERENCE GUIDE 1994-95

J & W Scientific's 1994-95 Catalogue and reference guide is available now. The new catalogue lists J & W Scientific's quality range of gas chromatography capillary columns, with full product descriptions, cross reference charts, trouble shooting guide and applications notes with chromatograms.

The J & W Scientific range of Accubond Solid Phase Extraction cartridges, for sample preparation are also listed in the catalogue. These cartridges provide consistent quality and lot to lot reproducibility taking the guesswork out of sample preparation. The catalogue provides notes on methodology and lists applications including chromatograms of samples.

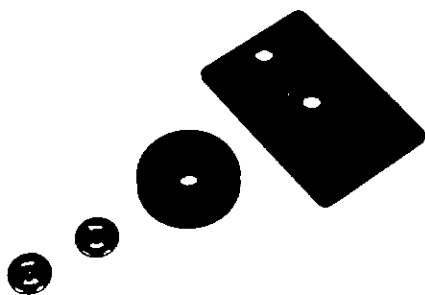
The catalogue also has sections on GC accessories and Capillary Electrophoresis. All products have full product descriptions including notes on usage. If you haven't received your copy already call and order it today.

Douglas Scientific, P O Box 45 027 Auckland 8.  
Ph (09) 837 5447, Fax (09) 836 0668,  
outside Auckland Ph (0800) 735 725  
or circle number 32 on the reader reply card

## AN ALTERNATIVE CELL FOR SMALL CROSS-SECTION IR SAMPLES

The Diamond Cell attachment is used to compress a micro sample into a thin plate, which is then directly measured by infrared microscope or more economically using a beam condenser attachment. This cell ensures that micro samples are measured with high sensitivity. Sample thickness can be easily adjusted with a precision screw.

The Diamond Cell permits measurement over the entire IR wavenumber range. Even originally thick samples can be measured in the transmission mode with high sensitivity.



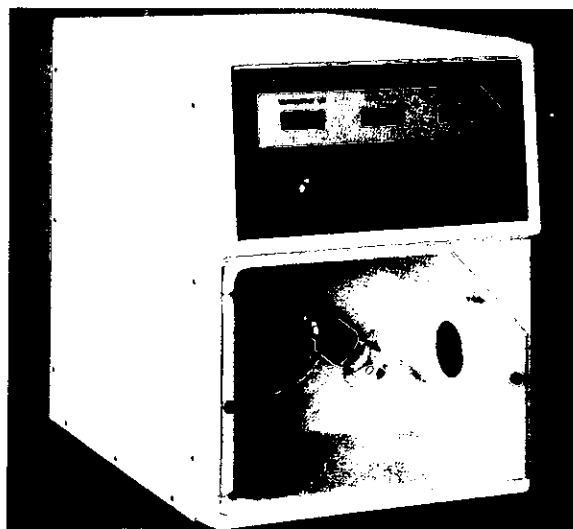
This method is applicable to many types of samples including pharmaceuticals, rubbers, plastics and polymers.

For further information on the diamond cell or any other IR or FTIR products contact:

Douglas Scientific, P O Box 45 027 Auckland 8.  
Ph (09) 837 5447, Fax (09) 836 0668,  
outside Auckland Ph (0800) 735 725  
or circle number 33 on the reader reply card

## SEDEX 55 NEW LOW TEMPERATURE EVAPORATIVE LIGHT SCATTERING DETECTOR FOR HPLC, SFC, GPC & CCC.

This alternative to refractive index detection can detect any non-volatile analyte, even those without chromophores. Made by SEDERE of France the detector is insensitive to fluctuations in ambient conditions, compatible with all commonly used chromatography solvents, has a detection limit of less than one nanogram and can be used with volatile acids, bases and buffers.



The detector operates by nebulising the effluent from the chromatographic column into a homogenous mist of particles. The mobile phase then evaporates off to leave non-volatile analytes which pass through the optical system where they diffuse an incident beam of light. A photomultiplier then collects the scattered light and converts it to an integrator compatible signal. The amount of diffused light is a function of the mass of solutes injected and this usually obeys an exponential relationship.

- \* Generally a greater response is obtained at lower temperatures and the SEDEX 55 is unique in the fact that it is the only detector of this type capable of working at 40°C with aqueous mobile phases flowing at 2 mL/min.
- \* With analytes that are polar, ionisable or even ionic it is possible to add volatile modifier to mobile phases such as acids, bases, or certain salts in order to improve chromatographic performance.
- \* Gradient elution can also be employed to enhance resolution.

There are a wide range of areas in which the SEDEX 55 can be used including analysis of natural products, pharmaceuticals, lipids, steroids and fatty acids. A list of 70 applications and a bibliography are available on request.

For further information on the SEDEX 55 contact:

Douglas Scientific, P O Box 45 027 Auckland 8.  
Ph (09) 837 5447, Fax (09) 836 0668,  
outside Auckland Ph (0800) 735 725  
or circle number 34 on the reader reply card

## GIVE A PROFESSIONAL POLISH TO QC MANAGERS REPORTS

As a member of the management team QC Managers must report on many aspects of the production process and on the operational aspects of their own department. Professional quality reports with graphical displays make a strong impression on other members of the team, supplying information in a clear and concise manner which reflects positively on your organisational skills and grasp of the important issues under your control.

While procedures help you to control the quality of output, measurements are required to ensure that procedures are followed and deliver the quality of products desired. So samples must be taken, measurements must be made and reported quickly and accurately with a minimum of staff and resources to keep costs under control. Modern quality control software therefore should not only supply graphical reporting templates to simplify the production of control charts, but should also wherever possible interface with the measurement equipment to simplify the process of data entry.

**QC Talk/PRO**, a memory resident program, can be called from within your existing instrument software and used to read numbers directly off the screen of the other program to produce a Mean Plot, (X-Bar, also known as Shewhart or Levey-Jennings) a Range Plot (R-Bar) or an XY Plot (Cartesian). QC Talk/PRO can also produce histograms, sigma plots and generate normal distribution statistics, and count the occurrence of data labels, flags or any other specified piece of information contained in the data file. Statistical Process Control (SPC) capabilities include process and capability statistics and the application of either Western Electric or Westgard Limit Rules. Customised statistical reports can be generated as well as multiple data point averaging.

**QC-Link/PRO** permits real time plotting from up to 4 RS232 devices simultaneously, and can be made portable with QC-Link/HP to run on the HP 95LX Palm-top computer.

**QC Manager** Data Evaluation and Presentation Software is utilised as a front end data capture device for data review and reduction as well as a back end report writing and graphing tool. It interfaces directly to instruments and other databases and can automate the flow of data to and from your LIMS. QC Manager provides 4 standard SPC graphs plus user definable graphs and charts. As a database it can contain all your analytical test information and make it simple to filter and sort data on any of the default or user definable fields. The seamlessly integrated spreadsheet allows transparent transfer of data selected in data base to a spreadsheet mode to perform user definable calculations. An optional network access module provides data base record locking and spreadsheet file locking for multiuser access over a local area network. And when not processing data with QC Manager, use the built-in word processor. QC Manager was written with Informix Software's SmartWare integrated software package and can run on virtually any PC hardware configuration.

**Control Chart** is an easy-to-use, Windows-based scientific graphics program. It uses a spreadsheet-like table editor for easy data entry, and can plot Reported Value data. Percent Recovery data and Absolute Difference between replicate sets.

Accuracy and Precision graphs using two different scaling methods; fixed interval (%) and Shewhart/Levey-Jennings X Bar (standard deviations). Extremely easy to learn, to use and gives very accurate results.

For more information on any of these QC software packages and to receive the es<sup>2</sup>c catalogue of scientific software contact: Conway Bishop,  
Alphatech Systems Ltd  
P O Box 37-583 Parnell, Auckland.  
Phone (09) 377-0392, Fax (09) 309-8514  
or circle number 35 on the reader reply card

## DENVER MOISTURE ANALYSER

The Denver IR-100 makes moisture analysis convenient and economical, while improving speed and accuracy. Because of the simplicity of operation, Denver's IR-100 is ideal for use in the production area. You don't have to be an expert to get accurate answers quickly and easily. Store your method in memory and recall it with just two keystrokes. Results are continuously displayed in % moisture solids, volatiles or in grams (from 0.001 to 100g), so your operators won't need to calculate, and an optional built-in printer supplying ID code, time, date, procedure, initial and final weights prevents transcription errors. An industry standard computer port is built-in.

Multiple modes of operation make the Denver IR-100 flexible for use in QC or R&D laboratories too. Dry to a preset time, to a constant weight, or manual operation. Two step drying is available for sensitive samples. Four parallel quartz heaters ensure long service life and better control for reproducible results time after time.

For convenient and economical moisture analysis, completely documented and simple enough for any operator Denver's IR-100 is ideal for use in the production area or the laboratory.

Contact: Trish Fenton, Alphatech Systems Ltd  
P O Box 37-583 Parnell, Auckland  
Phone (09) 377-0392, Fax (09) 309-8514  
or circle number 36 on the reader reply card

## INFRARED MICROSCOPE IMS-8000

The IMS-8000 Infrared Microscope developed for Shimadzu FTIR spectrophotometers combines a fast optical system and highly sensitive MCT detector to ensure measurement of micro samples is done easily.

Switching measuring modes involves a simple one touch selection of the infrared microscopy mode or the ordinary mode. Removal of the IMS-8000 is not necessary when the ordinary FTIR measuring mode is needed. There is also one touch selection of the transmission mode and reflection mode.

A glass dewar type MCT detector eliminates the need for re-evacuation and the liquid nitrogen monitoring system protects the MCT detector.

For more information on this FTIR microscopy system contact: Douglas Scientific, P O Box 45 027 Auckland 8.  
Ph (09) 837 5447, Fax (09) 836 0668,  
outside Auckland Ph (0800) 735 725  
or circle number 37 on the reader reply card

## CAPILLARY CELL SET FOR SHIMADZU UV SPECTROPHOTOMETERS - SAVES PRECIOUS SAMPLES

When it comes to the application of spectrophotometers in biotechnology, the capability of analysing a microscopic quantity of sample is called for since only a very small quantity of sample is available or the sample is very precious.

To meet this requirement, a capillary cell set has been developed by Shimadzu Corporation. This accessory is used for analysing a sample filled in a capillary tube of 0.5mm ID, sealant at the capillary end prevents sample loss. The minimum sample quantity required is as small as 3µL.

Measurement is very simple. A capillary adapter cell is attached to the cell holder of a standard sample compartment and the capillary tube filled with sample is placed in it. Retrieval of the sample can be done easily using a pipette, further reducing the wastage of samples which are expensive and difficult to obtain.

For further information on this expense, time and sample saving device contact:

Douglas Scientific, P O Box 45 027 Auckland 8.  
Ph (09) 837 5447, Fax (09) 836 0668,  
outside Auckland Ph (0800) 735 725  
or circle number 38 on the reader reply card

## TRACE MAGNESIUM ARSENAZO

The Trace Scientific Magnesium Arsenazo reagent is a unique formulation for the determination of Magnesium in serum, plasma & urine. The reagent is supplied as a single, ready to use solution, stable for 18 months at room temperature.

The Trace Magnesium Arsenazo Reagent is highly specific for magnesium. Toxic chelating agents such as KCN are not required. Calcium interference is prevented up to a level of 10mmol/L (40mg/dL) by incorporating a unique chelating agent.

Colour formation is instantaneous with peak absorbance at 568 nm (550-590 nm).

The reagent is strongly buffered which prevents pH drift, thus enhancing calibration stability even in "open" reagent boat containers.

Using the recommended sample to reagent volume ratio the reagent is linear to 2.0 µmol/L (4.86 mg/dL). Interference from bilirubin up to a level of 260 µmol/L (15 mg/dL) and lipaemia measured as triglycerides up to a level of 18 µmol/L (1620 mg/dL) is not observed.

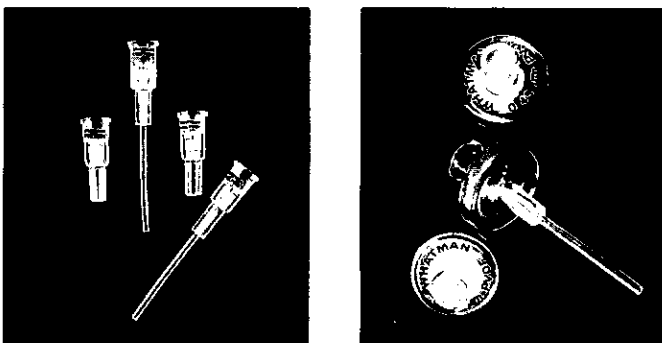
The reagent is available in 4x250ml and 1x1 litre kit configurations.

