NZIC

chemistry
in new zealand

Vol 53 No 2 April 1989

At the Frontier of Technology

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chemistry in new zealand

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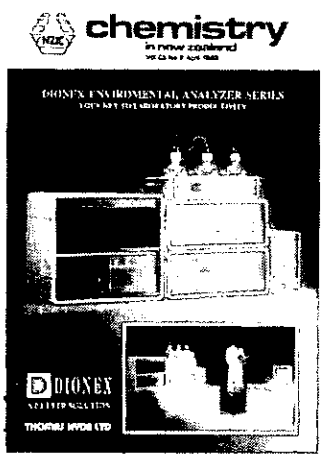
Front Cover Story



Cover Story
An Environmental Analyser System configured to perform HPLC, IC and FIA. Autolon 450 Chromatography Automation System provides data aquisition and analyser control.

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Advertising Features

APRIL:
In this issue we feature information on equipment for chromatography - GC, HPLC, SFC - and our cover story gives you the latest in IC. Suppliers of consumables for chromatography are also included.

JUNE:
The features products will be spectroscopy, in all its various forms - AA, UV-Vis, IR, FIIR, etc.

EDITORIAL

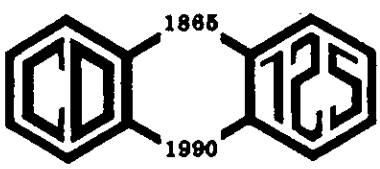
The farewell editorial by Bruce Graham mentioned in the last issue has not been written. Instead he has been, from his viewpoint, far more gainfully occupied in persuading a new editor to accept the position. Having achieved this objective he can only be commended for the thoroughness with which he has then briefed the new incumbent for his first attempt at producing your journal.

Bruce is still uncertain about what he is going to do with all the released cupboard space in his office and the hours of free weekend time during which he will be deprived of editorial activities. Well done Bruce for your five years of successful editorship.

This issue features a part of our profession, namely accurate and reliable analysis, which is well accepted by the public at large but not neccessarily understood. The results of an analysis after they have been published can be used for just about any purpose by anybody, qualified or unqualified. The dilema of a professional analyst is that one can never be sure when an apparently simple matter can become controversial.

One must wonder why it has taken so many years for the managerial disciplines, set out in the NZS5600 series of standards, either to be written or to become accepted as an essential part of the practice of chemistry, especially analytical chemistry. Laboratores practicing Quality Assurance are less likely to be drawn in to controversy than those who do not. In todays climate of instant news media judgement the release of information based on inadequate or incomplete work is inexcusable.

Ron Hall



Chemistry Division

WANTED:

Past staff of Chemistry Division D.S.I.R.

In 1990 Chemistry Division celebrates its 125th anniversary. We have begun collecting together information about past staff and tracing photographs, etc. But there are a lot of gaps. If you, or a member of your family have been employed by Chemistry Division (at any of the branches) in the last 125 years, please contact us.

1990 Celebrations Committee
Chemistry Division
D.S.I.R.
Private Bag
Petone

1989 NZIC/NZBS CONFERENCE

22-24 August, University of Waikato, Hamilton

Details of the programme are now being finalised for this year's combined NZIC/NZBS annual conference, the theme of which is to be "Chemistry in New Zealand".

Included among the invited plenary lecturers are Professor Graham Johnson, the RACI/NZIC visiting lecturer from Sydney University, whose interests lie in the pharmacological field; Professor Warren Roper, Auckland University (RSC Centenary Lecturer), who is well known for his research in the organo-metallic chemistry area; Dr Sylvia Rumball, Massey University, who is a member of a world-leading research team looking at the structures of the iron-binding protein lactoferrin, which has possibilities for being used as a means to control metal levels in the body; and professor Howard Reiss, UCLA, whose research interests include surface science, polymers and gas phase nucleation. Professor Reiss will be spending time with Robin Speedy at Victoria University during his New Zealand visit.

A number of symposia are being organised.

Industrial Chemistry Symposium

This symposium will probably be held on Wedensday 23 August, with Mr David Frow, General Manager-Production, Electricorp, and Dr Bob Buckley, Physics and Engineering Laboratory, Lower Hutt, as plenary speakers. Mr Frow will be talking about current energy trends and their association with chemistry, while Dr Buckley will be describing the work being undertaken by the joint DSIR/Electricorp project team, which is developing electrical superconductors. Several other people have also been invited to speak on related topics.

Education Symposium

A one-day symposium is being organised by the NZIC Chemical Education Group on the topic "NZ School Chemistry in a Time of Change", and is to be held on Wednesday 23 August. The invited speakers include Ann Hume (Hamilton Girls High School), Pauline Waiti (Te Timatanga Hou, University of Waikato), John Packer (Subject Convenor in Chemistry), Brendan Schollum (Auckland College of Education), Ian Torrie (President NZSTA) and Malcolm Carr (Director, Centre for Science and Mathematics Education Research).

The topics to be addressed will include curriculum matters; international assessment of laboratory work; grade related criteria; professional development of teachers; classroom-based action research; and bicultural science.

Both lecture and poster sessions are being organised. All enquiries should be addressed to Dr Malcolm Carr, Chemistry Department, University of Waikato, P.B., Hamilton.

Plant Cell Wall Biochemistry Symposium

No definite information is available yet concerning the plenary speakers for this symposium. Details of the programme will be included in the next issue of the journal. This symposium is being organised by Dr Peter Molan, Biochemistry Department, University of Waikato, P.B., Hamilton, who would be very pleased to hear from any potential participants.

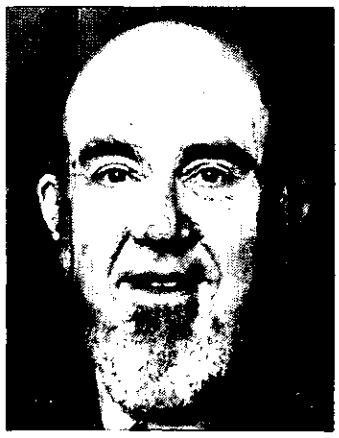
Post-Conference Chromatography Workshop/Symposium

The NZIC Chromatography Group is planning to hold a two-day workshop/symposium on "Data Handling and Chromatography" on Friday 25 and Saturday 26 August. Details have yet to be finalised, but it will probably be held at Waikato Polytechnic, with bed and breakfast accommodation at the University of Waikato on the Friday night. Chromatography Specialist Group sessions at the conference will be held on Thursday 24 August, to provide continuity with the workshop.

Registration and accommodation for the workshop/symposium will be treated entirely separately from the conference. For NZIC/NZBS members who are conference registrants, the registration fee for the workshop will be minimal. Anyone interested in attending the Post-Conference Chromatography Workshop/Symposium should contact Dr Peter Robinson, Waikato Polytechnic, Tristram Street, P.B., Hamilton, as soon as possible to be kept in touch with developments.

Continued next page

PEOPLE



FRS For Warren Roper

Professor Warren Roper of Auckland University has been elected a fellow of the Royal Society, one of the world's oldest and most prestigious scientific bodies.

He is one of only four living New Zealanders to be so honoured.

Professor Roper, who holds a chair in chemistry, is a world leader in the field of organometallic chemistry. In his research he aims to increase understanding of how compounds containing metals catalyse useful chemical transformations, such as the conversion of simple petroleum products into valuable polymers and even pharmaceuticals.

He does this by seeking to isolate intermediates and to model individual steps in these transformations. His research group has been extremely successful in this endeavour and many of the first examples of new types of molecules have been assembled in his laboratory.

Professor Roper describes his research as basic and fundamental rather than applied. "I am motivated by curiosity as to the way elements combine and can be put together as compounds."

Such work is an essential first step to developing chemicals for industrial use. To that extent his research, while conducted on a highly theoretical level of understanding, is relevant to the everyday world, says Professor Roper.

He has published more than 100 papers and spoken at numerous overseas conferences and universities.

Born in Nelson he graduated MSc and PhD from Canterbury University. After post-doctoral research at the University of North Carolina he came to Auckland University in 1966 as a lecturer, being promoted to senior lecturer in 1969 and associate-professor in 1974.

In 1984 he was appointed to a personal chair in chemistry as a tribute to his international standing as a scholar. This was later converted into an established chair. He was the first New Zealander to receive an award of the Royal Society of Chemistry, the senior chemistry body in Britain and the Commonwealth. The Royal Society of London for the Promotion of Natural Knowledge, to use its full name, was founded in 1660. Past fellows include such illustrious figures as Wren, Newton, Banks, Darwin, Huxley and Rutherford.

He is "absolutely delighted" to have gained this distinction, not just for himself but for New Zealand.

"We are a small country, serious research is extremely expensive and our scientists can't expect to be looked after as well as they are in more prosperous countries. Many physical sciences are clearly not well supported and this can create a feeling of depression, but that doesn't mean we can't succeed. How much better might we do if we were properly supported."

YOUR NEW EDITOR RON HALL

Mr R B Hall has been appointed as the editor of "Chemistry in New Zealand" commencing with this issue. He has recently retired from the position of Managing Director of NZFP Technology Limited. During his 35 years in the Pulp and Paper and other industries based on forest resources he has held a number of technical and managerial positions in NZ Forest Products Limited (now Elders Resources NZFP Ltd)

Ron Hall graduated MSc from Victoria in 1952 and in mid career completed a Dip BIA diploma in Auckland. The several forest based industries that Mr Hall has been both technically and managerially involved in provides a very wide range of challenging problems for practicing chemists. As a consequence his technical interests are broadly based including wood, paper and panel product chemistry, by-products, environental matters, technical and managerial training of staff, safety, including accident prevention and fire control and the broader issues of the management of Research and Development. For the six years prior to his retirement he was a member of the Executive of Appita, the Australian and New Zealand Pulp and Paper Industry Technical Association.

BETTY WIGNALL RETIRES

Mrs N. E. Wignall has retired as Administrative Secretary of the Institute. The position was created in 1974 during a period of rapid growth of the Institute. It had become apparent that an Honorary general Secretary and part-time Registrar could no longer cope efficiently with the Institute's clerical work and Council took this small but important step towards a full-time professional secretariat. Despite further considerable growth in membership and activities Betty continued as a half-time employee for the next 15 years. Her salary ofcourse advanced with the cost of living but she was given no more official hours. This elastic-sided capacity to absorb extra work characterised Betty's service to the Institute and came rather to be taken for granted. Efficient work always tends to disguise the amount of sheer hard slog that has gone into producing it and so it was with Betty. Officers of the Institute showed surprisingly little appreciation at times of the complexity and sophistication of the membership record system or that Better and Robert Maclogan had between them created a bench mark system of computerised membership records. (Significantly IP-ENZ chose to adapt the NZIC system for their memberhsip records.)

Betty has a degree in home science and worked as a chemist in the Food Section of the then Dominion Laboratory in its Sydney Street days so she came to the job with an interest in things chemical. She certainly showed high personal interest in and loyalty to NZIC and did much for the Institute over and above the calls of duty.

The Institute is grateful to Betty for her hard work, loyalty, and friendliness and for helping to develop the administration of the Institute a further stage towards a fully professional secretariat. We know that through her daughter Anne, chemistry teacher and member, Betty will keep informed about the Institute and watch its development with interest. We wish her well in her retirement.

NZIC/NZBS Conference Cont.

Easterfield Address

Dr Gordon Rewcastle, a Senior Research Fellow in the Cancer Research Laboratory at the Auckland Medical School, will present the Easterfield Address at the conference. Since taking up his present position with the Cancer Society in 1980, Dr Rewcastle has concentrated on the development of general synthetic methods for the production of several classes of new antitumour drugs. The 1988 winner of the Easterfield Award, he will give details of his past and present research interests when presenting this address.

Specialist Group Sessions

There will be the usual specialist group sessions in the various branches of chemistry, with review lectures and short research papers, as well as a substantial proportion of poster presentations. The organisers of the specialist group sessions were listed in the February issue of the journal. Institute and Society members are strongly urged to contribute to these sessions.

Student Participation

Students are particularly encouraged to attend the conference. Their registration fee is being kept low and an advantageous package, including accommodation, is being made available. Competitions for the best student paper and best student poster will be held.

Other Activities

The NZIC Annual general Meeting will be included within the conference programme, together with Specialist Group AGMs.

A Trades Display is being organised so that members can be brought up to date as far as new or improved products and services are concerned.

Various social events are being planned, including mixers, local visits and a Conference Dinner.

It has been apparent that Institute and Society members attending previous NZIC/NZBS conferences in Hamilton have had a good time, both scientifically and socially, so make sure you do not miss out this year. See you there.

COUNCIL NEWS

The February Council meeting was presided over by Dr Don Llewellyn in Wellington on 21 and 22 February 1989. Drs P R Poole (Waikato Delegate) and C N Trotman (Otago Delegate) and Messrs D P Karl (Registrar and Acting Treasurer) and A A Turner (General Secretary) were welcomed as new members of Council.

This meeting was held in the Council rooms of the Instituiton of Professional Engineers New Zealand Inc (IPENZ) in Molesworth House, 101 Molesworth Street, Wellington. NZIC and IPENZ have just signed a three year agreement whereby IPENZ hosts the Permanent Secretariat for NZIC. It is an arms length business arrangement and the integrity of each of the Institutes. is preserved.

An Executive Officer has yet to be pointed by Council but in the interim the General Secretary will act in this capacity on a temporary basis.

It is the intention of Council that all activities of the Institute will be centred on the Secretariat in Wellington. All Membership records will be transferred from Christchurch, and the day to day upgrading of our records will be carried out by the Executive Officer.

One consequence of this is that the Registrar's activities with respect to Membership and subscription details will be phased out and financial matters including budgeting and planning will become the responsibility of the Honorary Treasurer. This will be an elected posiiton, along with other elected officers of the Institute. Mr D P Karl is currently Registrar, but currently also acts as Acting Treasurer. Removal of the workload associated with Membership will allow our Acting Treasurer to concentrate on the financial budgeting and planning which will be vital for the Institute in the years ahead.