Instrument application protocols are available on request  
Contact: Medica Pacifica Ltd  
P O Box 24-421, Royal Oak, Auckland,  
Ph (09) 625-5261, Fax (09) 625-4396  
or circle number 39 on the reader reply card

## WHATMAN SYRINGE FILTERS

Whatman 13mm and 4mm syringe filters give maximum sample recovery and reproducibility. Designed to provide high efficiency filtration for samples of 2 to 10ml, they are available with a comprehensive range of filter media such as nylon, PTFE, PVDF, polysulphone, polypropylene and cellulose acetate in optional sterile packing.

PVDF, PTFE and nylon 13mm and 4mm syringe filters are also available with a special tube tip outlet. This provides a much more efficient delivery of samples into time microvials.



For more difficult samples, the 13mm syringe filters with the complete range of Whatman glass microfibre media, offer high retention of particles and good flow rates. The filters media are ultrasonically sealed within the polypropylene housings without adhesives to eliminate the possibility of contamination of the sample. For added convenience and ease of identification, each filter has pore size and media identification details printed on the housing.

Typical applications include GC, HPLC and TLC sample preparation.

For more information contact:

Labsupply Pierce (NZ) Ltd,  
P O Box 34-234, Birkenhead, Auckland  
Ph (09) 443-5867, Fax (09) 444-7314  
or circle number 40 on the reader reply card

## AUTOMATED SAMPLE CLEAN-UP IN FOOD ANALYSIS

A new eight-page booklet from Gilson describes methods for determining *N*-methylcarbamate pesticides in fruits and vegetables; sugars and organic acids in dairy products and beverages; vitamin C in orange juice by HPLC; and polychlorinated dibenzo-*p*-dioxins and dibenzofurans in milk by GC.

Devoted to the automated sample clean-up of foods, which often contain highly complex sample matrices, the booklet describes the use of the company's ASPEC™ XL and ASTED™ XL Sample Preparation Systems. ASPEC is used to automate solid-phase extraction; ASTED performs on-line removal of macromolecular interferents such as proteins, lipids, polysaccharides etc. Experimental details of analytical procedures are provided for each of the four applications, with results and chromatograms.

Contact: John Morris Scientific  
P O Box 6348, Wellesley Street, Auckland.  
Ph (09) 366-3999, Fax (09) 366-3060  
or circle number 41 on the reader reply card

## NEW VERSIONS OF SYSTEM 2000 FT-IR

The Perkin Elmer System 2000 is the best value high performance FT-IR spectrometer in the market with unmatched combinations of multi-range, multi-technique FI-IR for the price.

Now, for those customers who need the performance and sampling versatility of System 2000 with a fixed range spectrometer, Perkin Elmer has introduced two new versions at lower prices without sacrificing the "Upgradeability" which makes this instrument so attractive and such good value.

The system 2000M is a MID-IR version with a fixed KB Beamsplitter covering the range 7000-370cm<sup>-1</sup>.

The System 2000N is a NEAR-IR version with a fixed quartz beamsplitter covering the range 15,000-2,000cm<sup>-1</sup>.

This means that buying the fixed range System 2000 now doesn't lock-out upgrading to a multi-range system later. An upgrade kit is available to replace the fixed beamsplitter with interchangeable beamsplitters. The upgrade kit is easily fitted in your laboratory by one of our local service engineers.

Prices start from under \$60,000 plus GST.

Contact: Perkin Elmer New Zealand  
P O Box 22-159 Otahuhu, Auckland  
Ph (09) 276-2230, Fax (09) 276-5602  
or circle number 42 on the reader reply card

## NEW LOW-PRICED GILSON FC 205 FRACTION COLLECTOR FOR BASIC TIME/DROP COLLECTION OFFERS RELIABILITY, EASE OF USE AND A VARIETY OF RACK OPTIONS.

Gilson, Inc. has recently introduced a new, low-priced fraction collector designed for applications requiring routine collection in time or drop modes. The FC 205 Fraction Collector, incorporates the stationary rack design and other time-proven features shared by Gilson's entire line of fraction collectors. With the FC 205, up to ten collection windows can be added in either mode to divert non-desired eluent to waste, thus optimizing use of the collection tubes. It can be used as a stand-alone instrument or may be integrated with Gilson HPLC or LC systems, or that of another manufacturer.

Several key features of the FC 205 assure reliability and long service life. Its unique stationary rack system eliminates jams, drips and spills. X-Y stepper motor technology assures accurate placement of the dispense heads over the tubes in the rack and moves the head between, not over, filled tubes to avoid contamination. Metal internal drive components provide long life and reliable operation, even in cold rooms. And a chemically resistant keypad and case protect the FC 205 from corrosive substances.

Additional features make the FC 205 exceptionally easy to set up and operate. A built-in keypad with interactive prompt/response software, multiple-function soft keys and a 48-character LCD allows users to quickly set or review parameters to begin a run. On-line assistance is available if needed via a

special HELP key. To adapt to changing conditions, collection parameters may be edited during runs, and the most recent set of parameters is automatically stored in memory.

Unlike some fraction collectors in its price range, the FC 205 provides a wide range of rack and tube options - with 23 different racks, including three thermostatted options. Collection tube options include 10, 12 and 13 mm test tubes, standard and deep-well microtitre plates, microcentrifuge tubes, scintillation vials, and unlimited collection via teflon funnels.

To save time and increase throughput, an optional multi-column adapter permits simultaneous collection from up to eight separate columns. An optional three-way diverter valve facilitates collection at high flow rates, or into small diameter tubes or plates.

Contact: John Morris Scientific  
P O Box 6348, Wellesley Street, Auckland.  
Ph (09) 366-3999, Fax (09) 366-3060  
or circle number 43 on the reader reply card

## 'TROPPIX' CHEMILUMINESCENCE TECHNOLOGY

Chemiluminescence is the conversion of energy into light. Tropix's main products are chemiluminescent enzyme substrates that emit light in the presence of a target substance that is "labelled", or marked, with an enzyme. The amount of light produced is proportional to the amount of enzyme-labelled sample detected. The light signal persists for a sufficiently long time to be easily measured with instrumentation or photographic film. Tropix substrates enable the detection of extremely small amounts of virtually any biological substances that can be labelled with an enzyme. Smaller amounts of material can be detected than is otherwise possible using alternative testing methods.

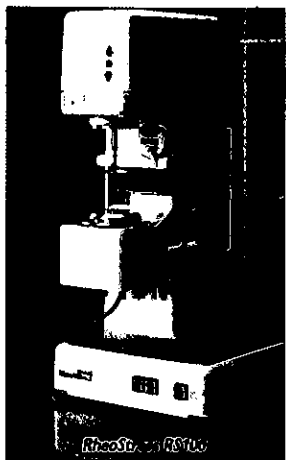
Tropix technology is used in life science research and commercial applications including DNA sequencing, forensic analysis, gene function study, molecular biology and immunology research. Other uses of Tropix technology include clinical human diagnostic tests for infectious diseases, including HIV (human immunodeficiency virus) and the early detection of certain cancer markers.

Tropix's products are enzyme-activated chemiluminescent 1,2-dioxetane enzyme substrates and related products, including its patented CSPD<sup>®</sup> substrate for alkaline phosphatase, Galacton<sup>™</sup> substrate for beta-galactosidase, and Glucuron<sup>™</sup> substrate for beta-glucuronidase. The company has licensed its technology to companies selling bioanalytical and clinical diagnostics test kits and products since 1988. Tropix currently has more than 2,500 customers worldwide, including laboratories of major academic and government research institutions, as well as leading biotechnology, pharmaceutical and chemical companies.

TROPPIX products are available from New Zealand distributors: Intermed Scientific Ltd  
P O Box 33-268, Takapuna, Auckland  
Ph (09) 443-1284, Fax (09) 443-8419  
or circle number 44 on the reader reply card

## CONTROLLED-STRESS RHEOMETER

Responding to the demands and requirements of its customers, HAAKE has developed the RheoStress RS100, a controlled-stress rheometer with a standard temperature range of -50 to 350°C.



Engineered to meet extreme demands, the RheoStress RS100 delivers a precise stress with a torque resolution of  $10^{-8}$ Nm and monitors the resulting strain with an unmatched resolution of  $10^{-6}$  rad.

### Software

Sophisticated software featuring user-friendly window menus provides completely computerised control of the instrument. True multi-tasking is now possible using the operating system OS/2 Version 2.0 with the RS100 software. A variable-speed lift and microprocessor-controlled positioning of the sensor system facilitate easy and reproducible sample loading. The "autogap" function precisely controls the gap of cone-and-plate or parallel-plate sensors to  $10^{-6}$ m.

### External Sample Loading

External sample loading is a standard option using either the interchangeable base plates or disposable sensors. Controlled-stress measurements are particularly meaningful in measuring the yield point and creep behaviour of a substance.

### Applications

Physical processes such as sedimentation, sagging and slumping can be readily simulated in order to predict the behaviour of food and pharmaceutical products, paints, and adhesives. Steady-shear testing makes it possible to measure flow curves in order to characterise the flow behaviours over an extended shear range. An extensive forced-oscillation software package is also available to measure the dynamic properties of viscoelastic substances.

All of these technical and control advances make the HAAKE RheoStress RS100 the most sophisticated rheometer available.

For further information please contact:

Watson Victor Ltd,

P O Box 1180, Wellington

Phone: (04) 385 7699, Fax: (04) 384 4651

Or one of our offices in:

AUCKLAND Phone: (09) 579 3039

CHRISTCHURCH Phone: (03) 366 9282

DUNEDIN Phone: (03) 477 7291

or circle number 45 on the reader reply card

## GILSON 215 ROBOTIC LIQUID HANDLER

The 215 Liquid Handler is an XYZ robot that can automate any number of manual liquid handling procedures. It can be linked up with other analytical devices via an optional filler port to automate virtually any sample preparation procedure your application requires.

Features include:

*\* Septum piercing ability*

Assures a high level of lab safety by reducing manual liquid handling, laboratory workers are no longer exposed to hazardous or potentially infectious samples. If septum piercing is not required, non-piercing probes for open tube sampling are available.

*\* The 215 Liquid Handler's reliable automation means higher throughput and improved accuracy*

Automation of sample preparation procedures results in the elimination of human error, resulting in enhanced accuracy and repeatability.

*\* Advanced software makes programming and control quick and easy*

The 215 Liquid Handler is controlled by programs created in Gilson 709 Sample Manager Software in Microsoft Windows 3.1 environment.

*\* Versatile operation that can be tailored to specific needs*

*\* Wide variety of rack and tube options*

*\* Optional custom-designed racks for specialised protocols*

*\* Bar code scanning for positive sample identification and tracking.*

For more information contact:

John Morris Scientific Ltd

P O Box 6348, Wellesley Street, Auckland,

Ph (09) 366-3999, Fax (09) 366-3060

or circle number 46 on the reader reply card

## NEW EUROTURRAX T20 BASIC FOR STANDARD DISPERSING JOBS FROM IKA

The future requires laboratory instruments with an efficient price-performance ratio.

The EUROTURRAX T20 Basic, moderately-priced dispersing instrument, outstanding in its easy handling and operating, has been designed with this requirement in mind.

The EUROTURRAX T20 Basic comprises a high-speed, efficient drive with a fixed speed of 27,000 1/min.

The matching element S 20-25 N-19 G is easy to fit and to remove and consists of corrosion resistant materials (1.4301/PTFE).

Typical Applications for the T 20 are:

- teaching and training purposes
- production control
- all simple dispersing, homogenizing, mixing and shredding jobs.

Contact: Labsupply Pierce (NZ) Ltd

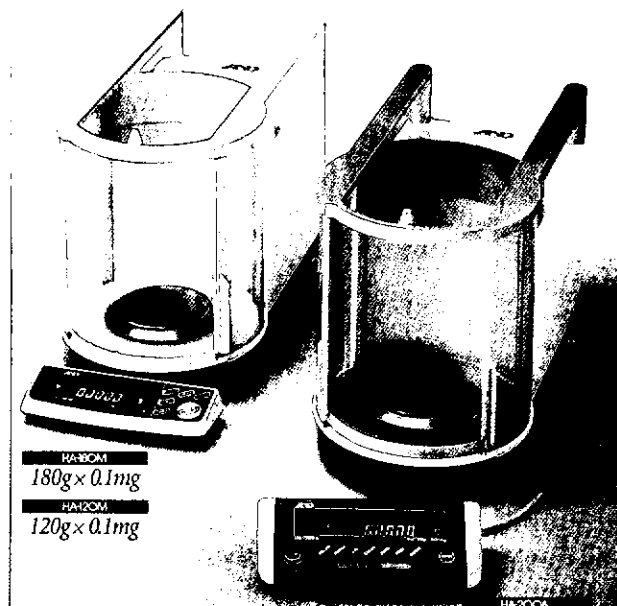
P O Box 34-234, Birkenhead, Auckland

Ph (09) 443 5867 Fax (09) 444 7314

or circle number 47 on the reader reply card

## THE NEW HA SERIES ANALYTICAL BALANCES FROM A & D

A & D announce the HA series, a new generation of analytical balances. The HA-A balance features a large pillarless weighing chamber with a door that opens automatically with the press of a button, or by simply touching the door. Door closure is also automatic, and the door can be set to close after placing or removing a weighing sample. The weighing capacity is 210g x 0.1mg. The HA-A balance also features an easy-to-read Capacity Indicator which shows the remaining capacity available for use during weighing and a handy Comparator Mode which allows acceptable high and low limits for weighing to be entered.



The HA-M balance is available in two weighing capacity models; 180g x 0.1mg and 120g x 0.1mg, and features a pillarless weighing chamber with three circular doors opening to give a 200° access. A top access door allows the user to weight tall containers such as beakers and volumetric flasks.

Both HA-A and HA-M balances have a detachable integrated keyboard and display unit with a big bright fluorescent display that is easy to read in any light. All HA Models offer Automatic Self-Calibration. The HA re-calibrates when a change in ambient temperature is detected. Two internal calibration masses are used for superior span and linearity. The optional AD-1651 Vibratory Spoon that accepts a preset shut-off signal from the balance can be used with all HA Models to eliminate over filling when weighing powders.

Contact: Advantage Data Systems Ltd,  
P O Box 68-281, Auckland,  
Ph (09) 360 0916, Fax (09) 360 0074  
or circle number 48 on the reader reply card

### THE MULTICAL MULTICALORIMETER SYSTEM

MULTICAL is a new development from IKA-Analysentechnik GmbH, allowing you to monitor and control the preparation as well as the course of tests in up to 8 IKA C4000 calorimeters at the same time.

The MULTICAL system consists of the following components:

- one to eight calorimeter(s) (C4000)
- control computer with control software
- printer
- analytical balance
- sample rack for weighed-in samples
- oxygen filling station with decomposition vessel identification

The control software ensures fully automatic performance of tests and administration of samples, decomposition vessels and test results. User prompting during the individual phases of a routine combustion test is triggered by the individual instruments.

Further important features of the software are:

- user friendly program structure using menu technology and context sensitive support.
- adaptation of the program to your sequence of operations.
- integrated error detection.
- logging and storage of all relevant test parameters.
- calculation of the calorific/heating value according to ISO 1928 and corresponding national standards (e.g. DIN 51900, ASTM D 2015-66, BSI 1016).
- conversion of the calorific/heating value into various reference conditions.
- output of results in standard units.
- automatic supervision of calibration tests and calculation of calibration values.

A special advantage of the MULTICAL system is the parallel mode of operation of the system. While tests are running in the calorimeters, samples can be weighed-in and identified, decomposition vessels can be prepared and preceding tests evaluated. If there are sufficient decomposition vessels and inner calorimeter vessels available, operations with the calorimeters can be carried out without a break.

Prepared samples can be stored in the sample rack for a longer time without evaporation of volatile components. The positions of the samples in the rack are administrated by the control software. The decomposition vessels are identified at the oxygen filling station. Existing C4000 calorimeters can be easily retrofitted with a MULTICAL-system.

Contact: Labsupply Pierce (NZ) Ltd  
P O Box 34-234, Birkenhead, Auckland  
Ph: (09) 443 5867 Fax (09) 444 7314  
or circle number 49 on the reader reply card

### NYLON MEMBRANE FILTERS

Poretics nylon membrane filters, as in the case of standard cellulosic (MCE) membrane filters, depend upon the random tortuosity of the fluid flow paths through the filter to achieve their rated pore size. Thus, nylon membrane filters have significantly greater internal surface area, and therefore greater binding capacity than that for polycarbonate/polyester straight through capillary pore screen membrane filters. Generally, the binding capacity of nylon membrane filters is also more than 25% greater than that of MCE membranes. Examples where nylon membranes will excel include: media filtration; sterilization of tissue culture, pharmaceuticals and biologicals; clarification and stabilization of wine and beer; particulate removal

from semiconductor liquids such as photoresists, solvents and water; and in molecular biology where a high binding capacity is required.

These membrane filters are manufactured of pure nylon on a non-woven support medium. They offer the following advantages compared to standard cellulosic tortuous pore membranes:

- \* Nylon is naturally hydrophilic - no wetting agents are needed. The absence of any cytotoxic wetting agents make them ideal for cell growth.
- \* The flow of nylon membranes filters are approximately equal to those of standard cellulosic membranes.
- \* Nylon membrane filters feature low extractables - boiling water extractables are less than 0.015mg/cm<sup>2</sup>.
- \* Nylon membrane filters have a high binding capacity - 125µg/cm<sup>2</sup> compared to 80-188µg/cm<sup>2</sup> for most cellulosic membranes. They consistently bind all sizes of DNA and RNA fragments.
- \* They are of superior quality as evidenced by consistent bubble point uniformity from disc to disc.
- \* They are strong - a 3mm diameter unsupported disc can withstand over 130 psi differential pressure. Therefore, they are easy to handle.
- \* Nylon membrane filters are autoclavable - they are completely unaffected by temperatures up to 180°C (365°F).

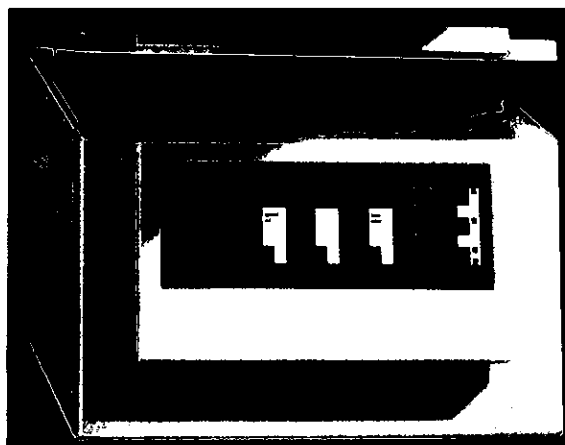
PORETICS are represented in New Zealand by:  
Intermed Scientific Ltd,  
P O Box 33-268, Takapuna, Auckland  
Ph (09) 443-1284, Fax (09) 443-8419  
or circle number 50 on the reader reply card

### NEW STANDARD TABLE-TOP CENTRIFUGE FROM HERAEUS

Centrifuges in the Labofuge 400 series are designed to handle medical and biological routine applications with medium-size samples. These laboratory centrifuges, like all equipment in the new Heraeus "Function Line", have been designed with an emphasis on the most essential functions. The Labofuge 400 centrifuges are thus suitable for a wide range of applications, are easy to use and durable, yet are also inexpensive.

Equipped with a swing-out rotor and round buckets, the Labofuge 400 can operate at a speed of 400 rpm and achieve an RCF value of 2750xg. A rotor for microtitre plates and an 18-place fixed angle rotor designed for centrifuging 1.5 ml and 2 ml microtubes are also available. The fixed angle rotor comes complete with three sets of adapters with 18 reducer sleeves each for centrifuging standard microtubes with a capacity of 0.6 ml, and 0.2 ml PCR tubes. You can also operate Labofuge 400 with a 24-place rotor for determining exact haematocrit values and a cyto-bucket.

The Labofuge 400 comes complete with a swing-out rotor and four buckets (100 ml capacity each). Adapters are available for all standard centrifugation tubes (DIN, blood samples, Falcon). The centrifuge is equipped with a microprocessor based control, LED displays for speed and RCF values, and a quick-run function for brief centrifugation.



The soft-start/soft-brake function ensures gentle centrifugation and tapered braking for sensitive samples. These centrifuges meet IEC 1010 international safety standards, are equipped with a maintenance-free induction drive and are extremely quiet.

The Labofuge 400e is a particularly cost-effective economy model. Equipped with a round bucket, it achieves a speed of 3500 rpm and a RCF value of 2110xg. It can also be used with cyto-buckets. Ten different types of adapters are available for centrifuging Falcon tubes, various blood sample tubes and DIN tubes. A rotor for centrifuging 2x2 microtitre plates can also be used.

Contact: Biolab Scientific  
Private Bag, Northcote, Auckland  
Ph (09) 418-3039, Fax (09) 418-0729  
or circle number 51 on the reader reply card

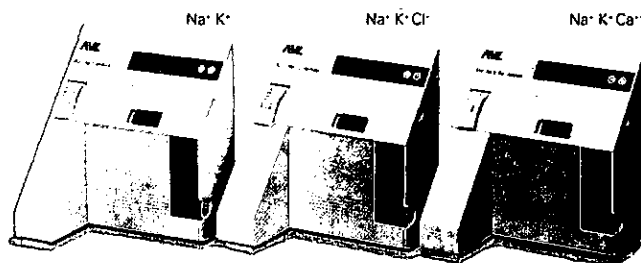
### FULLY AUTOMATIC ELECTROLYTE ANALYSIS

AVL 9100 SERIES

AVL 9120 - Na<sup>+</sup>, K<sup>+</sup>

AVL 9130 - Na<sup>+</sup>, K<sup>+</sup>, Cl<sup>-</sup>

AVL 9140 - Na<sup>+</sup>, K<sup>+</sup>, Ca<sup>++</sup>



Three valuable benefits offered by the AVL 9100 series electrolyte analysers:

#### **AFFORDABILITY**

The surprisingly low initial cost and low cost per test assures you of a rapid return on your investment, and your AVL Electrolyte Analyser will save you money for years to come.

#### **PATIENT CARE**

The precision and dependability of AVL's sensor technology is at the heart of the 9100 Series. With abnormal electrolyte values automatically flagged, you will have reliable results in less than a minute.

#### **CONVENIENT FLUID-PAK AND ZERO MAINTENANCE ELECTRODES**

Calibration solutions and sample waste are sealed in the disposable fluid-pak for maximum convenience and safety.

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Or one of our offices in:

AUCKLAND	Phone: (09) 579 3039
CHRISTCHURCH	Phone: (03) 366 9282
DUNEDIN	Phone: (03) 477 7291

or circle number 52 on the reader reply card

#### **PERKIN ELMER INTRODUCES A NEW APPROACH TO DYNAMIC DIFFERENTIAL SCANNING CALORIMETRY**

Scientists from The Perkin Elmer Corporation and Dr. Jurgen Schawe, a well-known thermal analysis researcher affiliated with the University of Ulm, Germany, have introduced a new approach to Dynamic Differential Scanning Calorimetry (DDSC). Discussed at a recent calorimetry conference in Rostock, Germany, this approach provides more accurate and meaningful data for a wide range of practical applications.

Unlike current products which are empirically based, Perkin Elmer's approach is grounded in dynamic response theory, which fully utilizes all of the information available from DDSC experiments. In addition, it takes advantage of the unique design of the power compensation DSC, which provides more precise control, allowing DDSC measurements to be made more accurately and more rapidly. Perkin Elmer has applied for a patent on this new technology and plans to commercialize it in connection with the company's DCS 7 system.

Contact: Perkin Elmer New Zealand  
P O Box 22-159 Otahuhu, Auckland  
Ph (09) 276-2230, Fax (09) 276-5602  
or circle number 53 on the reader reply card

#### **-100°C TITANIUM COLD TRAP**

The new model TT8105A1 Titan Trap cold trap replaces dry ice or liquid nitrogen as a cooling source to trap condensibles from the vapour flow before they enter the vacuum pump. A specially coated chamber and titanium trapping surface provide superior vacuum pump protection from corrosive vapour streams. Proprietary microprocessor control ensures fast,

reliable defrosting and automatic vacuum pump activation. Titan Traps are CFC-free.

Contact: John Morris Scientific  
P O Box 6348, Wellesley Street, Auckland.  
Ph (09) 366-3999, Fax (09) 366-3060  
or circle number 54 on the reader reply card

#### **NIKON-MICROSCOPE TECHNOLOGY**

Nikon professional microscopes naturally include the most advanced optics and functions. Nikon recognise that simple, convenient operation, including comfortable armrests, are essential for long hours of use. The "Optiphot-2" not only provides sophisticated techniques like epi-fluorescence, phase contrast, DIC, and simultaneous observation of epi-fluorescence and DIC, but offers high-quality image recording through photomicrography and CCTV.



Available also are a wide variety of accessories that expand your research possibilities. Inside, Nikon optics produce clear, bright images that are easy on your eyes.

The "Optiphot-2" is for professionals who want high performance with convenience and comfort.