ELECTION OF OFFICERS OF THE INSTITUTE

Council is currently made up of 4 elected officers and six Branch Delegates. They manage the Institute on your behalf!

In order to ensure that the elected officers are of the highest possible calibre and quality. Council wishes to draw the attention of all members to the rules for election of officers.

Rule 16.2 - States

"The President, Vice Presidents and General Secretary shall be elected annually from nominations made by Branches. OR BY ANY SIX CORPORATE MEMBERS, and forwarded to the General Secretary by June 30".

So think about it and act - it is your Institute!

JOURNAL EDITOR

This issue of the Journal will introduce a new Editor for the Journal. It is with sincere appreciation that the Council records their thanks for the services of Dr Bruce Graham, who has been Editor for some five years. We welcome Mr Ron Hall as the new Editor.

GRADES OF MEMBERSHIP

Council has now approved a change in the Rules which introduces amalgamation of all non-corporate grades into one "Associate" level. This means that the non-corporate grades of Graduate, Technician and Associate will now be merged.

NATIONAL CHEMISTRY DAY

This is schedules for 30 June 1989. Dr Waters, 1st Vice President and Co-ordinator advised that the theme is "Chemistry, Serving the Community". Local Branch publicity is well advanced.

NZIC ANNUAL CONFERENCES

Annual conferences are planned through to 1991. Main details are:-

1989 Waikato Branch - August 22-24, Hamilton

1990 Wellington Branch in conjunction with Chemistry Division of DSIR who will be celebrating their 125th year. Additionally, of course, it is the 150 year celebration for New Zealand, so we can expect to see and hear some world renowned chemists.

1991 Canterbury Branch - This year will be the Diamond Jubilee of the Institute which again is a tangible milestone in our activities.

Mention should be made of the very successful 1988 Combined NZIC/NZBS Annual Conference held in Palmerston North. It was also a financial success and acting on recommendations from the Manawatu Branch Conference Committee, Council has set aside $5000 to act as a loan for future conference committees to underwrite the cost of inviting overseas speakers. A large donation is also to be made to the Chemical Education Trust.

INTERNATIONAL CONFERENCES

There are several international conferences this year and the Institute will be officially represented at the following - National Chemist Societies, Lund, Sweden in August (Dr Arthur Campbell); FACS 3rd Asian Chemical Conference, Brisbane in August (Dr Steve de Mora); Pacifichem Congress, Honolulu in December (Drs Brian Halton and Joyce Waters).

INTERNATIONAL CHEMICAL OLYMPIAD - 1992

Council is giving consideration to supporting sending a team of four bright students to the International Chemical Olympiad to be held in USA., The Olympiad rule is that the stundents must be under 20 years old but still not at a tertiary institution.

A A Turner
Hon. General Secretary

CONFERENCES

CHEMISTRY INTERNATIONAL

Tenth Australian Symposium on Analytical Chemistry
Sheraton Hotel, Brisbane, 28 August - 1st September 1989.

The Analytical Chemistry Division of the Royal Australian Chemical Institute are welcoming registrations and the submission of papers for this international anylitical Chemistry Conference. In addition to the 10th Australian Symposium on Analytical Chemistry the 3rd Asian Chemical Congress and the 1st Environmental Chemistry Divisional Conference are being held concurrently. There is also instrumet exhibition.

Plenary speakers are attending from UK Europe and the USA.

Programme information, registration forms and full conference details may be obtained by contacting
Uniquest Limited
University of Queensland
St Lucia QLD 4067
Austalia
Telephone: 61-7-377 2733 Facsimile 61-7-371 5896

32nd IUPACC Congress
Stockholm 2-7 August 1989
Organised by the swedish National Committe for Chemistry

IUPAC, the International Union of Pure and Applied Chemistry is arranging a world-wide congress in Stockholm next summer. It is going to take place August 2-7 at Stockholm International Fairs, Massan.

Traditionally, the scope of the IUPAC congresses is very broad. They are intended to counteract the increasing specialisation that tends to separate different areas of research. The aim of these congresses is to give chemists an opportunity to get an overview of the state of knowledge in neighbouring fields while dipping at the same time into their own specialities.

In one respect, though, the scientific programme of the 1989 IUPAC congress will make a breach with tradition. Its seven sections will each deal with a timely scientific topic, selected for its industrial and social relevance; thus the time-honoured subdivision into inorganic, physical, etc chemistry is gone. Among the scientists who are going to give plenary lectures are two Nobel laureates for chemistry: Georg Bewdnorz (1987) from Switzerland, and Johann Deisenhofer (1988) from FRG.

Secretariat. IUPAC 1989 c/o Stockholm Convention Bureau
PO Box 6911 S - 10239 Stockholm Sweeden
Telephone 468230990 Telefax 468 348441

Annual Conference
The Nutrition Society of New Zealand
and
Department of Home Nutrition
University of Otago
24-26 May 1989
Knox College, Dunedin

The confernece will honour Marion F Robinson who retired in February 1989 from her position as Professor of Human Nutrition.

Information and registration forms may be obtained by writing to Dr Barbara Guthrie Dept of Human Nutrition, University of Otago, PO Box 56, Dunedin.

CHEMISTRY WAS FUN

Professor A. D. Campbell

University of Otago Box 56 Dunedin

The Arthur Campbell Symposium at the August 1988 New Zealand Insititue of Chemistry Conference was held to mark retirement from the many years of service Arthur Campbell has given to analytical Chemistry in particular and the cause of Chemistry in general in New Zealand. Several abridged papers from this symposium have been selected for publication in this edition of Chemistry in New Zealand. Space unfortunately does not permit publication of the full symposium material.

My first association with the Institute goes back to 1948 and since then I have been involved in Institute affairs in many ways. I am extremely grateful to the Institute for granting me an Honorary Fellowship because I value very much my association with its members.

I must thank the organisers of the 1988 Combined Conference of the NZIC and NZBS for granting me the honour of this special meeting. There are several reasons why I am pleased we are in Palmerston North. I have attended many excellent Conferences here on the Massey Campus including the one in my Presidential year. Also I have always followed the development of the Department of Chemistry and Biochemistry and in particular the work of the analytical group at Massey. Finally, not all of you will know that forty years ago I shared a flat with Dick Batt in Dunedin and it is interesting that we should come together again on this occasion.

I started in the pre-ground-glass-joint era and my M.Sc. research with Stanley Slater was concerned with the synthesis of branched chain carboxylic acids which were invariably oils. I became quite skilled at obtaining pressures below 1 mm mercury in vacuum distillations using flasks strung together with bark corks painted with celluloid dissolved in acetone to fill in the holes and to ensure a good seal. Technique was important in those days and you can see why I tended to get irritated when of late I saw ground glass equipment being used as little more than containers for the doubtful products of unsuccessful experiments.

Smells and fumes have always been a problem but at least fume hoods have improved considerably over the years. Early, in the open laboratory, I made benzyl methyl ketone by passing a mixture of phenylacetic acid and acetic acid through a tube packed with thoria heated to about 400 degrees C. My clothes became saturated and I became supersaturated with that very characteristic horse-urine like smell of phenylacetic acid. As soon as I would get settled in at a film people started looking around. I passed the blame on to the person behind by looking around too.

I was very proud of my line of washbottles in those early days. They were of the old type which you blew into. But not only were there ones for alcohol, water, acetone etc. but also for benzene and for carbon tetrachloride. These solvents were used routinely for recrystallisations in the open laboratory. In fact there were a lot of hazards of which we were completely ignorant. Both napthylamines were on the shelf in the second year laboratory and used in amine reactions. Safety glasses are a modern idea. We had very few accidents although I must admit luck was on our side - occasionally at least. I was not far away the day a large lump of sodium caught fire in a sink filled with water. Don't ask me what a large lump of sodium was doing in the sink. At this stage the experimetalist panicked and pulled the plug. In the ensuing explosion, which brought me to the scene, sodium in pellet form was distributed from end to end of the laboratory without a single casualty.

It is not so long ago that our chemicals came from United Kingdom as deck cargo lashed to the mast and first to be thrown overboard in a heavy sea. In those days fundamental starting materials were important. I recall requiring trinitrobenzene to prepare derivatives of polycyclic hydrocarbons. I decided the quickest route would be from trinitrotoluene and I knew the army had plenty of that. I must have written a good letter. A few days later two gentlemen in very neat uniforms arrived at the door of my room carrying a box and as soon as they had identified that they had found the correct person they put the box down and left. I opened that box cautiously because what little service I had seen with the New Zealand Home Guard gave me some indication as to what to expect. Yes, there it was, my TNT in one solid block with a hole for a primer down the centre - a five pound antitank mine. Not many were aware of the box which sat under my desk for a few days while I planned my next move. I finally obtained about 100 g for my preparation by dissolving the block in a mixture of solvents. A few small jars of TNT were kept for future use and the problem of the excess was solved by burning it, in small quantities, on an ash can lid on the bank of the Leith.

My initial interest was in synthetic methods. Why did I change to analysis? In my synthetic work I relied almost completely on quantitative organic analysis for the identification of my products. Originally Charlie Carter provided the analytical service but a new phase was introduced in 1949 with the appointment of Dr T. S. Ma. He was a very experienced microchemist who had been trained by a student of Fritz Pregl and he understood the techniques which were required to get consistent results.

The Campbell microanalytical laboratories at Otago University

However it was apparent that he would return to the United States and Professor F. G. Soper asked me to understudy Dr Ma. It was a very rigorous training. In those days of undamped free swinging two pan balances, technique was extremely important. Over the next two years "TS" taught me the intricacies of the Pregl methods of organic microanalysis. Detailed instructions were set out on worksheets, 1, 2, 3, etc. 1 was always "wash hands" not only because an interest in gardening and in machinery frequently left my hands looking more like those of an engine driver, but also because the moisture on hands can be very damaging to the results. Even the heating effect of hands on the balance required compensation. Today when I sit at a balance I find myself automatically placing both hands in identical positions either side of the balance and I can still manipulate forceps with either hand. Good results were obtained by following a very strict protocol. An example is that associated with weighing the absorption tubes for carbon dioxide and water in carbon and hydrogen analysis. The tube ends were cleaned with cotton wool on a probe, the tubes were wiped in turn with a moist flannel and then a chamois. They were then set beside the balance and a stopwatch was started. The water tube was placed on the balance on the 5th minute and weighed on the 10th, it was then replaced by the carbon dioxide tube which was weighed on the 15th. The rest point was then checked and the zero change corrected. And remember that with the Kuhlman free swinging balance the last two significant figures were obtained by subtracting the swing to the left from the following swing to the right - for several cycles. That certainly sharpened up your mental agility with figures.

I have been very fortunate in having some extremely good assistants in the laboratory. Microchemical analysis, in those early days in particular, was not everyones cup of tea. The success of a good analyst depends, not only on being extremely precise where it matters but also being able to relax and enjoy the work as well. In particular I should like to record my thanks to Wendy Grimmett (McIntosh), Verdon Chettleburgh, Doreen Petrie (Hale), Bob Monk and the current staff Marianne Dick and Bob McAllister. Fortunately new balances, new analysers, new combustion catalysts and much improved sample handling techniques have all simplified the ritual side of the methods but quantitative organic microanalytical methods will always remain the field for the very careful observant analyst. However these methods must never be classified as routine. Several papers published from the laboratory have been concerned with overcoming difficulties associated with a particular type of sample.

Over the years there have been numerous incidents of interest in the laboratory but I have time to relate only a few. Some research workers have considerable difficulty in preparing samples for analysis. On many occasions we have received well recrystallised ammonium nitrate for carbon, hydrogen and nitrogen analysis but difficulty with the elimination of hairs and fibres is the more common problem. Once we sent back a photomicrograph of the sample because we considered that would convey more information than elemental analysis. On another occasion I recall Verdon at the balance weighing out a sample from a client who was testing the theory that life could have originated from an electrical discharge through a mixture of gases. As he struggled to get sufficient sample the silence was broken with the remark "Its alive alright - its growing hair already". For the original Dumas nitrogen analyser we used a generator in which hydrochloric acid reacted with a strong sodium carbonate solution to get pure carbon dioxide. This gurgling device which for obvious reasons was called the " rumbling tum" in the laboratory was pressurised by reacting a large quantity of acid quickly. On one occasion this manipulation brought a greater than expected quantity of acid into reaction and the resulting,internal pressure blew the mercury (about 30 cm^3) out of the regulator. It hit the ceiling and showered down on Verdon and I. Our hair was full of finely divided drops of mercury. We took an early shower that day.

Microchemistry brought me into contact with analytical chemists and gradually over the years my interest changed from synthesis to analysis. To me analytical chemistry is chemistry with a purpose. It has immediate application. Today's society demands a lot more analytical data and analytical chemistry is now in a very dominant posiiton rather than in the subordinate role it formerly held. Today we realise the importance of standards - standards for raw meterials, standards for products, and for limits of impurities which may be even at the parts per trillion level.

Over the years the nature of analytical chemistry has undergone a tremendous change. We now have rapid automated systems linked to sophisticated process control. In addition to being skilful in the laboratory and knowing the chemical processes involved the analytical chemist must also be familiar with the physical processes involved in signal production and signal analysis. There remains a need for analytical chemists skilled in the classical methods but more and more the analytical chemist must also be capable of designing and controlling intricate electronic equipment.

Today analytical chemistry is used widely in many areas of research and it has become a basic requirement in much biological research. Unfortunately, many research workers believe that anyone can operate an analytical instrument. Instruments with a red button for stop and a green button for go are virtually idiot-proof in that inexperienced operators can do little harm to the instrument. However, not only must the operator be able to analyse the data but also he must be capable of evaluating the method which produced that data. Many years ago Professor Siggia of University of Massachusetts wrote that do-it-yourself jobs in analysis are akin to do-it-yourself jobs around the home. Somehow the book-case or cabinet made by the tradesman looks better and is finished more quickly than the same job done by the do-it-yourselfer. We hear people speaking about "routine" analysis. There may be some operations which could be classed as routine but it is the odd sample, the non routine one which is important. A negative test or unusual reaction may provide more information than all of the so called routine tests. Analytical chemistry requires a very attentive and well trained mind and frequently, meticulous attention to detail.

That brings me to the training of anlaytical chemists. In Europe about half of the Universities have a separate department or a chair in analytical chemistry. Unfortunately New Zealand tended to follow the United Kingdom tradition where

only a small number recognise analytical chemistry in this way. However I am pleased to say that today in most of our New Zealand Universities it is possible to take an undergraduate course of some sort in analytical chemistry. Surveys carried out among practising chemists in Europe show that about 20% claim that they deal predominantly with analytical chemistry, and I should expect the proportion in New Zealand to be at least equal to this. It is for this reason that we must ensure that our graduates receive adequate preparation in their courses. Although we are now reaching the stage where much of the sophisticated instrumentation must be left for postgraduate or special short courses the fundamentals upon which the instrumentation is based is appropriate for undergraduate courses.

The public understanding of chemistry is poor. The media screams when there is an accident involving chemicals and if there is not much to report they dwell at length on what might have happened or what happened elsewhere. The public is conditioned to the point where the only thing worth knowing about chemicals is that they cause accidents or pollution. Somehow we must stop this shortsightedness and point out the advances which can be credited to chemistry. At a recent Science Fair I noted that the only chemical type exhibits tended to be related to pollution.

I am an environmentalist because I have an interest in the future of our country, but I am also a keen supporter of industry for the very same reason. I admit that there is considerable room for some industry to improve its image with action with respect to the disposal of waste materials etc. but we must also counter over reaction, uninformed public reaction and decisions made on public fear of the unknown rather than on sound chemical principles.

DDT, the first major synthetic insecticide holds a lot of notoriety, yet people have lost sight of the fact that at the time of its first widespread introduction it would save the lives of many millions of people by stopping the spread of typhoid carrying insects. Had this new invention of the chemist been more wisely used by those in the field (who would not be chemists) we may not have had the problems which led to the present severe restrictions. We must teach people to be sensible in the use of chemicals. If we look back at most of the incidents which have given rise to this public fear of chemicals we find that the major problem is poor education. Inept handling by transport operators cannot be blamed on the chemicals and incorrect waste disposal arises either from ignorance of the nature of the material or an unwillingness to adopt recognised practice on the part of the plant operator. We seldom hear mention of the word dioxin without it being connected to the phrase "the most toxic substance made by man". But who can prove that dioxin at trace levels has ever caused a single human death? We live in a world where public fear and ignorance of the truth frequently takes precedence over scientific fact.

Nuclear power suffers from a not-in-my-backyard syndrome which originates from the horrific release of energy by nuclear fission at Hiroshima. Accidents such as Three Mile Island and Chernobyl stress the potential hazard with nuclear power but sooner or later the world must face a very important decision regarding energy. Can we continue to burn fossil fuels at the present rate? The world will continue to use energy at an increasing rate but what is the best source? Methane is an excellent feed stock for chemical industry and we are wasting it by burning it to generate electricity. Fortunately in New Zealand we have large rivers and much of our power can be generated from this source. If the world is to continue with the present accelerating rate of use of fossil fuels for energy generation then we must also accept the loss of forests from acid rain (a forest about the size of Denmark annually) and the consequences of a rising sea level brought about by the "greenhouse effect". Can we really afford to shun nuclear power any longer. There are hazards, but recent estimates would suggest that the cost in the future as a result of Chernobyl will be much less than the cost of accidents on New Zealand roads. Perhaps it is time to sit down and reason this through in a rational scientific manner.

One cannot live in 1988 without becoming involved in discussions on proposed changes in education. Is it really necessary to turn the present system into turmoil ? Is the present system such a bad one when it enables a person to start at a small country school, to proceed to a small secondary school and be the only person in the sixth form taking chemistry and yet have sufficient preparation to continue through to Professor of Chemistry and President of your Institute. Though some modifications are always necessary one of the major strengths of the present system is the opportunity it offers to everyone to succeed and I fear this may be lost in some of the proposed changes. I am interested to note that the United Kingdom Government is at present working towards a uniform system of education and intends to discard a regime which would seem to be similar to what some would have us introduce here.

The future of our profession depends on good teaching and as Professor Andy Cole of University of Western Australia has stated "good chemistry is easily understood chemistry". Chemistry can be interesting, it comes into everything we use: - chemistry is fun. Why not show the youngsters in their early education that chemistry is an interesting part of their everyday life? There are plenty of themes which can be developed in a descriptive way and by the time they reach an age where they are contemplating a career they can then be introduced to the theories and exceptions which will help to tie their background knowledge together and give the impetus which is necessary to hold the attention of the enthusiast.

When one retires one has time to reflect a little. Although I have found myself in a fairly prominent position in many roles within the Institute, the University and the profession of chemistry I very much prefer a behind the scenes role. However one of the problems of being willing to assist but apparently unable to say not is perhaps that I was trying to do too many things at the one time and my contribution many have been of greater significance had I concentrated on fewer interests. I should like to place on record my thanks to may who have helped over the years. I have been extremely fortunate in having colleagues in the University, in my Department and in my profession in general. I am extremely grateful to you all.

One of the great joys of working in a University is being associated with a succession of young students. And no matter what we may say about the tail end of the first year class I am firmly of the belief that the top students of today are very well prepared academically. Also I should like to add that we in Chemistry have always been favoured with an extremely pleasant group of young men and women. It has been a tremendous pleasure to be associated with them and I am extremely proud of their achievements.

Regarding the future of our profession there is no doubt that it has made very important contributions to the enjoyment of life by all. Unfortunately the advances and benefits receive scant recognition. We must encourage people to take a positive attitude towards chemicals rather than their present shortsighted negative view. There is no doubt at all that among other things chemicals have contributed to increased agricultural production (fertilizers and insectides) in many countries where starvation was formerly an annual event, and chemicals have gone a long way in helping to control many of the diseases which plagued the world population for centuries.

I should like to finish with a quotation. Paracelsus at the time of the European renaissance wrote "Without chemistry we are trudging in darkness". It is not a modern quotation but I am sure you will agree with the message it conveys.

THE CHANGING ROLE OF THE GOVERNMENT ANALYST

P. E. Nelson
Chemistry Division, Department of Scientific Industrial Research
PO Box 2224, Auckland, New Zealand

The role of the Government Analyst has, until recently, showed only an evolutionary change from the role set in 1865 when William Skey was appointed as an analyst under the Food Adulteration Act. This role was directly funded from central government, and projects and resources to achieve those projects set centrally. The Government Analysts worked strictly for other government departments as and when required, with some limited but uncharged consultative work in the national interest for local industry. This position has altered dramatically in the last seven years under the user pays policy and in particular in the last 18 months under the revolving fund which sees extensive financial control and accountability delegated to divisional Directors. Major changes are still in store for this role of the DSIR especially if recommendations in the STAC report are adopted. These changes are effecting the funding base of the Government Analyst function. They have released the Government Analyst from the constraint of serving only other government departments, opening many new opportunities in science. Beside these opportunities, existing client relationships such as those with the Police and the Health Department must be maintained in face of financial constraints placed on those organisations and competitive sourcing by those clients to achieving its needs.

The establishment of expertise in fertiliser chemistry, the planning for the introduction of DNA typing in forensic science and the investigation into the feasability of establishing a sports drug testing facility are three examples of initiatives currently being pursued in the Auckland laboratory of Chemistry Division.

FERTILISER CHEMISTRY

In 1986, removal of government subsidies forced the closure of the New Zealand Fertiliser Manufacturer's Research Association leaving a void in scientific expertise in chemistry, relating to the manufacture of fertilisers, in New Zealand research institutes. Chemistry Division took the opportunity to take up a role in fertiliser chemistry to advance, maintain and apply scientific and technical knowledge to the fertiliser manufacturing industry. This role aims to increase the knowledge and understanding of modern materials essential to the development of the industry; to provide a quality analytical and adivsory service on raw materials and finished products; and to advise the industry on the potential avenues to obtain "added value" for their product range.

In 1987, a major project in fertiliser chemistry was established in the Auckland laboratory of Chemistry Division. In the first 12 months of activity, this project returned the 38% target set by the DSIR as a goal for revenue generation. However, this is no cause for complacency, as Crown funding for DSIR projects is allocated through a competitive process with an emphasis on outputs. If those outputs benefit an identifiable body, then that body should fund the project, not the tax payer. Thus a significant part of this, and similar projects, involves marketing, with scientists needing to recognise the output of their work and identify how this output relates to the needs of the end user.

DNA TYPING

The forensic services of the DSIR have evolved from the original function of the Colonial Analyst. The service, originally funded from the Crown contract for Science and Technology, was one of the first activities under the user pays policy to receive full cost recoveries from the client. This operation is now well established, with funding derived from the budget of the New Zealand Police.

The role of the DSIR in forensic science is to apply scientific knowledge and expertise in the investigation of crime. The aims of this role are to provide the police with a scientific advisory and analytical service; to improve the quality, efficiency and range of forensic science; and to provide expert evidence in criminal trials.

In 1985, Dr Alec Jeffreys discovered a way of identifying individuals by analysing DNA in body cellular material. This technique looks at regions of the DNA molecules where great variability between individuals exists. These regions (minisatellites) contain short core sequences of bases, which can be repeated many times along the strands of the DNA molecule. Minisatellites with the same core sequence of bases are dispersed throughout the DNA molecule. Some core sequences are common to all individuals, but the number of times that they may occur at the site of a particular minisatellite varies from person to person. It was finding a common element, the core sequence of bases, in areas of variability, the minisatellites, that enable the production DNA profiles specific to individuals.

The introducton of this elegant technique is clearly within the goals of the DSIR. The planning and marketing of this technique to the New Zealand Police has seen the recent approval of $0.5M for its implementation in Auckland, Christchurch and Wellington in 1989.

SPORTS DRUG TESTING

DSIR interest in this project arose from its expertise in forensic toxicology. The forthcoming Commonwealth Games in 1990 prompted the investigation of procedures required for sports drug testing and the tralning of a staff member in these procedures during the Winter Olympics held at Calgary in early 1988. This effort was seen both as an opportunity to develop new revenue earning projects within the DSIR and to be in a position to provide scientific expertise to government and to the New Zealand public interested in sporting activities.

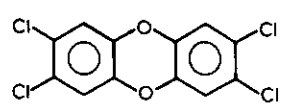
The events relating to drug abuse at the Seoul Olympics have aroused a great deal of public interst, and New Zealand sporting bodies are becoming unified in their approach to this problem. The knowledge gained in Auckland, has ensured that the DSIR is the principal scientific advisor in this area. The costs of establishing an IOC accredited service is high and methods of obtaining funding without government assistance are limited. However, the unified approach of the sporting bodies, backed by technical advice from the DSIR is expected to determine a means to provide for sports drug testing for New Zealand sporting events.

DEVELOPMENTS IN TRACE ORGANIC ANALYSIS

Donald J Hannah
Chemistry Division, DSIR, Private Bag, Petone

It is a privilege to be asked to speak at this symposium to honour the retirement of Professor Campbell. Of all those who are contributing today I am probably the most recent of Professor Campbell's students and that was in the early 1970s when I worked in the microchemical laboratory on a 4th year project involving the determination of sulphur in metal-organic compexes by fusion with metallic potassium. In the course of the year I was exposed to many aspects of chemistry, including such practical matters as it being easier to put out a solvent fire in a flaming beaker by placing an exercise book on top then by spraying it with a fire extinguisher. Two other events of the time in the micorchemical laboratory also are impressed on me as they have been very significant in my later work. Firstly, as a young student I would help Professor Campbell and Dr Jim Simpson run samples on the Varian CH-7 mass spectrometer, situated at the end of the microchemical laboratory at the time. Here I learnt the rudiments of mass spectrometry which has since become the backbone for the analysis of some of the work I wish to discuss today. The second event arose when I asked Professor Campbell what 2, 4, 5-T was as people were very upset about the spraying of gorse with it in Northland. After consulting over lunch with Professor Harry Taylor, Professor Campbell returned with the structure of 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin (TCDD) (Figure I) Since working at DSIR the study of dioxins has become a central theme of interest and I would like to devote the rest of this presentation to giving an outline of aspects of their occurrence and analysis in New Zealand, and some of the work we have been involved in.

Figure 1.



2,3,7,8- Tetrachlorodibenzo-p-dioxin

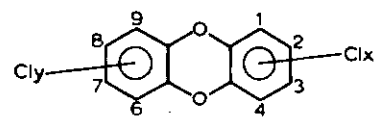
WHAT ARE DIOXINS?

The term dioxins is generically used to describe all the halogenated isomers of dibenzo-p-dioxin and dibenzofuran. There are 75 possible chlorinated dibenzo-p-dioxins (PCDDs) and 135 possible chlorinated dibenzofurans (PCDFs) (Fig 2). They are formed by several different mechanisms, the most well studied being the formation of 2, 3, 7, 8-TCDD from 2, 4, 5-trichlorophenol during the industrial synthesis of products such as 2, 4, 5-T and hexachlorophene (Fig 3). Initially we thought of dioxin, 2, 4, 5-T and Agent Orange (a 1:1 mixture of the herbicides 2, 4, 5-T and 2, 4-D) as being synonomous but now it is recognised that dioxins, with any or all of the possible 210 PCDD and PCDF isomers present, may be produced from a wide range of sources (Table 1).

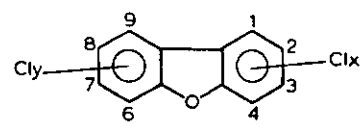
ANALYSIS

The techniques that are used to measure dioxins are among the most developed in modern organic analytical chemistry. At

Figure 2.