For further information please contact:

Watson Victor Ltd,  
P O Box 1180, Wellington  
Phone: (04) 385 7699, Fax: (04) 384 4651

Or one of our offices in:

AUCKLAND	Phone: (09) 579 3039
CHRISTCHURCH	Phone: (03) 366 9282
DUNEDIN	Phone: (03) 477 7291

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#### **BIOCHEMISTRY innovations from TRACE**

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- PBG (urine) available soon, ALT IFCC (2 vial)
- Micro Protein, Transferrin, CO2 (21 day, SV)

**Instrument applications for all models available**

#### **\* NZ representative:**

Medica Pacifica Ltd  
P O Box 24-421  
Royal Oak, Auckland  
Ph 09-6255261, Fax 09-6254396

## QUICKCHEM 8000 AUTOMATED ION ANALYSER FROM LACHAT INSTRUMENTS - FLOW INJECTION ANALYSIS ION CHROMATOGRAPHY

The QuickChem 8000 features the latest innovations in automated ion analysis technology. It provides powerful benefits for your laboratory.

### *High Productivity*

QuickChem 8000's flow injection technology provides a much higher level of productivity than segmented flow analysers. Typical sample throughput is 90 samples per hour.

### *True Multi-Tasking*

With QuickChem 8000's Omnion Software operating under WINDOWS 3.1, true multi-tasking enables simultaneous instrument control and data acquisition for one or several instruments.

### *Multiple Simultaneous Techniques*

The unique shared peripheral system incorporated into the Omnion Software, enables multiple analytical techniques to be run simultaneously on the QuickChem 8000. In addition to FIA, ion chromatography can also be run.

### *Automated Dilutions*

Omnion Software, combined with the XYZ sampler and Automated Dilution Station, completely automates preparation of standards and detects and dilutes off-scale samples into the working range of the method. This unique feature completely frees the operator from attending the instrument during a run.

### *Data Quality Assured*

Lachat's Data Quality Management (DQM) Software allows the user to establish custom quality control protocols. Out-of-control data is detected promptly and the appropriate corrective action is taken - automatically, with no user intervention required.

### *Simplicity*

For all its sophistication the QuickChem 8000 is remarkably easy to use. For routine daily operation the user simply names a data file and presses run - that's it!



### *Efficiency With Space Saving Design*

The QuickChem 8000 is available in a compact design to conserve bench space. In less than 1.5 metres of bench top space you can fit a complete system including 2 channels of FIA and one channel of IC complete with automatic sampler and data station. This is less than half the space required for two separate instruments.

### *Confidence With Proven Methods*

The QuickChem 8000 is the third generation of this line of Automated Ion Analysers. Methods have been developed for over 15 years, many of which are required for USEPA compliance monitoring. This means you can run the instrument with complete confidence in accuracy and precision. If you have a need to determine analytes in a wide variety of samples from sea water to soils the QuickChem 8000 can provide the solution.

For further information please contact:

GBC Scientific (NZ), P O Box 68-330, Newton, Auckland

Ph: (09) 3735 765, Fax: (09) 3600 683

or circle number 56 on the reader reply card

## PRICE • PERFORMANCE • VALVE THE HR SERIES ANALYTICAL BALANCES FROM A & D

The HR series analytical balances from A & D give you the capability you require at a competitive price.

The HR Adapts to your Environment:

- \* *Mode Key* - Changes weighing unit and alters condition of response to immediately adapt to changing environmental conditions.
- \* *Zero Point Calibration* - Calibrates zero independently of span.
- \* *Selectable Calibration Mass Capability* - corrects for errors in calibration weight.
- \* *Range Key* - Disables least significant digit for better display stability in unstable areas.
- \* *Strong Construction* - Aluminium alloy that won't chip or crack, guaranteeing years of reliable performance and good looks.

The HR is simple to operate but very flexible:

- \* Perform any operation with simple clearly marked key strokes
- \* Multiple weighing modes
- \* Digital tare capability allows manual or computer input of tare weight



- \* Under hook capability for density measurements and for weighing magnetic material
- \* Comprehensive system diagnostics to advise of error conditions.

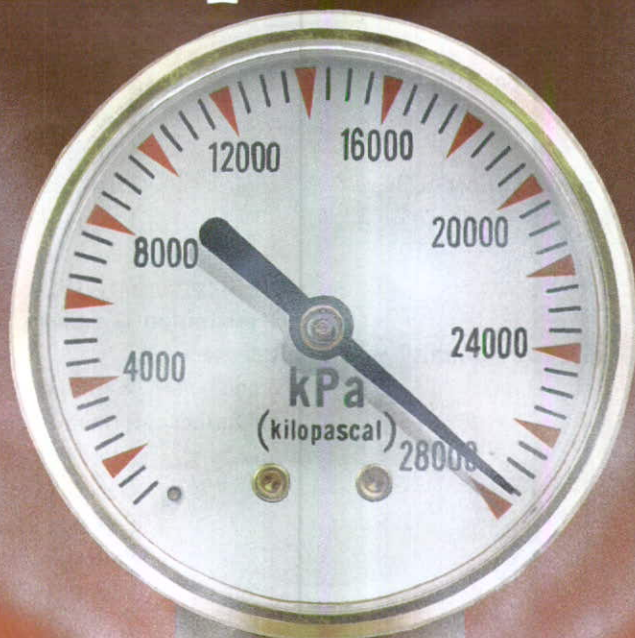
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P O Box 68-281, Auckland,

Ph (09) 360 0916, Fax (09) 360 0074

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# When the pressure is on..



GC17A Capillary GC  
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Chromatography*

### **Advanced Flow Control.**

- Keyboard control of column flow, split ratio linear velocity and reproducibility.
- Improves operator efficiency.

### **Simplified Parameter Setting.**

- Manual measurement of column flow and split ratio is now obsolete.

### **Column Pressure Programming.**

- Optimises performance over entire temperature range.

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- Re-start all parameters from pre-set files at your designated times.

### **Real Reductions in Operating Costs.**

- Auto standby and "sleep" mode reduces carrier gas consumption.

### **Selectable Data Processing Control.**

- CR7 Laptop Integrator for dedicated processing.
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# CONFERENCES & SEMINARS

## 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

innovations.

Contact: Dr G Subramanian  
60B Jubilee Road  
Littlebourne  
Canterbury, Kent CT3 1TP  
United Kingdom  
Ph 44-227-720819  
Fax 44-227-720819

## 6-9 September, 1994 Workshop - Assessment and Remediation of Subsurface Petroleum and Hydrocarbon Releases

Venue: Wellington, NZ

For further information contact:

Alan Turner  
General Secretary/Executive Officer NZIC  
P O Box 12-347, Wellington  
Ph (04) 473-9444  
Fax (04) 473-2324

## 11-16 September, 1994 9th Meeting on Radiation Processing

Venue: Istanbul, Turkey

Contact: Ms C Güven  
9th IMRP  
P O Box 177  
Bahçelievier, Ankara 06502  
Turkey

## 21-23 September, 1994 1st Australian Workshop on Molecular Simulation of Polymers

Venue: Burgmann College, Australian National University, Canberra, Australia

For further information contact:

Dr Graeme Moad  
CSIRO Division of Chemicals and Polymers  
Private Bag 10  
Rosebank MDC, Clayton  
Victoria 3168  
Australia  
Fax 61-3-543-8160

## 14-15 October, 1994 Citac '94 Hong Kong Symposium on Traceability and Comparability of Analytical Measurements

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

## 1-3 November, 1994 Cellular Oxidants - Production and Consequences

Venue: Queenstown, New Zealand

A satellite meeting of the 7th Biennial Meeting of the International Society for Free Radical Research.

For further information contact:

## 8-9 August, 1994 "The Greenhouse Gases Summit"

Venue: The Regent Hotel, Auckland, NZ

For further information contact:

AIC Conferences  
Freepost 3219  
P O Box 5321  
Wellesley Street  
Auckland  
Ph (09) 358-5566  
Fax (09) 358-5577

## 8-12 August, 1994 13th International Conference on Chemical Education

Venue: Metropolitan Campus  
Inter American University  
San Juan  
Puerto Rico

For further information contact:

Professor Ram S Lamba  
Chairman, 13th ICCE  
Department of Chemistry  
Inter American University of Puerto Rico  
P O Box 191 293, San Juan  
Puerto Rico 00919-1293

## 26-28 August, 1994 Massey University Chemists Reunion

Venue: Massey University, Palmerston North, NZ

For further information contact:

Professor Andrew Brodie  
Department of Chemistry & Biochemistry  
Massey University  
Private Bag 11222  
Palmerston North  
Ph (06) 356-9099  
Fax (06) 350-5682

## 6-9 September, 1994 Downstream Processing and Separations of Biological Molecules International Meeting

Venue: University of Cambridge, England

This meeting is a coordinated effort of industrialists, manufacturers and scientists involved in downstream processing who have come together to provide an opportunity to present the latest advances in the technologies and to face its new challenges including regulatory and standards. Representatives from major manufacturers will be available to answer your questions and show the latest technological

Dr Tony Kettle (Secretary)  
Postgraduate Office  
Christchurch School of Medicine  
P O Box 4345  
Christchurch, New Zealand  
Ph (03) 364-0410  
Fax (03) 364-0451

The Society of Polymer Science  
Nagooka Building  
2-4-2 Tsukiji, Chuo-ko, Tokyo 104  
Japan  
Fax +81 3 35458560

**6-10 November, 1994 International Adhesion Symposium**

Contact: Professor H Mizumachi  
University of Tokyo  
Yayoi 1-1-1  
Bunkyo-ko, Tokyo 113  
Japan

**6-10 November, 1994 7th Biennial Scientific Meeting of the International Society for Free Radical Research**

Venue: Sydney Convention Centre, Sydney, Australia  
For further information contact:  
Margaret Blackwell  
IFSRR '94 Secretariat  
P O Box 77, Pymble  
NSW 2073,  
Australia  
Ph 61-2-983-9330  
Fax 61-2-983-9307

**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, USA  
Fax 1-914-2550978

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

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

**21-25 November, 1995 New Zealand Society of Soil Science Conference**

Venue: Lincoln University, Canterbury, New Zealand  
For further information contact:  
Dr Alister Metherall  
Department of Soil Science  
Lincoln University  
P O Box 84,  
Canterbury  
New Zealand  
Ph (03) 325-2811  
Fax (03) 325-2944

**28 November-2 December 1994 5th SPSJ International Polymer Conference (IPC94) Society of Polymer Science**

Venue: Japan  
Contact: T Takahiko

**3-5 December, 1994 Conference of the Australasian Pharmaceutical Sciences Association**

Venue: Auckland, New Zealand  
This conference will be held jointly with the Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists and will include a satellite symposium on therapeutic drug monitoring.  
Contact: Assoc Prof John Shaw, Conference Secretary  
APSA '94  
School of Pharmacy  
University of Otago  
P O Box 913,  
Dunedin  
New Zealand  
email reception @ gandalf.otago.ac.nz

**11-16 December, 1994 10th International Organic Agriculture Conference**

Venue: Lincoln University, Christchurch  
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

**17-20 December, 1994 4th Eurasia Conference on Chemical Sciences (IV EuAs C<sub>2</sub>S)**

Venue: Federal Hotel, Kuala Lumpur, Malaysia  
For further information contact:  
Mr Lim Teck Thai  
Conference Secretary, 4th Eurasia Conference  
c/- Institut Kimia Malaysia  
129B, Jalan Aminuddin Baki  
Taman Tun Dr Ismail  
60000 Kuala Lumpur, Malaysia  
Ph 603-7189909  
Fax 603-7189909

**4-7 January, 1995 Inorganic Reaction Mechanisms Discussion Group**

Venue: University of Newcastle, United Kingdom  
Details from Dr David Richens, University of St Andrews

**31 January-1 February, 1995 NZIC Inorganic and Organometallic Specialist Group Meeting**

Venue: Massey University, Palmerston North  
For further information contact:  
Professor Andrew Brodie  
Department of Chemistry & Biochemistry  
Massey University  
Private Bag 11222  
Palmerston North  
Ph (06) 356-9099  
Fax (06) 350-5682

**5-9 February, 1995 20th Australian Polymer Symposium**

Venue: Quality Hotel, Adelaide, Australia  
For further information contact:  
Dr Mark Fisher  
SOLA International Holdings Research Centre  
P O Box 244, Morphett Vale  
SA 5162, Australia  
Fax 61-8-3261037

**17-22 December, 1995 Pacifichem '95**

Venue: Honolulu, Hawaii, USA  
Contact: Professor B Halton  
Chemistry Department  
Victoria University  
P O Box 600, Wellington  
Ph (04) 472 1000