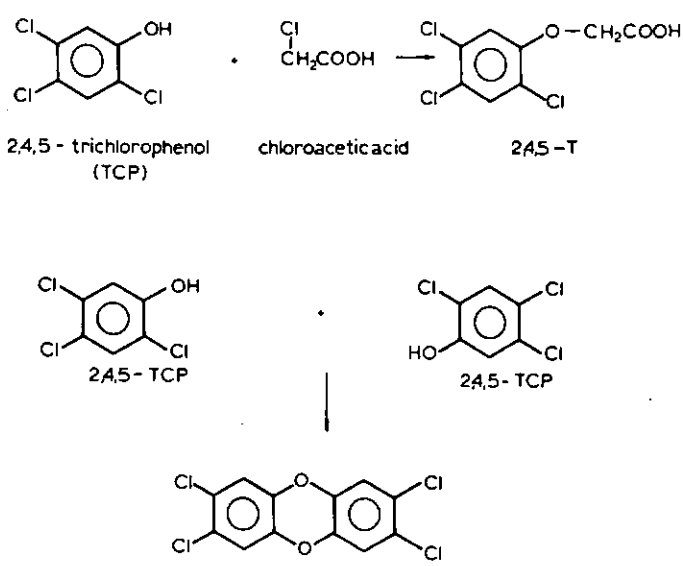
polychlorinated dibenzo-p-dioxins



polychlorinated dibenzofurans

Chemistry Division we were initially involved in monitoring the levels of TCDD (in a non isomer specific manner) in the 2, 4, 5-T product at levels down to 0.01 mg/kg (ppm) using packed column GC-ECD. Following the Waireka Landfill leachate problems and the ICI fire in Auckland we began using capillary GC and quadrupole mass spectrometry with the Hewlett Packard GC-MSD. With our recent projects on levels of PCDDs and PCDFs in human milk, sheep fat, and other samples we are now using high resolution capillary GC and high resolution mass spectrometry with the recently acquired VG 70-250S mass spectrometer, enabling measurements to be made at below ng/kg (ppt) levels on many samples. The analytical

Figure 3.



2,4,5 - trichlorophenol (TCP) chloroacetic acid 2,4,5-T

2,4,5- TCP 2,4,5- TCP

2,3,7,8- TCDD

TABLE 1

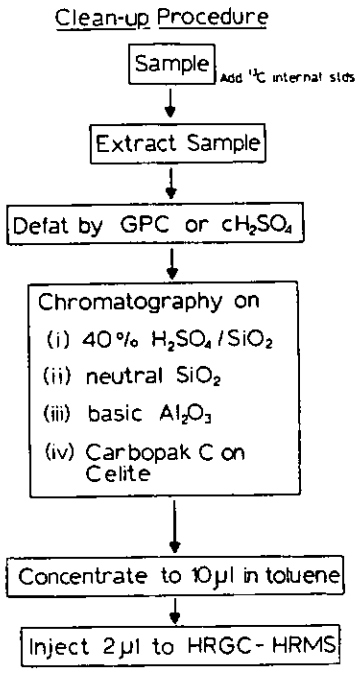
SOURCES OF PCDD AND PCDF

Technical Products	• trichlorophenol based products eg hexachlorophene, 2, 4, 5-T • pentachlorophenol • aliphatic, aromatic and some inorganic chlorocompounds
Combustion Processes	• waste incinerators including municipal solid waste and hazardous waste incinerators • domestic heating stoves and fires • emissions from automobiles using leaded gasoline
Industrial Processes	• petroleum refining • Kraft pulp and paper production • metal smelting processes

demands are exacerbated by the large number of isomers to be detected, the very low levels these are often present at, and the complex matrices they are often found in. Hence the analytical protocols involve two stages, a wet chemistry clean up stage, followed by the GC-MS measurement. The use of PCDDs and PCDFs synthesised using stable isotopes of ^{13}C and $^{37}C1$ has probably been the most significant factor in enabling these low levels to be achieved with analytical confidence. Without the use of these compounds, usually using internal standards with all 12 aromatic carbons being ^{13}C atoms, the analytical techniques would not be as well developed as they are today.

The wet chemistry clean up stage is outlined in Fig 4. As PCDDs and PCDF are usually found in lipid tissue, the amount of lipid is the limiting factor in this procedure, usually no more than 5g can be tolerated. After addition of the ^{13}C internal standards, the sample is defatted and the remaining organic extract processed through a series of small adsorption columns. These columns remove a range of polar and non-planar organic compounds with the final carbon column having the capacity to separate various groups of planar chlorinated aromatic compounds. The two classes of compounds that are critical to be removed are planar PCBs (that are non-ortho

Figure 4



substituted) which have ions which can interfere with PCDD analyses, and polychlorinated diphenyl ethers (PCDPE) which, in the mass spectrometer source, can condense to produce PCDFs. These procedures require a great deal of care and expertise, in preparation of the appropriate adsorbents, in calibration of the various columns to ensure that the fractions of eluent containing the PCDD and PCDF are collected, and in preventing any contamination in the laboratory, which is especially important when handling picogramme amounts of these substances.

The GC-MS parameters are outlined in Table 2. In order to achieve chromatographic resolution of the PCDDs and PCDFs 60m columns are required. We generally use Grob-type splitless injection in preference to on column injection (OCI) as OCI, while having the advantage of the maximum amount of material on column, can produce a decrease in chromatographic resolution. The column is fed directly into the mass spectrometer source. We have a specially designed electron ionisation source which can produce a larger and more stable electron current at 28 eV and this allows for optimisation of sensitivity

TABLE 2

GAS CHROMATOGRAPH-MASS SPECTROMETER CONDITIONS

Instrument:	VG 70-250S with HP 5890A gas chromatograph
Columns	60m DB-5 or DB-23/SP2330 columns
Injections:	2uL splitless
Interface:	Direct capillary inlet
Mass Spectrometer Source:	High sensitivity electron ionisation 28eV ionising voltage 500uA trap current 8kV accelerating voltage
Resolving Power:	10,000 daltons
Acquisition Mode:	Selected ion recording.

over conventional combined EI/CI sources. The mass spectrometer is tuned to a resolving power of 10,000 daltons. Table 3 outlines the parameters involved in the data acquisition system. The switching between channels is accomplished by varying the accelerating voltage within each acquisition group, holding the magnet current steady for each group. The magnet current then switches to be optimised for each acquisition group and this combination at voltage scanning within groups and magnet switching between groups allows for the scan rates, ion dwell times, and sensitivities to be maximised. With up to 9 channels of data being acquired in each group and five groups per sample run, each injection produces over 40 chromatograms that need to be analysed. This creates a mass of data to be handled and is one of the more time consuming aspects of the analysis. The criteria that are applied to the data before a positive PCDD or PCDF response is reported are outlined in Table 4. Figure 5 is a plot of the two natural TCDF isomer channels recorded from a sample taken from an electrical fire in which a capacitor filled with liquid PCB exploded and ignited. The two traces are identical and the ratios between the respective peaks of each mass is 100:72 which compares well with the theoretical ratio of 100:78.

The toxicity of the various PCDD and PCDF isomers varys greatly with those that have chlorine substitution in the four lateral positions, 2, 3, 7 and 8 (Fig 2) exhibiting the greatest mammalian toxicity. To aid in assessing the toxicity of samples such as in Fig 5, a scheme of toxic equivalent factors (TEF) has

been devised which relates toxicities to that of 2, 3, 7, 8-TCDD, arbitarily assigned a value of 1. Hence for a complex mixture of PCDD and PCDF a single TEF can be derived.

CONCLUSIONS

The public emotions concerning dioxins have been fueled over the years by a number of incidents. Initially the use of Agent Orange in the Vietnam War projected the terms into the public arena. A series of events overseas, such as the trichlorophenol reactor blow out at Seveso in Italy in 1976 (just prior to the Natural Products Symposium we hosted in Dunedin that year), producing 2, 4, 5-trichlorophenol for hexachlorophene synthesis, emitted a gas cloud containing 2, 3, 7, 8-TCDD, and locally, mostly relating to the production of 2, 4, 5-T in New Plymouth and the associated destruction of the various wastes, have kept the topic alive in New Zealand. The very high level of public emotion does not appear to be sustained by scientific data, but, in New Zealand, there has been an absence of sound data on which to make informed comment and regulatory decisions. Hence speculative comment has been rife. We are currently working on a range of projects designed to provide information as to the levels of exposure, and to provide indications as the sources of exposure, of the public to these chemicals to enable a more objectively based perspective to be presented. Another aspect attracts us to the study of these compounds and that is that they are very interesting compounds to work with and the demands in analysing them have some very positive influences in other areas of our work at Chemistry Division.

TABLE 3

MASS SPECTROMETER DATA ACQUISITION PARAMETERS

Computer: DEC PDP 11/73

Acquisition mode: Selected Ion recording
5 Groups of ions
9 ions per group plus two lock channels

Each Group of 9 ions has
2 native PCDF channels
2 13C12 PCDF channels
2 native PCDD channels
2 13C12 PCDD channels
1 native PCDPE channel

The five groups detect

1. Tetrachloro CDD and CDF isomers
2. Pentachloro CDD and CDF isomers
3. Hexachloro CDD and CDF isomers
4. Heptachloro CDD and CDF isomers
5. Octachloro CDD and CDF isomers

TABLE 4

CRITERIA FOR POSITIVE IDENTIFICATION

1. Retention time data
(i) + 1 second of internal standard
(ii) + 5 seconds of external standard

2. Isotope ratio + 10% theoretical value

3. Signal to noise ratio > 3:1

4. Recovery of internal standard > 30%.

ANALYSIS - How We Get It Wrong In New Zealand

Dr Max Robertson, Government Analyst
Chemistry Division, DSIR, Christchurch

I was greatly honoured to be asked to present a paper at this symposium to mark the retirement of Professor Arthur Campbell.

I very much enjoyed the lectures which Arthur gave us in 1964 on sugar chemistry and on the carcinogenic polycyclic aromatic hydrocarbons. Now 24 years later my own laboratory is doing research in conjunction with Canterbury University into the presence of these compounds in the environment.

We have already established that the ratios of the various PAHs are indicative of the particular sources of pollution. This led to clear indications that the PAHs in particulate smog in Christchurch originate largely from house fires - no surprises! Recently we have also developed an HPLC/fluorescence method to analyse PAHs in environmental waters at sub parts per trillion levels (0.05 g/m Benzo (a)pyrene).

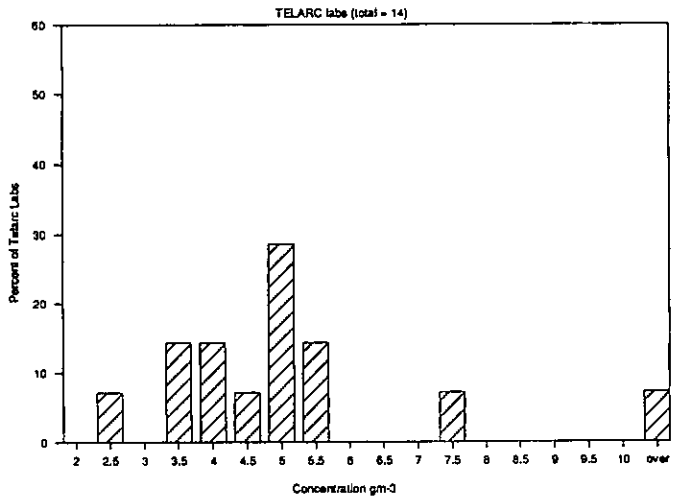
In the mid 1970's I first became an assessor for TELARC, when I visited Kaipara Dairy Company with Garth Wallace. Our reports went to Arthur who had become the Chairman of TELARC's Chemical Registration Advisory Committee.

About that time, Chemistry Division, DSIR was starting to become involved in collaborative analyses or "round robins". The first I remember was a sample of sausage meat sent to our three food laboratories. From six or seven analysts, results for sulphur dioxide ranged from 0 to over 300 parts per million. The analyst who didn't boil the sample was quickly trained. All subsequent SO_2 collaborations have indicated that the Chemistry Division laboratories are now satisfactory.

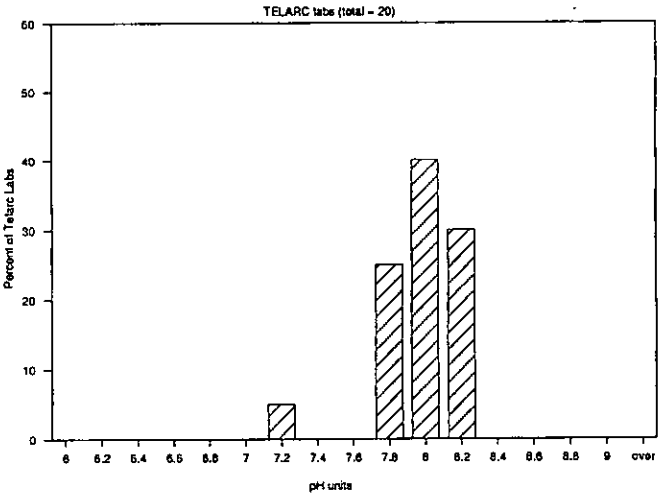
The late Dr Michael Kingsford started the Chemaqua collaborative analysis programme which we offered to water laboratories throughout New Zealand. When it started, results for a single analyte on a single sample were typically spread over at least two orders of magnitude. Over 50 laboratories including several from overseas participated in the most recent Chemaqua round but results still range over one to two orders of magnitude.

I have selected two parameters, pH and magnesium which you will agree are easy to analyse, to illustrate my point. You will see that apart from one laboratory, you are better to consult a TELARC laboratory if you have Sample 26 and want pH. For magnesium you may well ask if I got the laboratories mixed up - I didn't! Perhaps another 15 years of Chemaqua will bring some improvements!

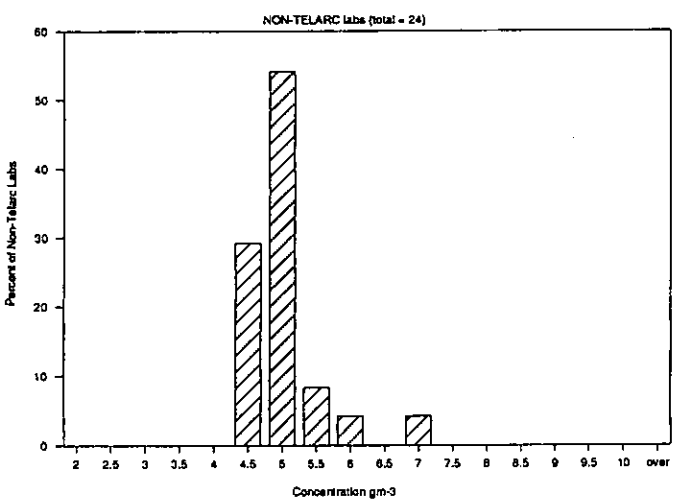
Magnesium Sample 26



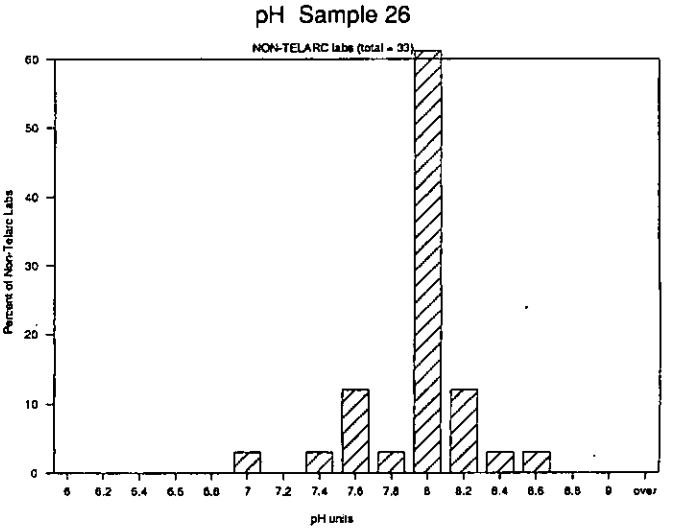
pH Sample 26



Magnesium Sample 26



pH Sample 26



Analysis continued . . .

More recently Chemistry Division has introduced a food collaboration called Kaiqual. Are New Zealand food analyst's any better?

My many TELARC assessments over the years and the Chemaqua and Kaiqual results such as those above have convinced me that many business and environmental decisions and even som legal ones in New Zealand are based on bad analytical results. I know of some that have cost many thousands of dollars.

There was once a contaminant found to be in a material at a level of about 12 part per million. The specified limit was 10 ppm. The organisation paid over one million dollars more for an alternative material. The confidence limits at 95% for the analytical method were at best +6 ppm!

There were once some workers who were worried about their environment, "Can you test it to see if it is safe?", they asked. "Analyses indicate that the toxin has not been detected" they were told. At the true limit of detection for their method, many of the workers would have been very ill or dead.

There was once a company who was taken to Court for a non-complying nitrogen content of a saveloy sample. "But we have analysed the second portion and it complies", they cried. The judge ordered that the third portion be analysed in Christchurch. The 95% confidence limits for all portions overlapped. Why did two members of the NZIC argue in court when their results actually agreed with each other?

This episode convinced me that many analytical chemists in New Zealand did not even understand confidence limits and limits of detection let alone calculate them using their own data. I still hear chemists, say that a peak twice the height of the baseline noise is their limit of detection. When extractions, digests, etc are included it may be 10 times this machine limit.

With all this depression, what can you do, apart from coming to Chemistry Division, to get your analyses done correctly?

The most common sources of error in my experience are -

a) Transcription errors
b) Calculation errors
c) Mixed up units
d) Incorrectly prepared standards

TELARC assessments pay particular attention to analytical methods and to calculation and transcription checking procedures and if their advice is really followed, then many of these errors should disappear.

However, too few laboratories have check systems in place which will quickly identify when errors are occurring. With cheap computers and good programs available it is quite easy to have systems which check regularly how an analytical method is behaving.

A standard reference material or sample can be rerun each time a method is used to ensure that accuracy is not drifting.

Selected samples can be reanalysed at a later date and (preferably) by a different analyst to form pairs of results for calculation of confidence limits or, for low level limits of detection.

Laboratories should seek out and participate in all relevant collaborations available and take remedial action immediately if they produce a wild result.

Laboratories should have professional chemists overseeing analyses. My experience of many laboratory assessments convinces me that where this is not the case, things go wrong and especially where low levels of analytes are sought.

In conclusion I consider that TELARC should be much tougher in demanding satisfactory collaborative results and properly calculated confidence limits and limits of detection before registration is granted. Only then will I be able to say "Go to a TELARC laboratory; they know what they are doing".

ANALYTICAL CHEMISTRY - Is it Time For a Simplified Approach

H. K. J. Powell
Chemistry Department, University of Canterbury.

Many developments in analytical chemistry centre on increasingly sophisticated instrumentation. Consider atomic analysis by optical absorption or emission; in the last 20 years we have seen the focus shift from flame atomic absorption - to electrothermal AAS - to ICP - to ICP-MS. The change of focus was driven by the search for higher sensitivity and selectivity, and by attempts to counter interferences.

Looking for tomorrow's innovations in analytical chemistry we may see a change in focus to simpler instrumentation. For example: development of 'field' tests for environmental or biochemical analyses; inexpensive, disposable electroanalytical probes; inexpensive methods for automation (eg FIA); improved methods for sample preparation.

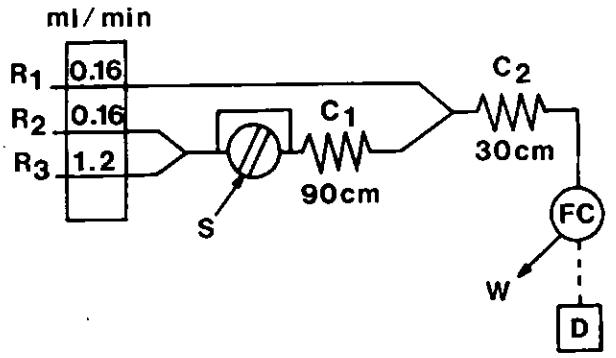


Fig 1. Typical manifold for FIA; flow rates for reagents R_1, R_2, R_3 and length of reaction coils C_1, C_2, can be varied

FLOW INJECTION ANALYSIS (FIA)

FIA is a simple, inexpensive technique capable of high through-put of aqueous samples in either manual or automated modes. Essentially it is a technique for controlled addition and dispersion of samples into a stream of flowing reagent, and presentation of the sample-reagent product at a flow through detector system after a short but precisely controlled elapsed time.

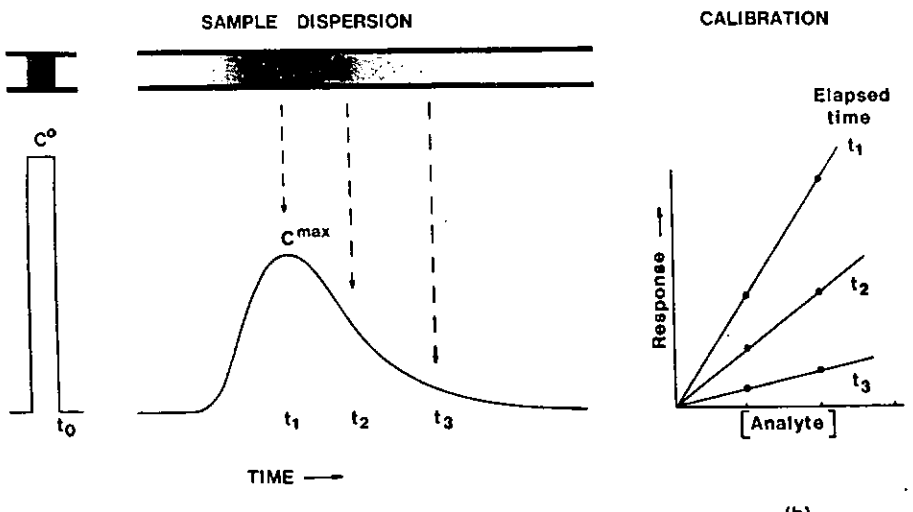
First reported by Ruzicka and Hansen in 1975[1] the technique, has made solid though not spectacular in-roads into analytical laboratories; now some 1000 scientific papers have appeared. The simple modular construction of the FIA 'manifold' allows development of inexpensive home-made systems; indeed the early systems made by Ruzicka and Hansen were constructed on Lego board - a nice Danish touch!

A typical FIA manifold is shown schematically in Fig 1. A good peristaltic pump is required, preferably with a minimum of 3 channels; this is the most expensive component. Manual sample injection requires a good injection value, eg Rheodyne R5020 with a 100, 250 or 500 uL sample loop. All tubing is 0.5 to 1.0 mm i.d. tygon or teflon. Reaction coils (C_1, C_2) consist of measured lengths of tubing wound on any convenient support. The flow through cell/detector system may involve visible-UV spectrophotometric, potentiometric, amperometric, ICP or atomic absorption measurements.

A sample injected at S disperses with the flowing reagent as a result of laminar flow and radial and axial diffusion processes. The concentration profile of the sample zone changes in the short elapsed time (20-120 s) between the injection point and the detection cell (Fig 2a). The dispersion, **D**, varies through the sample profile; the minimum value, given by $D_{min} = C^o/C^{max}$, is typically in the range 2 to 5 but for certain applications lower values ($D_{min} \sim 1$; atomic absorption, pH measurements) or higher values ($D_{min} > 10$; acid base titrations) are appropriate. **D** is governed by flow rate (F), sample volume (S), tube radius (r) and length (L), elapsed time (t) and the dispersion number (ϑ): $D = 2\pi^{1.5} r^2 L^{0.5} F \vartheta^{0.5} t^{0.5} S^{-1}$.

In a non-pulsed FIA system dispersion is very reproducible, and carry-over between samples is minimal; the elapsed time for Dmin is very reproducible and easily controlled, and it is not necessary for the reaction to go to completion. A sharp transient signal is obtained at the detector. Sample injection rates of 30-120 per hour are possible. The range of **D** values arising

Fig 2. (a) Sample dispersion in FIA; injected concentration C^o. (b) Gradient dilution technique, showing change in sensitivity (Response/[analyte]) for different elapsed times.



for different values of t facilitates a wider working range by use of 'gradient dilution techniques'[2] (Fig 2b).

A typical application is analysis of extractable aluminium in soils. The manifold shown in Fig 1 can be used, with R_1 = chrome azurol S (5 x 10^{-4} M), R_2 = ascorbic acid (9%), R_3 = hexamine buffer (0.2 M, pH 4.9). The metallochromic reagent CAS (amber, λmax 434 nm) reacts rapidly with aluminium to form the purple complex Al(CAS), λmax 544 nm, ε64,000. The absorbance-concentration curve is linear to 13 ppm Al for this concentration of CAS. Aluminium extracted in 5 min with 0.02 M $CaCl_2$ ('soluble aluminium') is a useful index of aluminium toxicity in soils,[3] and has possible agronomic applications as a basis for determining soil lime requirements. Typical levels in soil extracts (5g soil, 10ml $CaCl_2$ solution) are 0.5 to 20 ppm. For white clover aluminium toxicity is associated with soil levels > 5.6 ppm, and for lucerne with levels > 2 ppm.

Many variations on FIA manifolds and detection systems are possible, eg. inclusion of a chelex microcolumn for metal preconcentration and desalting, determination of metal dithizonates by solvent extraction, determination of CO_2 or NH_3 after diffusion through a teflon membrane followed by indicator (colorimetric) or conductimetric analysis, turbidimetric determination of sulphate as $BaSO_4$, and acid-base 'titrations' by measurement of peak width (spectrophotometric analysis of indicator colour). For atomic absorption measurements on samples with high salt content (eg seawater, or 1 M KCl extracts of soil) the small sample required for FIA minimizes the effect of salt deposition on the nebulizer bead or burner slot.

References

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3. Close, E.A and Powell, H.K.J. Rapidly extracted (0.02 M $CaCl_2$) 'reactive' aluminium as a measure of aluminium toxicity in soils. Aust. J. Soil Res. (1989): Submitted.

CAMPBELL SYMPOSIUM

LABORATORY ACCREDITATION IN NZ

J. H. Garside

Telarc New Zealand Private Bag Remuera Auckland 5

Development of TELARC Registered Laboratory Programme

The functions of TELARC relating to laboratory accreditation are defined in the Testing Laboratory Registration Act 1972 as follows:

"to promote the development and maintenance of good laboratory practice in testing and to establish and maintain a scheme for the registration of testing laboratories in respect of which application is made for registration and which comply with that practice"

This statement properly interpreted the wishes of those responsible for the formation of TELARC as a mechanism for the upgrading of testing laboratory competence in New Zealand. It recognised that a registration scheme operated in isolation would be little more than a licensing body serving only to endorse the capabilities of those elitist laboratories that already existed and would do little to promote the development of appropriate testing competence throughout the country.

Of course the Act was written at a time when it was envisaged that TELARC in common with other quangos would continue to be partially supported financially by Government. As we all know this policy has been replaced by a commercial user-pay policy which is not necessarily compatible witht he more promotional and developmental aspects of TELARC's functions. Nevertheless financial support has been forthcoming from Government for some 15 years and it is now possible to operate laboratory accreditation in NZ on a full cost recovery basis.

In developing its original modus operandi the Council chose to follow the NATA (Australia) lead and use the concept of peer review. That is to say to establish standards of good laboratory practice by refernece to those currently practicing in the various testing disciplines and to ensure that all aspects of its registration programme were regularly scrutinised by practitioners.

For each field of testing there was established a Registration Advisory Committe comprising persons invited for their personal knowledge and expertise. They did not represent any organisation or affiliation. Each RAC maintained a panel of assessors who similarly undertook assignments on a personal basis.

The Chemical Testing RAC was chaired throughout its existence by Professor Campbell. For over 10 years the RAC met at regular intervals to provide the Council with advice on a variety of matters. The Council itself established the fundamental criteria for good laboratory practice that were to apply across all fields of testing and it then fell to each RAC to develop them into detailed criteria applicable to particular fields of testing.

There have been two major influences on the way TELARC has developed over the recent past. The first of these has been the move away from substantial Government financial support by way of grant funding. This has necessitated a thorough review of all procedures in order to reduce costs through streamlining operations. The fundamental criteria for registration have not been affected by the "peer review" concept upon which NATA and then TELARC were founded has been refined.