**22-26 May, 1995 6th Asian Chemical Congress**

Venue: Metro, Manilla, Phillipines  
Contact: Dr Ishmael Ordoñez  
Chairman  
Media and Promotions Committee  
6th Asian Chemical Congress  
Fax 63-2-996868  
or  
Alan Turner  
General Secretary/Executive Officer NZIC  
P O Box 12-347, Wellington  
Ph (04) 473-9444  
Fax (04) 473-2324

**27 August-1 September, 1995 10th International Conference on Fourier Transform Spectroscopy**

Venue: Budapest, Hungary  
Contact: Mrs Klára Láng *or*  
Mr Attila Varga  
Conference Office  
Roland Eötvös Physical Society  
H-1371 Budapest, P O Box 433  
Hungary  
Ph/Fax 36-1-2018682

**3-8 September 1995 6th European Conference on the Spectroscopy of Biological Molecules**

Venue: Université de Sciences et Technologies de Lille  
Villeneuve d'Ascq  
France  
For further information contact:  
Professor J C Martin (Chairman)  
ECSBM '95, LASIR, UST Lille  
Bât. C5  
59655 Villeneuve d'Ascq Cedex, France  
Ph 33-204-36988  
Fax 33-204-36755  
Email: ECSBM95@univ-lille1.fr 33-20434920

**3-6 November, 1995 IUPAC 6th International Symposium on Macromolecule-Metal Complexes**

Venue: Beijing, China  
Contact: Professor Ying-Yan Jiang  
Institute of Chemistry  
Academia Sinica, Zhongguancun  
Beijing 100080  
China

**12-16 December, 1995 4th Pacific Polymer Conference**

Venue: Kauai, Hawaii  
For further information contact:  
Professor Ray Otterbrite  
Department of Polymer Chemistry  
Virginia Commonwealth University  
Richmond, Virginia 23204, USA  
Fax 1-804-367-8588

**12TH AUSTRALIAN AND NEW ZEALAND  
INTERNATIONAL SYMPOSIUM  
ON THE FORENSIC SCIENCES**

The 12th Australian and New Zealand International Symposium on the Forensic Sciences will be held in Auckland at the Centra Hotel on 21 to 25 November, 1994. The Symposium is biennial, the last meeting being held in Hobart in 1992.

The theme for this conference is "Present achievement, future promise". The last few years have seen advances in many fields of forensic science; it is very likely that this will continue. It therefore seems appropriate that in 1994 the forensic community gives itself the opportunity to pause and reflect on the quality and the range of the work being carried out at present, and to consider the changes in techniques, procedures and other aspects of forensic science that the future will bring.

The conference programme is centred on the Plenary speakers who open each day's proceedings, and address the conference theme with reference to their own specialist areas of interest. These are followed by parallel sessions on various topics. Topics selected for presentation and discussion include Racing Chemistry, Serology and DNA, Fires and Explosions, Fibres, Fingerprints, Substance Abuse, Blood and Breath Alcohol, Physical Evidence, Forensic Toxicology, General Technology, Law, Quality Assurance and Management, Odontology, and Firearms. Poster sessions are also scheduled in the conference.

Workshops have been organised to take advantage of the expertise assembled in Auckland. These are: DNA Interpretation with Bruce Budowle, Bruce Weir and Ian Evett; the Advanced Glass Workshop with Ian Evett; and Tyre and Shoe Impressions with William Bodziak. We also hope to hold a Workshop in Fingerprint Technology and Methodology which would be organised in conjunction with the NZ Police. The first three workshops have been organised by the Australian and New Zealand Forensic Science Society in association with ESR: Forensic.

Overseas speakers including scientists from FBI and other American laboratories, from CRSE (UK), and from European laboratories are attending. A large number of expressions of interest have been received, and the organisers have every expectation that the conference will be a success.

**Further details can be obtained from:**

Douglas Elliot  
Conference Committee  
c/o ESR: Forensic, Hampstead Road  
Mount Albert  
Private Bag 92 021, Auckland

# THRESHOLD LIMIT VALUES: PART II

By Ian B Campbell and Douglas M Hay  
Occupational Safety and Health, Massey University

**Douglas Hay** is Senior Lecturer in Occupational Safety and Health at Massey University. He is currently on a long term contract with the International Labour Organisation as Chief Technical Adviser in China where he is establishing a National Training Centre in Occupational Safety and Health. He was educated at Auckland University, Canterbury University and Imperial College, London and holds the degrees BSc, BE(Chem), MSc, DIC.

**Ian Campbell** is a Teaching Fellow in Occupational Safety and Health at Massey University. Holding the degrees of BCom and PhD he was formerly Director of Safety for the Accident Compensation Commission and previously Chief Executive for the Workers' Compensation Board.

## ABSTRACT

The primary objective of this paper is to examine the assessment of TLVs for binary mixtures. TLVs for three such liquid/vapour systems have been calculated using differing methods. It has been demonstrated that theoretical concentrations can vary up to an order of magnitude depending upon the method used. This poses problems for those who have to assess acceptable exposure levels for such mixtures and throws considerable doubt on the method commonly used.

## INTRODUCTION

The greatest difficulty is to determine accurately, exposure of an individual. Exposure will depend upon the distance a worker is from a source of contamination, air movement in the work area, whether evolution is continuous or spasmodic, to mention a few. The "simplest" determination is for a single gas or vapour and even this is not easy. What is a representative sample; is it a sample taken over 10 minutes, a half hour, or a whole day? Costs in most cases preclude the use of sophisticated techniques and usually one resorts to "grab" samples upon which to base an assessment.

## EXPOSURE TO SINGLE GAS/VAPOURS

### (i) Qualitative method using odour

The nose is a very sensitive organ and should not be overlooked as an early warning device. Fortunately most substances have odour thresholds well below their TLV and here remedial action can be taken once an odour is detected, assuming no sensitization. However there are some chemicals that have odour thresholds well in excess of their TLVs and in such cases the odour is of limited use as an early warning device. Amoores and Hautala (1983) have referenced odour thresholds on 214 industrial chemicals. They have, among other things, developed an 'Odour Safety Factor' which is defined as:

$$\frac{\text{TLV (ppm; v/v)}}{\text{Air Odour Threshold (ppm; v/v)}}$$

They produced the following classification table using this factor.

Odour Safety Factor	Interpretation
>500	More than 90% of distracted persons perceive warning of TLV concentration in the air
26 - 500	50 - 90% of distracted persons perceive warning of TLV
1 - 26	Less than 50% of distracted persons perceive warning of TLV
0.18 - 1	10 - 50% of attentive persons can detect TLV concentration in the air
<0.18	Less than 10% of attentive persons can detect the TLV

### (ii) Quantitative method for exposure to single gas/vapour

The Workplace Exposure Standards and Biological Exposure Indices for New Zealand (WES) is published from time to time and lists the TLV-TWA and TLV-STEL for various substances; being largely an adoption of the ACGIH standards. If a TLV-STEL factor is not given then 3 x TLV-TWA is used as a guideline. Exposures are based on 15 minute sampling periods. These figures are used to assess exposure to single chemicals. The expression used for the evaluation is:

$$\text{TLV-TWA}' = \frac{\sum C_i T_i}{480}$$

where  $C_i$  = concentration to which an individual is exposed for  $T_i$  minutes (based on 8-hour (480 min) day).

This TLV-TWA' is then compared with the TLV-TWA listed in the WES and if  $\text{TLV-TWA}' > \text{TLV-TWA}$  then the exposure is deemed to be excessive. For shift work less than 8 hours the time weighted concentration can be determined assuming zero exposure during the remaining time. For shift work of more than 8 hours the time weighted average concentration should be determined for a representative 8 hour period. This is usually done by determining the exposure level for 8 hours then multiplying it by either:  
hours worked during shift/8, or  
hours worked during week/40 to give the corrected exposure.

Again this corrected value is compared with the values contained in WES.

## THE PROBLEM OF GASEOUS MIXTURES

Here interest is centered on both the qualitative and quantitative assessment of the gaseous mixture. Qualitative assessment can be difficult and costly and, with a complex mixture, GLC techniques are required. Once individual concentrations have been determined then an assessment can be made as to whether

the mixture exceeds the TLV. Also concentrations of the individual components at the mixture TLV can be determined.

$$\text{If } \sum_{i=1}^n \frac{C_i}{T_i} > 1$$

then mixture TLV is exceeded.

$$\text{If } \sum_{i=1}^n \frac{C_i}{T_i} < 1$$

then mixture TLV is *not* exceeded, where  $C_i$  = concentration of  $i^{\text{th}}$  component in mixture and  $T_i$  = TLV of  $i^{\text{th}}$  component in mixture. The concentrations of the individual components at the TLV are:

$$\frac{C_i}{\sum_{i=1}^n C_i/T_i}$$

### THE PROBLEM OF EXPOSURE TO VAPOURS FROM LIQUID MIXTURES

In evaluating vapour/liquid systems assumptions must be made otherwise the calculations become extremely involved. Exposure concentrations depend on proximity of workers to the source of the contamination and air flow in the area. Assessments are carried out in two ways:

1. Evaluation of vapour concentrations over the liquid mixture by analytical techniques - this is the method adopted by enforcement agencies. Assessment is as shown previously for gaseous mixtures.
2. Determination of vapour concentrations using theoretical techniques - method most commonly adopted by factory occupiers.

This second method poses the most problems since fundamental assumptions must be made regarding the mixture. Included in these are:

- a) Should ideal behaviour be assumed?
- b) Should non-ideal behaviour be assumed?
- c) Does the vapour composition vary significantly with time or can constant composition be assumed?

There are three methods used in determining TLVs of gaseous mixtures above liquids. In all methods assumptions have been made which the scientist must assess. Also additive effects are assumed for all components in the vapour mixture i.e. the target organs in the human body are the same for each component in the vapour mixture.

Method I: This method uses the expression:

$$\text{TLV (approx)} = \frac{1}{\sum_{i=1}^n f_i/T_i}$$

where  $f_i$  = weight fraction of the  $i^{\text{th}}$  component  
 $T_i$  = TLV of the  $i^{\text{th}}$  component ( $\text{mg}/\text{m}^3$ ).

The assumption in using this expression is that the liquid evaporates to a vapour having the same composition, by weight, as the liquid i.e. all the liquid eventually evaporates into a non-ventilated space. In this expression no account is taken of the different boiling points of individual components. No account is taken of the dynamic nature of the system - it is assumed the

system composition remains unaltered over time. This expression gives the TLV of the vapour in  $\text{mg}/\text{m}^3$ . Concentrations of individual components at the TLV of the mixture are determined by multiplying the mixture TLV by the respective weight fractions of each component in the liquid.

Method II: This method assumes ideal behaviour and takes into account vapour pressures of the individual components in the liquid mixture.

The expression used is:

$$\text{TLV (ideal)} = \frac{\sum_{i=1}^n X_i P_i^\circ}{\sum_{i=1}^n X_i P_i^\circ/T_i}$$

Where  $X_i$  = mole fraction of the  $i^{\text{th}}$  component in liquid

$P_i^\circ$  = vapour pressure of the  $i^{\text{th}}$  component in the liquid

$T_i$  = TLV of  $i^{\text{th}}$  component (ppm)

Individual concentrations of each component at the TLV of the mixture are obtained by multiplying the TLV by  $P_i/P_T$  where  $P_i$  is the partial pressure of the  $i^{\text{th}}$  component ( $= X_i P_i^\circ$ ) and  $P_T$  is the total vapour pressure ( $= \sum X_i P_i^\circ$ )

Method III:

This expression assumes non-ideal behaviour.

$$\text{TLV (real)} = \frac{\sum_{i=1}^n \gamma_i X_i P_i^\circ}{\sum_{i=1}^n \frac{\gamma_i X_i P_i^\circ}{T_i}}$$

This is the most accurate method to use. In using this method the dynamic nature of the equilibrium is not considered, i.e. it is assumed that the activity coefficients remain constant over time and relative concentrations of each component remain constant. To determine the concentrations of each component at the TLV level of the mixture, TLV (real) is multiplied by:

$$\frac{\gamma_i X_i P_i^\circ}{\sum_{i=1}^n \gamma_i X_i P_i^\circ}$$

### RESULTS

To assess the accuracy of each method three binary mixtures were chosen: Ethanol/toluene; Benzene/ethanol; Carbon tetrachloride/benzene and the concentrations of each component at the TLV for each mixture was determined. See Tables 1, 2 and 3.

Column (a) gives the mixture TLV for ideal systems. (Method II) and the concentration of the individual components at this TLV. Column (b) gives the mixture TLV using the most accurate method (Method III) and the concentration of each component at the TLV. Column (c) gives the mixture TLV using the approximate method (Method I) and the concentration of each component at the TLV.

Columns (d) and (e) give the ratios of the individual concentrations with respect to calculations done using methods (III) and (I). If methods were similar then one would expect columns (d) and (e) to have values very close to unity. Only Table 3 shows similarity in that the concentration determined by both methods (III and I) are not too dissimilar.

However Table 1 and 2 show marked deviations in the two methods. In fact from Table 1 it can be seen that concentrations can differ by an order of magnitude. Put another way an occupier of a chemical processing plant could perform a theoretical calculation to determine the 'acceptable' concentration to which a worker can be exposed. Depending upon the method chosen the occupier could be an order of magnitude out. This would produce unacceptable exposure levels and conceivably chronic illness could result.

### CONCLUSIONS

The concentrations shown in Tables 1, 2 and 3 are for the equilibrium vapour concentrations for various liquid/vapour binary systems. The assumptions made when arriving at these values are given in the body of the text. How then does the scientist interpret the differences indicated by each of the three methods? The only procedure is to adopt a suitable safety factor in establishing control limits. This factor should be applied to the calculated vapour values. The more dissimilar the components of the liquid mixture, the greater will be the concentration differences. With the binary systems used in this

paper it appears that a safety factor of at least 10 should be adopted; i.e. when using the approximate solution to determine the vapour concentrations of the TLV. The scientist should divide the result by at least 10 to be sure that those exposed are not receiving excessive doses. The authors are of the opinion that a better safety factor would be thirty (30). Obviously the figure adopted will depend greatly upon the working conditions that prevail. It is, however, the responsibility of the scientist to establish control limits based on the worst case scenario.

### REFERENCES

*Handbook of Chemistry and Physics*,  
Chemical Rubber Co Ltd, 49th Ed, Frensd, Blukis and Haneka,  
Physical Chemistry, MacMillan.

Novak, J and Vasek, V, Discussion on the Interpretation of TLVs 27 (1966) American Industrial Hygiene Assn Journal, 555-558.

Perry, J H, *Chemical Engineers' Handbook*, 4th Ed 13-17.

**Table 1: Ethanol (1) — Toluene (2)**  
Temperature 34.9°C:  $P_1^\circ = 100\text{mm Hg}$   $P_2^\circ = 47.9\text{ mm Hg}$

$X_1$	$X_2$	g	g	Column (a) TLVm (ideal){ $C_1$ ,ppm { $C_2$ ,ppm	Column (b) TLVm (real){ $C_1$ (b) { $C_2$ (b)	Column (c) TLVm (approx){ $C_1$ (c) { $C_2$ (c)	Column (d) $\frac{C_1 (b)}{C_1 (c)}$	Column (e) $\frac{C_2 (b)}{C_2 (c)}$
0.1	0.9	5.808	1.029	120.4{22.7 {97.7	206.3{118.1 {88.2	206.2{ 11.0 {195.2	10.74	0.45
0.2	0.8	3.685	1.115	144.7{49.6 {95.1	232.5{147.2 { 85.3	216.6{ 24.0 {192.6	6.13	0.44
0.3	0.7	2.557	1.259	173.9{82.1 {91.8	238.4{153.8 { 84.6	229.9{ 40.6 {189.3	3.79	0.45
0.4	0.6	1.915	1.470	210.0{122.2 { 78.8	238.1{153.5 { 84.6	229.9{ 40.6 {189.3	3.79	0.45
0.5	0.5	1.531	1.765	255.4{172.7 { 82.7	238.0{153.5 { 86.7	268.4{ 88.6 {179.8	1.73	0.48
0.6	0.4	1.294	2.166	314.6{238.4 { 76.2	241.9{157.6 { 82.3	301.4{129.6 {171.8	1.22	0.48
0.7	0.3	1.147	2.688	394.8{327.6 { 67.2	254.9{172.1 { 82.8	347.6{187.7 {159.9	0.92	0.52
0.8	0.2	1.060	3.342	509.5{455.0 { 54.5	288.4{286.0 { 70.0	426.8{286.0 {140.8	0.73	0.50
0.9	0.1	1.014	4.399	687.4{652.7 { 34.7	372.0{302.2 { 69.8	577.1{473.2 {103.9	0.64	0.67

TLV: Ethyl Alcohol 1000ppm 1900 mg/m<sup>3</sup>, Toluene 100ppm 375 mg/m<sup>3</sup> MWT Ethanol = 46g/mol, Toluene = 92g/mol  
Reference: Handbook of Chemistry and Physics

**Table 2: Benzene (1) — Ethanol (2)**

Temperature 74°C: P<sub>1</sub><sup>o</sup> = 635mm Hg P<sub>2</sub><sup>o</sup> = 64.5 mm Hg

X <sub>1</sub>	X <sub>2</sub>	1	2	Column (a) TLVm(ideal){C <sub>1</sub> ppm {C <sub>2</sub> ppm	Column (b) TLVm (real){C <sub>1</sub> (b) C <sub>2</sub> (b)	Column (c) TLV (approx){C <sub>1</sub> (c) {C <sub>2</sub> (c)	Column (d) $\frac{C_1(b)}{C_1(c)}$	Column (e) $\frac{C_2(b)}{C_2(c)}$
0.05	0.9	5.43	1.00	170.10 { 8.38 {161.72	43.98 { 9.66 {34.32	159.01 { 8.51 {150.5	1.14	0.23
0.0	0.90	3.93	1.06	92.90 { 9.16 {83.74	33.82 { 9.76 {24.06	86.33 { 9.23 {77.10	1.06	0.31
0.30	0.70	2.14	1.15	32.92 { 9.77 {23.15	22.45 { 9.87 {12.58	31.11 { 9.81 {21.30	0.72	0.60
0.50	0.50	1.58	1.43	19.95 { 9.91 {10.05	19.09 {9.91 {9.11	19.09 {9.91 {9.18	1.00	0.99
0.70	0.30	1.15	2.23	14.29 {9.96 {4.33	18.29 {9.92 {8.37	13.88 {9.95 {3.93	1.32	2.13
0.90	0.10	1.08	4.92	11.12 {9.99 {1.13	15.06 {9.95 {5.11	11.01 {10.00 { 1.01	1.00	5.06
0.95	0.05	1.00	5.65	10.53 {9.99 {0.54	12.99 {9.97 {3.02	10.49 {10.00 {0.49	1.00	6.16

TLV: Benzene 10ppm (30 mg/m<sup>3</sup>) Ethanol 1000ppm (1900 mg/m<sup>3</sup>)

MWT: Benzene = 78g/mol Ethanol = 46g/mol;

Reference: Novak and Vasec (1966)

**Table 3: Carbon Tetrachloride (1) — Benzene (2)**

Temperature 70°C: P<sub>1</sub><sup>o</sup> = 613.8mm Hg P<sub>2</sub><sup>o</sup> = 54.8:2 mm Hg

X <sub>1</sub>	X <sub>2</sub>	1	2	Column (a) TLVm (ideal){C <sub>1</sub> ppm {C <sub>2</sub> ppm	Column (b) TLVm (real){C <sub>1</sub> (b) {C <sub>2</sub> (b)	Column (c) TLV (approx){C <sub>1</sub> (c) {C <sub>2</sub> (c)	Column (d) $\frac{C_1(b)}{C_1(c)}$	Column (e) $\frac{C_2(b)}{C_2(c)}$
0.05	0.95	1.112	1.000	9.47 {0.53 {8.94	9.42{0.58 {8.84	9.53 {0.47 {9.06	1.23	0.98
0.10	0.90	1.099	1.001	9.00 {1.00 {8.00	8.93{1.07 {7.86	9.10 {0.9 {8.2	1.19	0.96
0.30	0.70	1.055	1.011	7.55 {2.45 {5.10	7.50{2.50 {5.00	7.71 {2.29 {5.42	1.09	0.92
0.50	0.50	1.027	1.030	6.54 {3.45 {3.09	6.55{3.45 {3.36	6.68 {3.32 {3.36	1.04	0.92
0.70	0.30	1.009	1.057	5.80 {4.19 {1.61	5.84{4.17 {1.67	5.89 {4.11 {0.53	1.01	0.94
0.90	0.10	1.001	1.091	5.24 {4.77 {0.47	5.26{4.74 {0.52	5.27 {4.74 {0.53	1.00	.00

TLV: Carbon Tetrachloride 5ppm (30mg/m<sup>3</sup>) A. 2. Benzene 10ppm (30mg/m<sup>3</sup>) A. 2.

Activity coefficient calculated using Van-Laar equations with A<sub>12</sub> = 0.052 and A<sub>21</sub> = 0.0461

$$\text{Log } \gamma_1 = \frac{A_{12}}{\left( \frac{A_{12} X_1}{1 + A_{21} X_2} \right)^2} \quad \text{Log } \gamma_2 = \frac{A_{21}}{\left( \frac{A_{21} X_2}{1 + A_{12} X_1} \right)^2}$$

# NZIC COUNCIL NEWS

## ANNUAL GENERAL MEETING

Notice is given that the AGM will be held on Wednesday 17 August, 1994 at 7:00pm in the Chemistry Department Seminar Room, University of Canterbury.

The AGM will be immediately prior to the Canterbury Branch August Meeting.

A. A. Turner  
Honorary General Secretary  
for NZIC Council

## A CAREER IN CHEMISTRY: BROCHURES

There has been a need to update the brochure dealing with "Careers in Chemistry". This is currently being undertaken for Council by Manawatu Branch, utilising their local resources including DRI, Massey University, Manawatu Polytechnic, HortResearch and others.

The plan at this stage is to produce a four colour A5 size brochure folded down from A2 size glossy quality paper. When folded out, it will reveal information on chemistry careers and educational requirements and the back can be used as a poster - it shows chemistry as the central science. The information should not date too quickly and hopefully will last at least five years.

It is intended that the brochure will be disseminated from NZIC Branches, University Chemistry Departments, Polytechnic Chemistry Departments, Career Advisers, etc. A small quantity will be sent to every secondary school.

The NZIC wants to distribute the brochure free of charge but would welcome sponsorship, which would be highlighted and acknowledged.

## THE ROYAL SOCIETY OF CHEMISTRY AUSTRALASIAN LECTURESHIP

Both Australia and New Zealand receive a subvention from the Royal Society of Chemistry (UK), the amount being based on the number of financial members of the RSC in each country.

Since 1960 some of the Australian money has been spent annually on an RSC Lectureship, held by an Australian chemist who delivers a research lecture in most of the chemical centres throughout Australia.

After discussion between NZ and Australian RSC corresponding members it was agreed last year to extend this concept to an Australasian Lectureship, with NZ selecting a lecturer every fourth year. RSC funds in each country support the internal expenses of the lecturer in that country, and the country nominating the lecturer provides the trans-Tasman airfare.

## APPENDIX

Let  $C_1, C_2, \dots$  be the concentrations of each component in the vapour phase (ppm) and  $T_1, T_2, \dots$  be the TLVs of the concentrations of each component in the vapour phase (ppm)

Then at the TLV of the mixture

$$\frac{C_1}{T_1} + \frac{C_2}{T_2} + \dots = 1 \quad (i)$$

and  $C_1 + C_2 + \dots = T$  (assuming additive affects)

$$\text{Therefore } \frac{C_1}{T} + \frac{C_2}{T} + \dots = 1 \quad (ii)$$

Combining equations (i) and (ii)

$$\frac{C_1}{T_1} + \frac{C_2}{T_2} + \dots = \frac{C_1}{T} + \frac{C_2}{T} + \dots \quad (iii)$$

From Raoult's Law (iv)

$P_i = X_i P_i^0$   
where  $X_i$  = mole fraction of the  $i^{\text{th}}$  component in the liquid  
 $P_i^0$  = VP of the  $i^{\text{th}}$  component  
 $P_i$  = partial pressure of the  $i^{\text{th}}$  component

$$\text{and } C_i = (\text{Constant}) P_i \quad (v)$$

Where  $C_i$  = Concentration of the  $i^{\text{th}}$  component in vapour  
 $P_i$  = partial pressure of the  $i^{\text{th}}$  component in vapour

Combining equations (iv) and (v)

$$C_i = \text{Constant } X_i P_i^0 \\ = a X_i P_i^0$$

Equation (iii) becomes

$$\frac{a X_1 P_1^0}{T_1} + \frac{a X_2 P_2^0}{T_2} + \dots = \frac{a X_1 P_1^0}{T} + \frac{a X_2 P_2^0}{T} + \dots$$

Rearranging

$$T = \frac{X_1 P_1^0 + X_2 P_2^0 + \dots}{\frac{X_1 P_1^0}{T_1} + \frac{X_2 P_2^0}{T_2} + \dots}$$

$$\text{thus } T = \frac{\sum X_i P_i^0}{\sum \frac{X_i P_i^0}{T_i}} \quad \text{ideal behaviour}$$

$$T = \frac{\sum \gamma_i X_i P_i^0}{\sum \frac{\gamma_i X_i P_i^0}{T_i}} \quad \text{non-ideal behaviour}$$

Where  $\gamma_i$  = activity co-efficient of the  $i^{\text{th}}$  component

## Inorganic and Organometallic Specialist Group News

Professor Ian Dance of the University of New South Wales was the inaugural Australasian Lecturer, giving his lectures in Australia in 1993 and in NZ in April 1994. His lecture in NZ, delivered in all six centres, was on "New Big Elementary Molecules". In addition he gave further lectures in the Chemistry Departments of Auckland, Victoria and Otago Universities.