The second and by far the more important influence on our development has arisen from the contact with the increasing numbers of overseas accrediting bodies.

When TELARC was established the only model upon which to base its structure and operation was NATA. Indeed in 1973 and for the next 5 to 8 years TELARC operated as a clone of NATA. With the advent of such organisations as NATLAS in the UK, RNE in France and NVLAP in USA new concepts emerged.

The period of rapid development of laboratory accreditation bodies coincided with the development of quality assurance systems standards for civilian purposes in the UK (BS5750), Australia (AS 1821 series) and Canada (CZ-299 series). In 1983 the TELARC Act was amended to prescribe the operation of quality assurance accreditation for suppliers of goods and

TELARC Registered Laboratories (as at August 1988)

FIELD OF TESTING	APPLICATIONS	GRANTED	CURRENT
Biological	31	27	26
Chemical	93	82	70
Electrical	10	10	7
Mechanical	221	202	155
Medical	28	23	22
Metrology	11	9	6
Physics	29	25	17
	423	378	303

services. This gave added stimulus to the adoption of a QA system approach to TELARC's laboratory accreditation activities.

NZ Code of Laboratory Management Practice

In 1987 ISO published a series of international standards relating to the development of generic quality assurance systems. The series has been adopted in New Zealand as the NZS5600 series. These standards have the potential to assist laboratories with the development of their QA systems but like most QA system standards they present their recommendations from a manufacturing point of view and service organisations like testing laboratories must Interpret them for their specific needs.

The NZ Code of Laboratory Management Practice has been prepared by TELARC to assist laboratories to meet the requirements of ISO Guide 25 - which defines te general criteria for good laboratory practice and NZS 5602 - which defines the more specific requirements that relate to a laboratory quality assurance system.

It is interesting to reflect that at the 1983 Institute of Chemistry Conference I talked about he TELARC programme of laboratory accreditation without a single mention of quality assurance. In Dunedin a few years ago the then newly published BS 5750 was examined by one of my colleagues as to its application to laboratories. Now QA system standards and laboratory accreditation are inexorably interwoven and any system of laboratory accreditation which does not embody the principles of QA - especially those relating to documentation is internationally unacceptable.

Laboratory Accreditation Internationally

In 1973 when TELARC was established there were in fact 3 such programmes; NATA in Australia, STP in Denmark, established at about the same time as TELARC and TELARC itself. There are now at least 18 broad spectrum national programmes around the world and many more in various stages of development.

In addition there are many other schemes for laboratory approval or accreditation. These may be national in coverage but confine themselves to specific technologies. Teh programme run by MAFQual in New Zealand which covers dairy laboratories is a good example. There would be in excess of 1000 such specific purpose or regional schemes in existence in the world.

NEWS

Auckland Branch

The Auckland Branch held a talk by **Dr Barry Axon** on Forensic Analysis of Explosives on 22nd of February. The talk generated a lot of interest with 45 people attending - members and non-members. Barry showed slides of various explosive devices and their effects and discussed the techniques used for identification of explosive materials. He concluded with a discussion of probable future developments in the explosives area from a forensic viewpoint.

Several NZIC members attended the New Zealand Society of Cosmetic Chemists Conference on 3rd and 4th March at Pakatoa. The conference attracted 80 delegates from a variety of countries. The main theme of the speakers was on the challenge presented to the New Zealand manufacturing industry by the new economic conditions prevailing in New Zealand. All the speakers expressed positive views of the industry's future with restructuring having largely taken place and orders now being received from overseas. Aslo presented was a paper by Robin Mouat and Jan Douglas of CSR Pty Ltd Sydney on the use of Dimethyl ether as a propellant in the aerosol industry.

Waikato University

During February, the Chemistry Dept took delivery of two new FTIR spectrometers, a Perkin-Elmer 1610 for running routine spectra in undergraduate teaching labs, and a Digilab FTS-40 (with both mid- and far-infrared capabilities) for research and other specialised tasks. Together with the existing Laser Raman facilities, Waikato is now fully equipped to carry out the most demanding of vibrational spectroscopy experiments.

Prof. Frank Gunstone of St Andrews visited the Chemistry Dept of February 20th for a late afternoon talk on fats and triglycerides. Of particular interest was the economic angle he presented to the audience, which although small, included a good cross-section of interests.

Waikato Branch

Members of the Institute in all parts of the country should be aware by now that the NZIC Annual Conference is to be held in Hamilton this year, with the University as principal venue. The theme will be "Chemistry in New Zealand", details of which will appear elsewhere in this and later issues. A good deal of the Waikato campus has changed since the last Waikato-based conference in 1983, and those who haven't visited since then will notice particularly the addition of a new Recreation Centre and the construction (currently underway) of new buildings for Maths and Computer Science.

MAF Ruakura

The Waikato Technology Foundation (WTF), a steering group for the establishment of a Waikato Science Park, has chosen Ruakura as the preferred site for the park. Several companies have already shown an interest in setting up at such a venue, and progress now depends on MAF to release the site (which is Crown Land) and arrange the type of payment (e it lease or other). WTF has a working capital of $60,000 and are currently exploring ways of getting "feed money", so that further progress may be made.

The board of directors of New Zealand's first City Council Property Development Company, recently set up in Hamilton, includes a past-Branch Chairman of NZIC, **Rex Gallagher.** Working alongside the Development Company is a Property Management Company that will manage the Council's assets.

Otago University

Rob Smith has just returned from a profitable and globetrotting leave spent at Research School of Chem, ANU with L. Mander, the Univ of California, Santa Barbara with B. Lipshutz and finally at the Bell Labs AT&T, New Jersey with S.Bertz.

Jim McQuillan left in December for leave at University of York. Jim will be working with R. Hester on the FTIR of electrode surfaces.

Keith Hunter and **Russell Frew** will be taking part in a chemical oceanographic cruise with the CSIRO research vessel "Franklin" in the western approach to Foveaux Strait during May. The cruise is a joint venture involving the Chemistry Department and CSIRO's Chemical Oceanography group at Hobart. It follows a highly successful departmental expedition to Doubtful Sound last October.

The A.D. Campbell Microanalytical Laboratory will be officially opened on May 4 in conjunction with the inaugural A.D. Campbell lecture. The lecture will be given by **Dr P Nelson** a former student of Professor Campbell's.

The microanalytical laboratory now has a CARLO ERBA 1108 CHNS analyser. There is a significant improvement in sample throughput for routine C, H, N analyses and the facility for simultaneous sulfur determination will be appreciated by some researchers.

Dr H Kumagai has taken up a post-doctoral position with Mel Carr, Barrie Peake and Brian Robinson. He will be investigating the mechanism of the autoxidation of West Coast coal in conjunction with the Coal Research Institute.

Export Success by New Zealand Laboratory Equipment Manufacturer

Export sales of equipment produced by Rocklabs Ltd, Auckland increased 15% in 1988 to a new record. North America and Australia continue to be the main markets but sales were made in many countries, including sales to Korea, Syria and China for the first time. Nearly 1000 laboratories world-wide are using Rocklabs equipment.

One of the highlights of the year was the initial production of the world's first multi-stage flow through Ring Mill. This machine has been developed over many years, including two years field trials. It is designed to handle large assay samples, samples for metallurgical test work and small scale production work. Sales have been made to labs in australia, Canada, Indonesia, New Zealand and the USA.

In February 1989, Rocklabs Manager, **Dr. Ian Devereux** presented a paper "New Developments in Sample Preparation Equipment" at the Society of Mineral Analysts Conference, Salt Lake City, USA and visited laboratories and mines in Utah and Nevada.

NATIONAL CHEMISTRY DAY

30th June 1989

National Competitions

Three national competitions are being organised with the following prizes being offered:

Photographic - open to all school pupils - colour: first prize, $200; second prize, $50, monochrome: first prize, $200; second prize, $50.

Essay - restricted to 6th and 7th formers, length 1000-1500 words.

First prize, $200; second prize $100; third prize, $25.

Poster - This competition is divided in to two categories, one for 3rd and 4th formers, the other for forms 1 and 2.

In each category the first prize is $200, the second $50.

Entries close with Branch coordinators on 30th June 1989. They are:

Auckland - Dr P Brothers, University of Auckland

Canterbury - Mr A G Groves, Ellesmere Leeston College

Manawatu - Dr D Newstead, Dairy Research Institute, Palmerston North

Otago - Mr R Tapper, 179 Victoria Road, Dunedin

Waikato - Dr P R Doole, Ruakura A.R.C., Hamilton

Wellington - Dr J. Craig, Victoria University

Theme: Chemistry Serving the Community

Branches have been asked to promote the national competitions as well as their own local programmes.

Local Activities

Auckland - will offer regional prizes in the national competitions.

Canterbury - will run crystal growing (forms I to III), poster (forms I to IV) and essay competitions and are offering prizes in each of these events. They are organising an analytical competition for Forms VI & VII also, with a prize offered to the winner. In addition winners of the analysis and essay competitions will have an assured place in a "Field Day" in the Chemistry department of Canterbury University which will be held on June 30th and July 1st.

Winners in the Junior section will be invited to join the "Field Day" on one of the afternoons.

Manawatu - will mount an advertising initiative with local firms. Other plans include local poster and essay competitions as well as a lecture with demonstrations to school pupils.

Wellington - will offer regional prizes for the national competitions but as well plans an analytical competition, a competition for the best T-shirt design relating to a chemical topic and a software competition to illustrate the application of computers in chemistry.

NOTICES

THOSE CHEMICALS !

An Industrial Safety Seminar "Working With Chemicals"

Centre for Continuing Education, University of Auckland May 24th 1989.

The Auckland Branch of the NZIC and the Centre for Continuing Education in the University of Aucland are organising this seminar with the object of providing information to help people work safely when their work involves potentially hazardous chemicals. We hope that those attending will be workers, supervisors and line managers in factories, warehouses, transport industries, cargo handling and the like, as well as safety officers, health inspectors, industrial nurses, and suppliers of equipment used in this field.

Speakers include:
Mr Bulog: Accident Compensation Commission
The International Safety Rating System
Mr Haggarty: NZ Fire Service
Changing Attitudes and the Response of the Fire Service
Mr A Sheat: Croda Lusteroid Paints
The H.I.M.S. Labelling System
Dr W Temple: The National Poisons Information Centre
Mr T Hall: Fluid Transport Services Ltd
Bulk Chemical Handling
Mr P Tse: Consultant
Proposed Code of Practice for Hazardous Substances
Mr D McGreggor: Bell Gully Buddle Weir
Legal Aspects
Mr I Donald: Labour Dept.
Explosives and Dangerous Goods Training.

Full details are on the programme/enrolment form available from branch secretaries. Outside the lecture room a display of safety equipment from some of the leading suppliers has been arranged.

The fee includes teas, lunch and a social hour after the seminar. Members of the Institute will receive a substantial discount.

Auckland members may contact Mr G. Dibley Ph 737832 for information.

ACOL Courses Again at ATI

The ACOL (Analytical Chemistry by Open Learning) program is an initiative developed by the UK polytechnic system to provide specific training in a range of analytical techniques. A series of self-paced distance learning texts have been produced to facilitate "do-it-yourself" instruction by students in their chosen topic(s).

The following courses will be offered in 1989

1) Gas Chromatography: Transition from packed column to Open Tubular column GC using wide bore capillaries.

Tues 2nd May - Thurs 4th May

2) Atomic Absorption/Flame Emission Spectroscopy: A three day practical workshop.

4th - Thurs 6th July

This course is intended as an introductory to intermediate level course in modern AAS and FES theory and practice.

3) Infra-red Spectroscopy: A three day workshop course

Mid November (Exact dates to be advised)

If you would like further information on either of these courses, or to register as a participant for either or both, please contact: Bruce Fraser, Faculty of Science and Engineering, ATI, Private Bag, Auckland.

NOMINATIONS FOR COUNCIL
Reminder to all Members

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

The Council manages your Institute

Before the council elections make sure you have nominated the best candidates

EXERCISE YOUR RIGHT - GET THE COUNCIL YOU WANT

BOOK REVIEWS

Personal Computers for Scientists: A Byte at a Time
Glenn I. Ouchi, American Chemical Sopciety, 1987
ISBN 0-8412-1001-2

The book is divided into three sections., dealing in turn with Personal Computers for the Chemical Laboratory, Application Software, and Communication and Interfacing. Although it is stated in the preface that little or no experience with computers is assumed, the pace from ground state to an overall appreciation of what PC's can offer is fairly hectic and you don't get a lot of time to appreciate some of the scenery. The approach is unashamedly IBM/clone oriented and the depth of treatment of software packages obviously reflects the author's experience.

Section 1 covers the groundwork of hardware, operating systems and programming languages, with enough information to enable one to understand the jargon and appreciate for example the advantages of different types of printer. This section may become a little dated in the future but much of the information is core material and the author makes some fairly shrewd predictions about future hardware developments.

Application software is divided into three chapters on Word Processing, Spreadsheets, Graphics, Data Bases and the Project Management Programs. The capabilities of word processors are covered briefly but it was nice to see one of the quoted blind spots of Spelling Checkers being unintentionally illustrated with the phrase "piece of mind". The chapter on Spreadsheets is devoted to Lotus 1-2-3 but is exceptionally good because the synthetic (separation of C1-C8 alkanes on Sephadex) example reveals the capabilities of a spreadsheet in a way that enables the chemist reader to see unlimited applications unfold.

The final section deals with interfaces mainly from the viewpoint of what is available. A glossary and comprehensive index complete the book.

I personally felt that the chapter on Spreadsheet applications justified the rest of the book, much of which could be classified as useful reference material. If you have an underutilised IBM in the lab but don't have the time to write your own programs, buy the book for Chapter 5, the rest is a bonus.

Book Review
Chemistry Pot Pourri - Unlocking chemistry through investigations,
Mabel Ho
Available by mail order from Singapore Science Centre
NA$11.00.

What a refreshing publication from the Singapore Science Centre!

Thirty seven projects investigate everyday chemistry for the 13-17 year old. The theme is the application of chemistry to everyday life.

Subjects include, chemistry of home care and personal products, chemistry in the kitchen, chemistry and the consumer, food, colour, environment and the electrical properties of chemicals. Each is presented as practical investigations with several suggestions for further investigations. The book was prepared by a team of chemists, including a teacher on leave to assist teachers in starting a chemistry project which is both a relevant part of everyday life and which demonstrates some important chemical principles. In using this book, teachers and students seee themselves as chemistry detectives, reasoning and controlling variables to reach a logical conclusion.

An excellent 137 page resource book which should be in every New Zealand HOD Chemistry Library and used daily!.

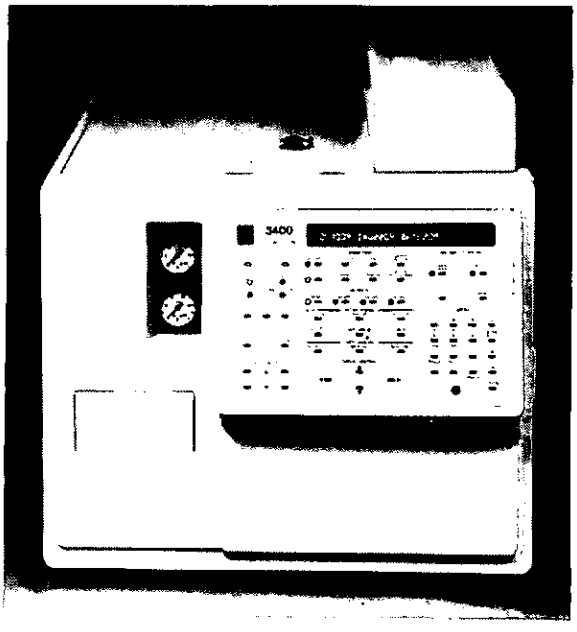
J.G. Fletcher

CONFERENCE REPORT

Neil Edmonds (ATI Chemistry) attended the 17th Symposium of the RACI Polymer Division held in Brisbane late January. The meeting featured many high quality papers and also afforded the opportunity to promote closer ties between the NZIC Polymer group and their Australian counterparts.

The Polymer Group has recently joined the Pacific Polymer Federation; this organisation will hold its first conference in Hawai during December of 1989. Neil attended the PPF council meeting held on the Gold Coast, the major agenda item being the program for the December Conference.

Covering the field in analytical instruments



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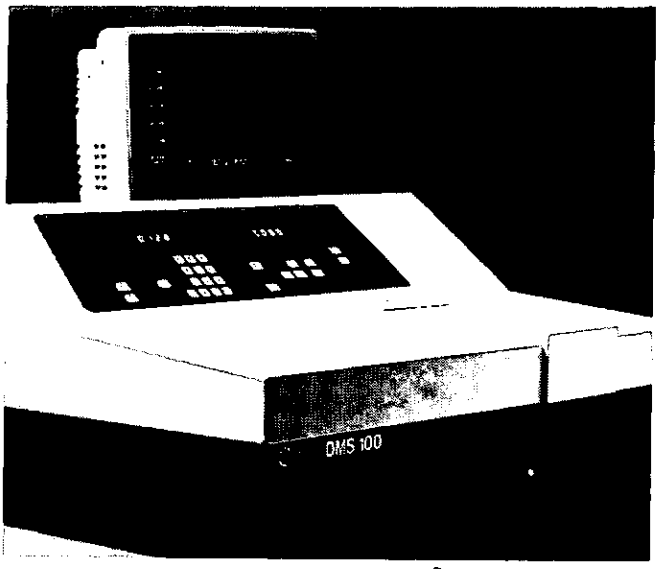

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Models 80, 90, 100, 200, 300

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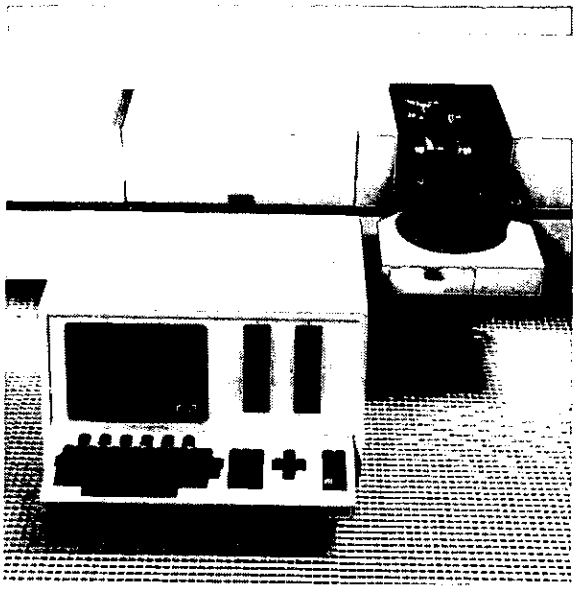

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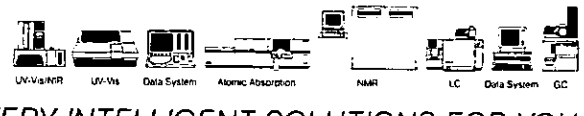

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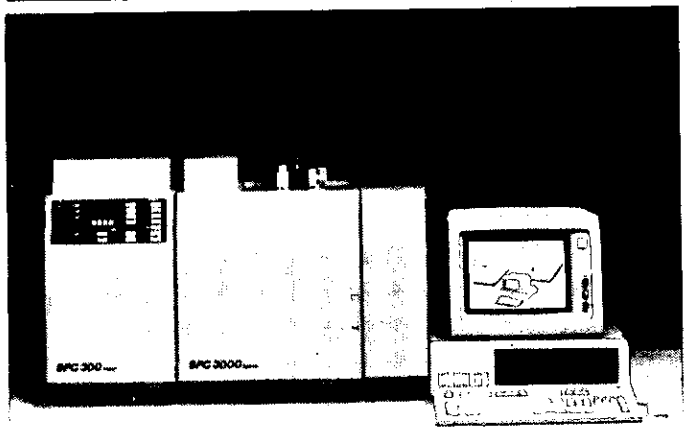


Developments In SFC

With the new technique of Super Critical Fluid Chromatography (SFC) Carlo Erba have again established themselves as technology leaders.

The SFC3000 is a completely integrated SF chromatograph comprising a high pressure programmable syringe pump, time controlled SF injector, cold-on-column injector, high temperature programmable GC oven, controller and FID detector. An autosampler to operate on both the SFC injector and the cold-on-column injector is available as an option. Complete computer control is a further option for pressure/density and temperature programming, autosampler operation and data handling. Super Critical Fluid Extraction (SFE) is also available on line with the chromatograph.

The Carlo Erba solution with uncompromising chromatography is available through sole New Zealand agents Alphatech systems.

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

Computer - Controlled Varian LC Star System Sets New HPLC Standard For Automation And Flexibility

Varian's LC Star System, a fully integrated; yet modular high performance liquid chromatography (HPLC) sets new standards in centralized computer control, sample throughput, methods diversity, and flexible automation. Chromatographers in the basic chemical, pharmaceutical, industrial research, and quality control markets will benefit from the new system.

An IBM PS/2 computer and instrument control software based on colour graphics and Microsoft Windows combine to create an LC workstation providing complete, single-point control of all modules and functions. This combination improves user productivity, helps minimize errors, and provides full data handling capabilities.

Each of the LC Star System's modules - gradient pump, programmable autosampler, diode array detector, and UV-Vis detector - are independently intelligent components. This unique feature allows the modules to operate as powerful, stand alone components without the need for computer control.

The computer control and flexible automation provided by the LC Star System make it ideally suited for a range of HPLC tasks, from complex research or methods development to high-throughput quality control applications.

For further information please circle no. 11 on reader reply card.

Ion Chromatography

Waters have recently made a number of new product releases in their Ion Chromatography range. Foremost is the new ACTION ANALYSER, a fully inert, high pressure, 4 solvent gradient Ion Chromatography system with Powerline control. This enables chromatographic analysis of all types of ions including anion, cation (monavalent and divalent), transition metals, as well as other analytes such as proteins, carbohydrates, peptides and amino acids.

In addition to the ACTION ANALYSER, Waters have introduced the Millitrap Sample Preparation Device. This innovative, hand-held disposable device is designed to remove the following ions/interferences from difficult samples - hydroxides, carbonate, alkali metals, transition metals, alkaline earths, amines and high/low pH system peaks.

Further information on these new systems and new editions of Waters' ION NOTES are available from ALPHATECH SYSTEMS.

For further information please circle no. 12 on reader reply card.

Chromatography Equipment From Shimadzu

Shimadzu Corporation, world leaders in the manufacture of scientific instruments produce the largest and most completely integrated range of chromatographic equipment currently available.

Gas Chromatographs are available in three main ranges. The GC 8 Series offers a family of basic single detector models with simple programming options. This is followed by the GC 14 Series. Regarded by Shimadzu as their work horse, it features high performance in a compact space. Shimadzu designers place great importance on accurate temperature control for capillary work and the GC 14 has been designed accordingly. Up to four detectors can be fitted at once and injectors and gas control modules may be swapped around as desired.

The GC 14 progresses to the GC 15/16 Series, the flagship of the range, with all the features of its smaller relative but with the ability to control other G.Cs, and robots etc., interface with bar code readers, and generally offers better communication facilities.

A full range of accessories is available, including autosamplers, head space analysers, switching valves, a methaniser, Satellite Ovens and so on.

There are also three main ranges of HPLC starting with the LC 6 A system with single or dual piston pumps, Gradient Controller, Auto Sampler, Column Oven pre or post Column Derivatisation and a complete range of detectors including, UV/VIS, RI, Fluorescence, Electrochemical, Conductivity and Diode Array. A Fraction Collector is also an option, as are Micro Bore Components for Biotechnology Applications. The LC 7 A Chemically Inert System is available.

The range is completed by the LC 8 A preparative scale HPLC. This features wide range pumps (0.1 to 150 ml/min) which can also be used for analytical applications. Plus a range of valves for Reservoir, Column and other switching applications.

Shimadzu's interest in Supercritical Fluid Chromatography is maintained through a Technical & Marketing Agreement with Suprex Corporation, USA.

Data processing is available through Shimadzu's well known range of Integrators CR6A, CR5A, CR4A. Listed in increasing order of data manipulation functions. The CR4A is now available with either a 20 MB Hard Disc or 200 MB Optical Disc for greater data storage.

Lesser known products from Shimadzu include Isotachophoresis systems and a thin layer plate scanner. Shimadzu are also very active in hyphenated techniques such as GC - MS, LC -MS and GC-FTIR.

Shimadzu products are available in New Zealand from AWA New Zealand Limited.

For further information please circle no. 13 on reader reply card.

Hewlett Packard announces a new detector for Gas Chromatography:
- AED -
- ATOMIC EMMISSION DETECTOR -

The AED couples atomic emission spectroscopy with gas chromatography. The primary benefit of GC-AED is ELEMENTAL SELECTIVITY on a GC. The capability of the GC-AED System includes:

- Detection of 15 elements
- Simultaneous monitoring of up to 4 elements
- Oxygen detection
- Metal detection
- Hydrogen and Deuterium detection
- Sulphur detection with linearity and no quenching.
- Carbon sensitivity increased over FID
- Halogens detection

The HP5921A is a complete chromatographic system including GC, AED, and workstation with sophisticated software. Now available through Medtec Products Ltd.

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

Alltech Catalogue Due Soon

ALLTECH's 1989 Catalogue will be bigger than ever - 725 pages packed with Chromatography's best - featuring many new items, including:

- Durachrom™ Low Pressure Column Chromatography
- Peristaltic Pumps - a choice of 3
- MF-Plus™ HPLC Column System - pack your own columns!
- SGE's LS 3200 HPLC Autosampler
- New IC Pumps and UV-vis Detector
- Quadrex Super-Cap™, MS5A & HayeSep™ PLOT Capillaries

If any of these items are of immediate interest, Alltech will be pleased to send you full details. Just give them a call on (09) 444-3230, or toll free 0800-652766.

Catalogue No. 200 has just gone to press, and is expected to be available, in New Zealand, in June.

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

New HP Laboratory-Automation Software Provides Advanced Chromatographic Capabilities

Hewlett-Packard Company has introduced software for its HP3350A laboratory-automation system that provides advanced chromatographic analysis, graphics and report generation.

Revision D software extends the ability of instruments interfaced to the HP 3350A via HP3392A integrators. Not only can users fully control HP gas and liquid chromatographs (GC and LC), but they can take advantage of HP's peak processor.

These peak detection, integration, sequencing and calibration capabilities produce the latest in chromatographic analysis. These advances include:

- exponential tangent skimming;
- negative peak integration;
- peak shoulder detection;
- automatic updating of integrator-timed events;
- multilevel internal standards for peak quantitation.

A data-link subsystem allows users to control setpoints on the HP1090 LC and HP5890 GC. It also supports two HP7673 automatic samplers on one HP5890GC. Setpoints and all other data related to an analysis are kept in one file for centralized data management, which helps with good laboratory practices.

A batch capability has been added to automate repetitive chromatographic tasks for simpler, more productive analysis. For example, a series of chromatographic commands can be set up so all laboratory personnel can perform the same tasks accurately.

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

Full Range of Gas Chromatography Instruments From Perkin Elmer

Perkin Elmer's 8000 Series Gas Chromotographs have introduced a concept of chromatographic versatility, performance and ease of operation previously unavailable.

Column ovens have a front opening sliding door providing a very compact design needing the minimum of bench space. Modular injector and detector systems allow unrestricted access to all components. A complete range of injector detectors and accessory options allows almost any type of single or dual channel system to be configured.

All instruments are controlled from a simple keyboard and large visual display unit using 'soft key' user interaction. A powerful micro-processor not only looks after control of all chromotography parameters, but can also allow you to display the chromatogram on the screen and perform all the necessary data handling you require including reintegration.

Unique to the 8000 series is Automated Bleed Compensation (ABC) which allows the user to compensate for bleed profiles obtained in temperature programmed runs.