The amount of money that NZ can put into this scheme is only \$1000 annually. Thus if the lecturer is to visit all six NZIC branches (and the six corresponding universities), "home-hospitality" is going to be essential, as accommodation cost is a major item. Further, "home hospitality" is much more pleasant for the lecturer.

### ROYAL SOCIETY OF CHEMISTRY LECTURES

1981	A. Beckwith (ANU) - Organic Chemistry
1982	P. Fensham (Monash) - Chemical Education
1983	A. Sargeson, F.R.S (ANU) - Inorganic Chemistry
1984	D. W. Cameron (Melbourne) - Organic Chemistry
1985	J. H. O'Donnell (Queensland) - Polymer Science
1986	M. I. Bruce (Adelaide) - Organometallic Chemistry
1987	L. N. Mander (ANU) - Organic Chemistry
1988	A. F. Reid (CSIRO, Inst. Minerals, Energy and Construction) - Applied Chemistry
1989	A. M. Bond (La Trobe) - Inorganic/Analytical
1990	D. St. C. Black (NSW) - Organic
1991/2	D.H. Napper (Sydney) - Physical
1993	I. G. Dance (NSW) - Inorganic

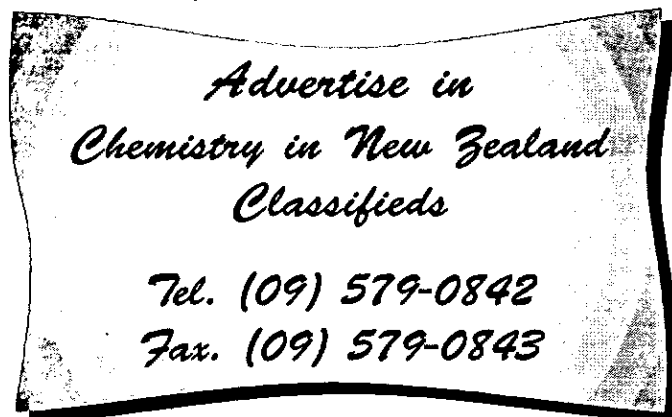
### CALL FOR NOMINATIONS FOR THE 1995 LECTURESHIP

New Zealand is to select the 1995 lecturer. The selection panel will be the three corresponding RSC members in NZ, currently Professor Leon Phillips, Professor Robin Ferrier and Associate-Professor John Packer.

We now invite nominations for this research lectureship. The Australians have made some effort to spread the lectureship around the various chemical disciplines, but it will be carteblanche on this inaugural occasion. Nominations should come from two people with the nominee's approval, a *brief* CV of the nominee and short statement on the research area.

Nominations should be sent to: Dr J E Packer, Chemistry Department, The University of Auckland, Private Bag 92019, Auckland, by the 28th October 1994.

J E Packer  
RSC Local Member for NZ



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### WELLINGTON

**Dr Gary Burns** is currently in France on sabbatical leave. Upon his return to Wellington he will take up the role of Assistant Vice-Chancellor (Academic). One of Gary's students, Susan Collier, has recently completed her Ph.D. degree. She is currently seeking employment.

**Neil Curtis** has been invited to attend and present a talk during the "The Golden Oldies" seminar at the Inorganic meeting in Perth. Other members of the Inorganic Group at Victoria would like to be present at this occasion but are afraid they might also be regarded as part of the Golden Oldies brigade!

**David Weatherburn** is beginning to look forward to the time when he is no longer Chairperson and he can get back and do some real work (only 15 months to go). The review of the department, which was conducted in November last year, has made a number of positive recommendations. A major item is a new building and we await with baited breath the University's attitude to that particular recommendation. Members of the department found the review process quite stressful. Sally Davenport commented that she went into her interview with the Review Panel a lot more confident than when she came out. However, the general opinion is that the process was worthwhile and we are working hard to implement the recommendations.

The students in the department are looking forward to organising and taking part in a joint meeting with the students from Massey to be held later in the year. A good time is promised for all participants.

**Dr Cyril Childs**, formerly of Landcare, has accepted an Honorary Research Fellowship within the department. Cyril decided not to move to Hamilton or Palmerston North when Landcare moved from Taita and those cities loss is the department's gain.

### CANTERBURY

We congratulate Ward Robinson on being appointed to a personal chair in Chemistry at the University of Canterbury. This reflects Ward's standing in the international community of crystallographers and his contribution to making the X-ray Unit one of the most efficient in the Southern Hemisphere.

We also congratulate Drs Owen Curnow and Richard Hartshorn on their appointments as lecturers in the Chemistry Department. Owen is a graduate of Waikato University and the University of Michigan and commenced his duties in January. His interest are in the area of organometallic chemistry. Richard is a graduate of this department, and of Melbourne. He expects to arrive in December and brings with him an interest in bio-organic chemistry.

You will also be pleased to know that Emeritus Professor Cuth Wilkins continues to have regular office hours in the department and continues a long standing interest in West Coast mineral phases together with active x-ray collaboration with Ward Robinson.

Jack Fergusson (retired 1993) also maintains his office with part-time teaching contracts. In February this year he conducted a two week pre-CHEM 101 class for about 20 students who recognised their need to upgrade their chemistry skills.

We are also pleased to have in the Department David Paterson, a visiting teacher from Shirley Boy's High School. David is a foundation recipient of the New Zealand Science and Technology Teacher Fellowship Award. David is making a significant contribution to our first year teaching and writing a resource module (natural products) for levels 7 and 8 in Science in the National Curriculum.

Vickie McKee and Jan Wikaira send their best regards to you all, from Belfast, Alison Downard is on leave in Melbourne, and other personal notes follow.

**Kip Powell**, jointly with L.D. Pettit and Academic Software has published the new IUPAC Stability Constants Database. This PC system, which contains solution equilibrium data for over 27,000 metal-ligand combinations, covers the literature from 1974 to 1989. It has extremely powerful search routines so could, for example, quickly find all the data for Ni<sup>2+</sup>-polypeptide systems measured at 37°C where the peptide contains a tyrosine residue. Kip continues to convene IUPAC's Stability Constants subcommittee which is currently working on entry of all the data from the 3 book volumes (pre 1974) and extending coverage to 1993. He has also accepted the position of secretary of IUPAC Commission V6 (solution equilibria).

Kip agreed to forgo his summer vacation when invited to join the Cawthron Institute's field programme in Antarctica. With Carl Hulse he was involved in what they coined "environmental archaeology". Historic point sources of contamination abandoned at a land based runway construction site in 1959 are being used to monitor the movement of heavy metal pollutants in Antarctic soils. The programme contributes to the general assessment of the environmental impact of human activities in Antarctica. Soil characterisation is being done at Cawthron and trace metal analyses will be done at Canterbury's Class 100 clean room facility.

**Peter Steel** won the 1993 New Zealand Association of Scientists research medal. He gave a lecture at the NZIC Conference in Auckland entitled: Useful New Alternatives to 2,2'-Bipyridine. He is coordinator of first year studies at Canterbury and has five research students synthesising new heterocyclic ligands and studying their coordination chemistry.

**Owen Curnow** has now joined our Inorganic staff. Owen started his academic world tour at Waikato where he studied Sn-Co clusters for his M.Sc. thesis with Brian Nicholson. He then went to the University of Michigan, Ann Arbor, for his Ph.D. working with M. David Curtis on a Co/Mo/S cluster as a model for the industrial hydrodesulfurisation (HDS) catalysts. The cluster is able to clearly desulfurize thiophene, thiols and a number of other sulfur containing organic compounds. A successful postdoctoral year at Dartmouth College with Russell Hughes produced a tetrafluoroethylene complex with a metallocyclopropane structure (Cp\*Ru(LX)(C<sub>2</sub>F<sub>4</sub>)) and a low barrier to propellor rotation, as well as the long sought after first perfluorocyclopentadienyl complex, RuCp\*(C<sub>5</sub>F<sub>5</sub>). A year

at the Universität Heidelberg with Professor Dr Gottfried Huttner gave the first group 13 indene complex, [InBr{Cr(CO)<sub>5</sub>}<sub>2</sub>]<sup>2-</sup>, and the opportunity to begin work on his own line of research.

Owen has two students to get his research rolling; Sam Smail will work with multi-cyclopentadienyl and -phosphine ligands while Shane Telfer will start off a project on 3-phosphinocyclopropene ligands.

**Ward Robinson** has had an active year. Last August he was the New Zealand delegate to the 16th Congress and General Assemble of the International Union of Crystallography in Beijing, China. At the Congress he was elected President of the Asian Crystallographic Association and also Secretary of the Teaching Commission of the International Union of Crystallography.

After the Congress he, and graduate student Mark Neiuwenhuyzen, visited Jilin University in Changchun to further long-standing teaching and research collaborations.

Last December and January he travelled extensively in India lecturing at a regional IUCr meeting and the National Crystallographic seminar in Madras. This was followed by teaching about chemical structure and X-ray diffraction at four universities, three institutes of science and technology and the Babu Atomic Research Centre. Lectures were also given in Kuala Lumpur and first steps taken to organise a conference of the 17 Asian Crystallographic Association countries late next year.

He was promoted to Professor in his absence and has just been absent again at the 18th meeting of the Society of Crystallographers in Australia.

During early 1993 his diffractometer underwent a major upgrade and has now settled down to produce one new high quality, low temperature, data set, on average every 36 hours. This is slow compared with data sets now produced in microseconds using synchrotron radiation sources and new area detectors, but will be adequate to service most of the requirements of New Zealand synthetic chemists, who do not have their own facilities, for the next few years.

**Don House** presented a paper (*Hydrolysis kinetics of cisplatin*) at the Auckland NZIC conference in December 1993. He now has our first visiting junior research fellow, Andreas Derwahl (Köln), working with him on the synthesis of binuclear Cr(III) complexes for spectroscopic studies back in Germany. Andreas is working towards a Ph.D. in Köln during his one year stay at Canterbury. It is possible that his supervisor, Professor Fritz Wasgestien, may visit us towards the end of the year.

## OTAGO

### The Robinson/Simpson Group

Brian Robinson returned from a short period of leave with a number of new and interesting ideas and contacts. The composition of the group has been depleted with the departure of Maurus Spescha to a Postdoctoral Fellowship in Canada, however we are still in regular correspondence over forthcoming publications. Meanwhile, back in the lab, Noel Duffy and John McAdam are making significant inroads on

the chemistry of both linked cobalt cluster systems and attempts to make bi-ferrocenylamine analogues of cis-platin. Once loose ends are tied up, Noel will be moving into an investigation of non-linear optical materials. Sarah McManus is poised to write her M.Sc. thesis describing her work with macrocyclic amides based on ferrocene and Debbie Weston enters her second M.Sc. year with some successes in the preparation of water soluble ferrocene/platinum derivatives. This work is now being supported by Johnson Matthey. We had an unexpected visit from Katie Robinson, who pioneered some work on water soluble phosphine derivatives of metal clusters when she was with us four years ago. Having successfully completed a Ph.D. in electrochemistry in London she is now extremely gainfully employed with a London based Merchant Bank; who says chemists aren't versatile? Jim Simpson is currently preparing for a Far East adventure, with lectures in Singapore and an X-ray structure solving workshop at Chulalongkorn University in Bangkok, on the way to the Organometallic meeting in Sussex by the sea. Brian Robinson will be in Perth for IC'94 and in Thailand during August.

### The Hanton Arsinoetheriums

Harrison Sikanyika has his postdoctoral fellowship extended until December. He has completed the synthesis of a series of isotopic ditopic thioethers. Harrison has been doing so much chromatography that he has his own drum of pet ether. He is currently investigating the metal chemistry of his new thioether ligands. He and Joyce have a new addition to their family, a little girl Nkumbu, born in early January.

Roger Edie has just submitted his MSc Thesis and is now puzzling over beakers containing crystals but now illegible labels.

David McMorran, in association with the Buckingham group, is investigating the kinetics of ligand exchange in a series of bidentate and tridentate nickel arsine systems. Early results show the system displays zero order kinetics. He has also been investigating the fluxional process of a series of Ni, Pd and Pt arsine systems. Recently David and Angela were married, with most of the group able to attend the wedding.

Michelle Leus, an M.Sc. student, has joined the group to continue the work initiated by Fiona Roxburgh who has returned to her undergraduate laboratory responsibilities. Michelle is keen to investigate the interaction of flexible thioethers with gold.

Penny Kneebone, a fourth year student, has amalgamated Lyall's interests in arsenic and sulfur by producing a new tridentate ligand which contains both elements, but its complexes are refusing to crystallize.

Lyall is attending the IC94 conference in Perth. He will be presenting work on Cu(I) dithioether complexes, carried out by Roger and Fiona.

### The Brooker Bunch

Our FRST programme, thanks to Rob Kelly's expert hands, has produced some very exciting results, including the preparation of the *first* macrocycle to be derived from 3,6-diformylpyridazine. As an added bonus, this is only the *second* [4+4] Schiff-base macrocycle known. Rob had a major back operation in January and is now "as good as new". He made

good use of this time to reflect on life and recently announced his engagement to Claire Wilson.

Paul Croucher has overcome last year's single crystal growth jinx and produced some breathtaking gems. Armed with the resulting structure determinations he is now moving on to look at the physical and chemical properties of these macrocyclic complexes in detail. He will also be going to IC'94 this year.

Geoff Dunbar has recently begun his Ph.D. research into amide-containing macrocycles and their complexes. He has adjusted remarkably well to life with column chromatography and already has a range of exciting new cyclic and acyclic ligands in pure form.

Two final year honours students, Paul Plieger and Bronagh Carter, complete the team. Paul is looking into the preparation of polynuclear vanadium complexes using his newly acquired Schlenk techniques, whilst Bronagh is exploring unsymmetrical complexes, particularly those involving pyrrole-containing ligands.

Sally has just completed half of her lecture load for the year, and is looking forward to a short breather before beginning lectures to the fourth year class. She is also writing a number of papers and is attending the ICCS in Kyoto, Japan during July.

Simon Oldham (B.Sc. Hons. from the Brooker Bunch in 1993) paid us a flying visit recently. He has now started work in the Dyes and Chemicals Division of Ciba-Geigy, with the prospect of trips to Australia in the near future.

### Allan Blackman and coworkers

The year got off to a slow start with extensive renovations having been made to the 4th floor lab. With these now almost finished, labwork has begun in earnest. Of last year's students, Kay Baxter (BSc (Hons)) has started a job at the Bluff Smelter, while Michelle Leus (BSc (Hons)) has started an MSc with Lyall Hanton. Both Peter McCallum and Helen Matthews have returned to complete the second year of their MSc degree. Two 4th year honours students make up the group this year; Nick Young is investigating metal-catalyzed hydrolysis reactions of simple cyclic phosphate esters, while Rachel Fanshawe is looking at reactions of Co(III) complexes containing an asymmetric tetradentate ligand. Her progress however is being hindered by a fractured arm sustained on a lab biking expedition! We have thus resorted to safer indoor pursuits such as numerous visits to the staff club.

### MASSEY

Two new staff have joined us recently. They are Dr Geoff Jameson and Dr Tony Burrell. **Geoff Jameson** comes to us from Georgetown University, Washington, DC, where he was an Associate Professor in Chemistry. However, Geoff is a New Zealander having obtained B.Sc. (Hons.) and Ph.D. degrees from the University of Canterbury. Furthermore he spent a period on sabbatical leave here in 1990 working with the protein structure group. Geoff's Ph.D. under the supervision of Ward Robinson and Gordon Rodley, was concerned with the structure of dioxygen carrying transition metal complexes, in particular those involving iron which are good models for haemoglobin. In fact Geoff was involved with the structural work on the very important iron 'picket fence' porphyrin complexes. Geoff's interest in bioinorganic chemistry was followed with postdoctoral fellowships at Northwestern University and at the

University of Zürich. He took up a faculty position at Georgetown in 1982. Geoff now plans to extend his expertise in crystallography by working further on metalloproteins. His teaching commitments will be in the chemistry section of the department. Geoff is accompanied by his wife Beth (an accountant) and their three children (Kimberley, Heather and Andrew) plus a dog.

**Tony Burrell**, lecturer in inorganic chemistry, is a graduate of the University of Auckland. His M.Sc. supervisor was Peter Boyd and his PhD. supervisor was Warren Roper. In his PhD. he synthesized and characterised the first  $d^8$  trifluoromethyl- and difluorocarbene complexes of rhodium and iridium. He spent a period at the University of Texas with Jon Sessler on a variety of projects including porphyrin mediated electro transfer reactions. His second postdoctoral fellowship was at Los Alamos National Laboratory investigating technetium chemistry. One of his collaborators there was F A Cotton (the co-author of a very well-known textbook). Tony's wife Margaret is now a teacher at Freyberg High School.

**Andrew Brodie** will be attending IC'94 in Perth in July and also plans to visit the University of New South Wales and the University of Wollongong.

**Eric Ainscough** travels to Italy for EURBIC II in Florence in August. He will also be visiting universities in London.

**Ted Baker** in attending a Protein Crystallography Workshop in Sicily in May.

Two new masterate students have started inorganic projects this year. They are **Andrew Steedman** (with Tony Burrell) and **Andrew Lowe** (with Andrew Brodie and Eric Ainscough).

#### NZIC: Inorganic and Organometallic Specialist Group Meeting

Tuesday January 31 and Wednesday February 1 1995:  
Massey University

This promises to be a great event. Some overseas inorganic chemists have expressed an interest in coming. Please let Andrew Brodie know of people (especially Australians) who could be persuaded to have a holiday in New Zealand next summer which would include this meeting. Also are there going to be any inorganic chemists visiting your department from overseas at this time?

#### WAIKATO

The organometallic research groups at Waikato are thriving. Warren Grigsby completed his D.Phil. early in the year and is now on a post-doctoral fellowship with Philip Power at Davis, where he managed in the first three weeks to get married (to a New Zealander he took with him!) and to get a traffic ticket for failing to stop at a stop sign on his bicycle. Otherwise he is enjoying California. Janine Cooney has also submitted her doctoral thesis, and is currently working as a part-time tutor in the Chemistry Department, and a part-time research scientist at HortResearch at Ruakura. Mayson Kay has completed his D.Phil., and Michael Young has finished his M.Sc. and is planning a trip to Canada. Warren Tully, Meto Leach, Gary Depree and Greg Olsen are making good progress on their D.Phil.s, while new MSc students Maarten Dinger, Craig Depree and Lea Bonnington have joined finishing MSc student Scott McIndoe in the lab. Ken Mackay is continuing to run the School of Science and Technology as Dean. He and Ann

are planning to attend the XVIth Organometallic Conference at Sussex in July. A 5th Edition of Mackay and Mackay is under preparation with Bill Henderson contributing to it.

Derek Smith is back to normal after a successful period of leave at Leeds last year, and has just completed the latest review of copper chemistry of the next Specialist Periodical Reports issue. Brian Nicholson is still inflicted with the role of Chairperson of Department, but can still remember vaguely what teaching and research involve.

We have just ordered our VG Platform II mass spectrometer, with Electrospray and IPCI sources, with expected delivery about June. We are looking forward to assessing this relatively new type of ionisation for our sort of molecules, and would be interested in running samples for others once we have it up and running.

Derek Smith, Bill Henderson and Brian Nicholson are attending the RACI conference at Perth, and Brian is also going to the Sussex meeting. We have all enjoyed stimulating visits to Waikato from Professors Saito, Schmidbaur, Dance and Douglas Russell, it has been a good year for Inorganic visits.

#### AUCKLAND

The Inorganic section of the Chemistry Department hosted Professor T. Saito as a medium term visitor in March-April this year. Most of you will have met Professor Saito when he visited other Chemistry Departments on a tour south of the Bombay Hills. Other Inorganic Chemists from overseas that have visited the Department this year are Professor H Schmidbaur, Professor I Dance and Dr S D Robinson. We look forward to a visit by Professor Manfred Rigitz in July.

Douglas Russell is the new Professor of Physical Chemistry at Auckland University. Douglas graduated in Natural Science from the University of Cambridge. He returned to Cambridge for 6 years as a Royal Society Research Fellow. He moved to Leicester University in 1979, and took up his post at Auckland in January 1994. Douglas becomes New Zealand's second recent Leicester import, following the trail blazed by Bill Henderson.

Although he is labelled a physical chemist, Douglas' tastes in chemistry range from the more arcane reaches of the theory of spectroscopy, through inorganic and organometallic reaction mechanisms, to the investigation of processes used in the semiconductor industry. His formative years were spent in the highly competitive (and expensive!) area of high resolution spectroscopy, largely of free radicals and other short-lived species in the gas phase. More recently, he has utilized this experience to good effect for organometallic chemistry by investigating the vibration-rotation spectra of a number of species like  $Ni(CO)_4$ ,  $M(CO)_6$  ( $M=Cr, Mo, W$ ),  $CH_3Mn(CO)_5$ ,  $\eta^4-C_4H_6Fe(CO)_3$ ,  $CpMn(CO)_3$  and  $CpCo(CO)_2$ , and  $CF_3Mn(CO)_5$ . This has been achieved by combining the use of tunable solid state IR lasers with the technique of supersonic jet expansion. The structural information obtained in this way is several orders of magnitude greater than that from diffraction techniques, and has allowed the determination of an upper limit to the barrier to internal rotation in several of these molecules.

Not content with using lasers to determine organometallic structures, Douglas has now persuaded them to assist in investigations of reaction pathways. This is done using the technique of IR Laser Powered Homogeneous Pyrolysis (IR

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VCH have released their spring 1994 catalogue of new titles in chemistry and applied science. For more details contact: The Editor, Chemistry in New Zealand.

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The post carries with it clinical duties of 5/10 which in the first instance will be based within the Auckland Hospital Department of Clinical Chemistry.

Candidates must hold a recognised postgraduate qualification in Pathology which includes special training in Chemical Pathology. A research degree would be highly desirable. Candidates are expected to have demonstrated skills in research and to have had experience teaching postgraduate and undergraduate students.

Commencing salary will be established within the range \$67,808 - \$87,588 per annum.

Further information, Conditions of Appointment and Method of Application, should be obtained from the Academic Appointments Office, The University of Auckland, Private Bag 92019, Auckland, telephone 0-9-373 7999 ext 5097, fax 0-9-373 7454. **Three copies** of applications should be forwarded to reach the Registrar by **22 August 1994**.

Please quote Vacancy Number UAC.438 in all correspondence.

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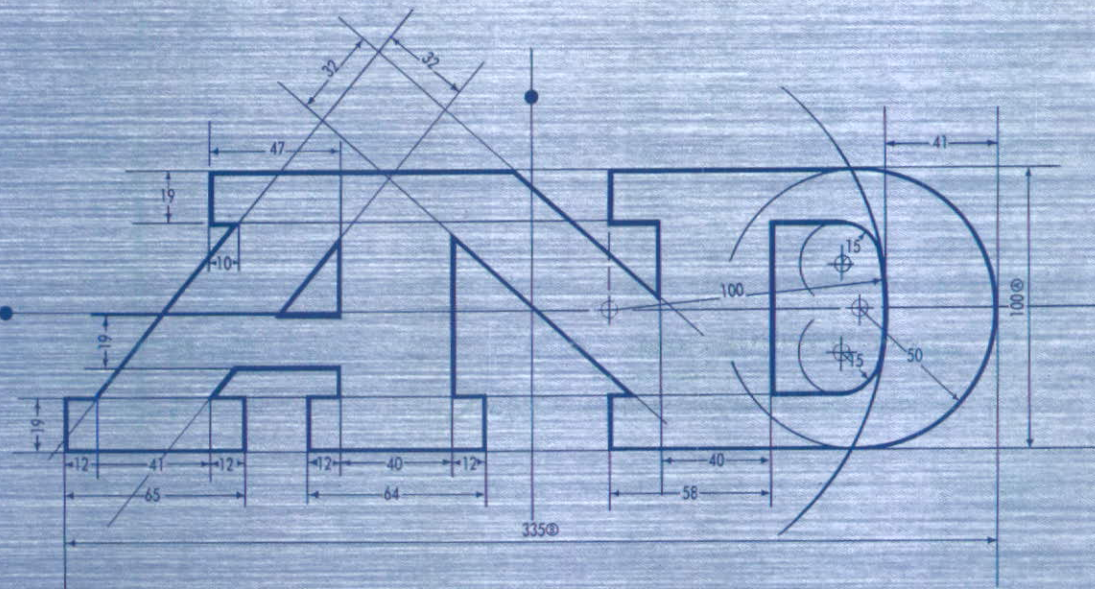
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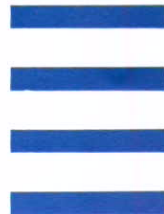
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