The 8000 series is available in 6 separate models of instruments from single detector/packed or capillary column, through to dual column, multi-detector systems, with capability for multi-dimensional GC, colour or monochrome VDU, soft key operation, real time or post run graphics and so on. The options are virtually unlimited, but at a price to suit your budget.

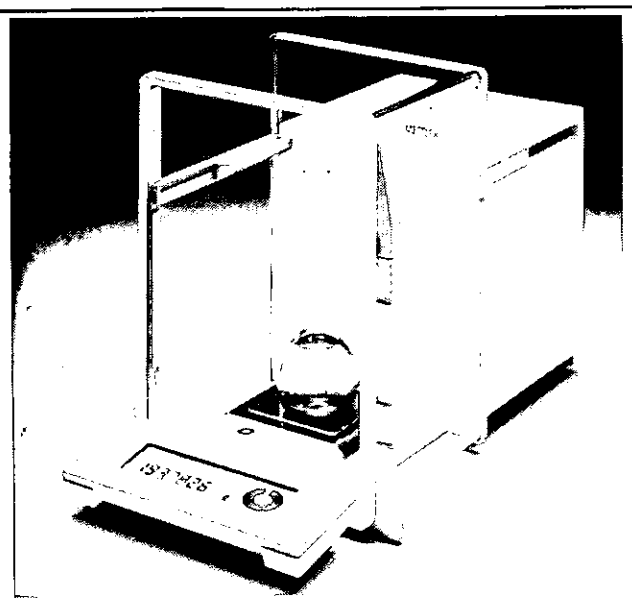
Oxygen Resistent Coarbowax Capillary Columns

Restek Corporation have recently released a range of bonded Carbowax capillary columns which exhibit excellent stability and low bleed levels. The Stabilwax® columns include netural, acid deactivated (DA) and base deactivated (DB) columns which are believed to be the only oxygen-resistant Carbowax columns available.

RESTEK capillary columns and accessories are available from Alphatech Systems.

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

PRODUCT NEWS



New Analytical Balances by Mettler:

The new METTLER AT Balances not only have an appearance different from regular analytical balances - they also are different. Never before has a weighing chamber been so well illuminated and as easily accessible and never before have wind shields moved back and forth automatically at the proper moment.

AT Balances are based on totally new, user-oriented concepts. No matter what the weighing goods look like - the windshield is never in the way. The functionally divided panes can be displaced automatically, without interfering brackets, by simple keystroke or manually, as in the past. The low level weighing pan is very easily accessible and permits the user to support their hand during weighing-in procedures, without touching the housing.

The new METTLER analytical balances guarantee accurate results, even for drastically changing ambient temperatures. The reason: whenever necesary, sophisticated sensor and microprocessor circuits are brought into action to provide fully automatic balance calibration. This also includes a linearity test of the instrument.

The eight digit digital display is complemented by the well proven, analog overview display METTLER DeltaTrac. This shows either the remaining weighing range or deviations from a target weight, even for a tared balance. DeltaTrac provides for the user an overview option for better contact with the weighing process.

METTLER AT Balances automatically include a CL line-current interface as well as an RS232C voltage interface. Thus, data communication with computers, printers or robots present no problem. Furthermore, there is included the balance-specific METTLER data bus GT, which can handle peripherals, such as terminals, control modules or auxiliary displays.

The METTLER AT product line includes three models: AT100 with a weighing range of 0-100 g and a readability of 0.1 mg, AT200 (0-250 g; 0.1 mg) and AT250 (0-52 g, 0.01 mg and 0-205 g; 0.1 mg).

For further information please circle no. 6 on reader reply card.

Zeal Agency

G H Zeal Ltd are pleased to announce that they have appointed LABSUPPLY PIERCE (NZ) LTD as their sole New Zealand agent.

Zeal have for the last 100 years manufactured precision measuring instruments from Thermometers of all types, to Hydrometers and Pressure Gauges. Labsupply Pierce will be able to support all customers from its large stocks in Telarc Registered, special purpose, maximum-minimum, clinical, soil and general purpose Thermometers. They will also carry Hydrometers of all standard types.

For further information please circle no. 7 on reader reply card.

Ohaus Balances to Medtec

Medtec Products Limited is pleased to announce their appointment as sole New Zealand distributors for the Ohaus range of Electronic Balances.

Ohaus Scale Corporation USA is a manufacturer that has supplied the New Zealand market for over fifty years with a range of high quality electronic and mechanical balances.

With a range of scales from simple portable instruments to fully equipped analytical balances, Ohaus covers the complete range of laboratory weighing instrumentation.

Medtec Products is a New Zealand Private C9mpany dedicated to the marketing of high quality Medical and Analytical Instrumentation, from such brand leaders as Hewlett Packard, Vygon, Omron, Quinton and Chemtext.

For further information please circle no. 8 on reader reply card.

Economical Oxygen For Many Uses

The costly and inconvenient problem of providing a reliable, safe and continuous supply of high quality oxygen for industrial and medical uses has at last been solved.

Now available for the first time on the local market is a range of compact and economical oxygen generating units which can provide the gas from standard models to 90% purity in quantities from as little as 3 litres an hour up to 1000 cubic feet an hour. Larger sized plants can be made to order, and the local company's American principals have recently commissioned a plant in Taiwan which generates up to 30 tonnes of oxygen a day.

Named AirSep, the range is available from Air Separation of Avondale in Auckland. The AirSep range of generators and filling stations uses the tried and proven, pressure swing absorption system (PSA), which generates the oxygen by passing room air through a molecular sieve of synthetic zeolite, which lasts indefinitely.

The gas can then be supplied to users through air lines, compressed to higher pressures if required, or coupled with a dehumidifier and freezer to fill pressure bottles.

By installing their own system, users eliminate the need to wait on a possibly unreliable supplier to deliver expensive cylinders.

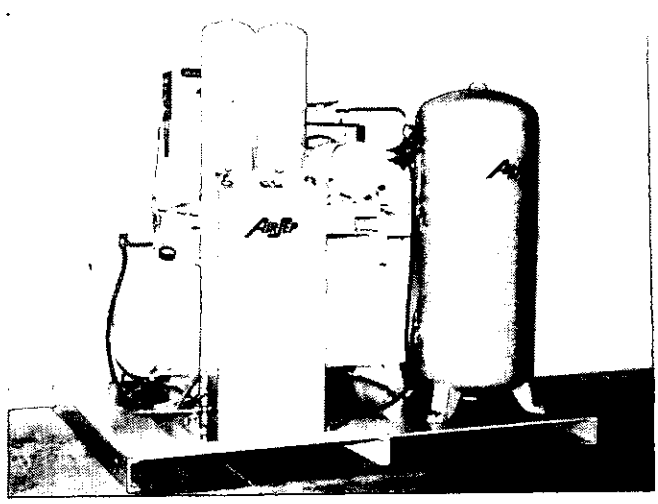
The AirSep systems operate at a maximum pressure of only 60 PSI and are compact, safe and easy to use. But most important, the cost per litre of oxygen is about one tenth that of bottled and supplied oxygen, and if the capital costs are taken into account, are about one quarter of the cost over a five year period.

The simple, quiet, maintenance-free and compact AirSep units require no special installation, have a year's guarantee on parts and labour and need only a change of air filter every six months along with a normal equipment maintenance programme. The machine is simply plugged into a normal single phase power outlet, a compressed air feed line, and turned on. A micro processor and a series of standard industrial components complete the unit.

AirSep systems use two molecular sieve beds as absorbents. Air is passed through one absorbent bed at high pressure. The molecular sieve absorbs nitrogen, allowing the oxygen to pass through as product gas. Before the bed becomes saturated with nitrogen, the inlet air is switched to a second bed.

The first bed is now regenerated by desorbing nitrogen through depressurization and then purged back to the atmosphere. The pure oxygen is then passed to a separate holding tank (called the surge tank). The complete cycle is then repeated. The zeolite is completely regenerative and under normal operating conditions will last indefinitely.

For further information please circle no. 9 on reader reply card.

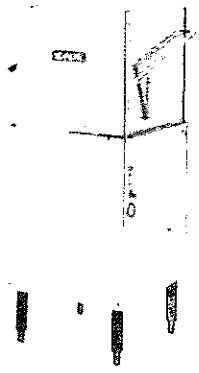


PRODUCT NEWS

Laboratory Equipment Wash Machines

Wash Systems Limited offer a range of machines suitable for washing glassware and other laboratory equipment. Many of the units are commercial glass and dishwashing machines modified to meet the requirements of laboratories and industries.

Pictured is the Starline M2 model.



When used in restaurants this machine has a one or two minute cycle comprising wash and hot rinse and accepts 500mm square plastic baskets to hold washware. Modifications for industrial users can include: variations to the operating cycle - such as increasing the cycle time or adding prerinse cycles etc; provision of special wash jets or manifolds; provision of special racking systems for glassware etc; or even machine cabinet size variations to accomodate particular items for washing.

A wide range of machines from undercounter units to conveyor installations are available - with pricing from around $3,000.00.

For further information please circle no. 3 on reader reply card.

MORE CHROMATOGRAPHY

HPLC From Perkin-Elmer

Perkin-Elmer 250 systems provide an extended modular approach to liquid chromatography:

Perkin-Elmer's new line of modular, upgradable 250 LC Systems allows the liquid chromatographer to choose from a variety of functional components to satisfy optimum analytical cost/performance requirements. From entry-level isocratic variable wavelength UV systems to sophisticated binary gradient diode array systems with spectral capability, analysts can select the proper combination of modules for any liquid chromatographic analysis.

The Perkin-Elmer 250 LC Systems provide cost-effective systems for use in QA/QC, methods development, and biotechnology. These new modular systems allow the flexibility of choosing only the modules required, without having to purchase unneeded capabilities. Full upgradability is provided for system expansion at a later date.

Perkin-Elmer 250 Systems are designed to meet the needs of analysts performing either research or routine analysis in virtually all LC applications including pharmaceutical, chemical, environmental, polymer, biomedical, and biotechnological.

Perkin-Elmer's new 250 Isocratic and Binary LC Pumps are based on a patented pump design that provides superior flow rate precision and compositional accuracy. The diode array detectors are of dual-beam, dual-array design with no moving parts for maintenance-free operation. Patented signal processing results in detection limits equal to those of the best conventional UV detectors.

For further information please circle no. 4 on reader reply card.

TLC and GC/MS Analysis of 40 Common Drugs of Abuse Detailed in Booklet From Marion Labs and HP

Hewlett Packard Company and Marion Laboratories, Inc. have published a new, 100-page monograph titled "Screening and Confirmation of Drugs with Toxi-Lab TLC and Hewlett-Packard GC/MS Systems."

The free booklet presents step-by-step methods and procedures for anlysis of 40 common drugs of abuse including antidepressants, benzodiazepine, pentazocine and tripelannamine. The booklet containing many full-colour illustrations and a list of references, explains the interpretation of results.

This booklet is available through Medtec Products Ltd.

For further information please circle no. 5 on reader reply card.

ENVIRONMENTAL ANALYSIS SYSTEMS FROM DIONEX

Ion Chromatography is a relatively new technique that is finding increased applicability to both wet and dry deposition analysis. In fact Dionex suppressed Ion Chromatography chemistries have been specified by the Environmental Protection Agency (EPA) in their quality assurance procedures (figure 6,7).

These applications with regards to Ion Chromatography have been well documented in the past. More often the determination of trace elements in complex matrices remains one of the most challenging areas in environmental chemistry. When applied to complex matrices the general analytical technique may fail. Such is the case for the determination of trace transition metals in seawater, estuary water, brines, biological fluids, concentrated acids, bases and salts. Extremely high levels of alkali-alkaline earth metals and halogens in trace matrices make the determination of trace and ultra-trace transition and lanthanide metals a formidable task.

The Dionex solution: to successfully determine trace elements in complex matrices, uses a separation or pre concentration step. This step serves to concentrate the analytes of interest from the volume of the sample components. Chelating ion exchange resins (macroporous iminodiacetate chelating resin) are used to concentrate and retain the transition and post transition metals. A poor selectivity for calcium and magnesium allows the gradient pump to selectively elute calcium and magnesium to waste.

The transition elements are then eluted from the concentrator using mineral acid, hydronium ions having a high affinity for the iminodiacetate functionality.

The next phase is the analytical stage. This can take two forms, more traditional modes of detection such as atomic absorption spectroscopy or ICP can be utilised with an increased degree of sensitivity (fig. 16) being achieved via the elimination of calcium and magnesium, or more appropriately Ion Chromatography can be used as the mode of detection.

The analytical chromatography method used utilises the Dionex IonPac CS5 column buffered with pyridine -2,6-dicarboxylic acid. This chromatography method allows the sequential determination of Fe(II), Fe(III), Cu, Ni, Co, Zn and Mn. The detection of the separated metal ions is accomplished using post column derivatization with 4-(2-pyridylazo resorcinol) at 520 nM, the limits of detection being at the sub ppb levels. The average run time including sample pretreatment and matrix elimination is approximately twenty minutes. (fig 15)

The environmental analyser's versitility allows the user to perform HPLC, Ion Chromatography (IC) and flow injection analysis (FIA) on one system. This coupled with the systems ability to perform complex matrix elimination and ultra trace analysis on a totally metal free system, makes the Dionex environmental analyser series an extremely effective analytical device.

For further information please circle no. 1 on reader reply card.

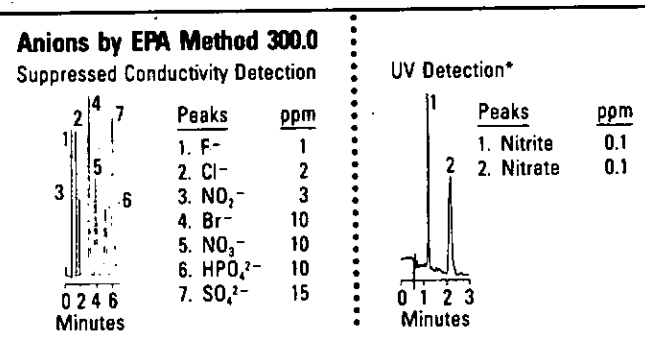


Figure 6. Determination of anions in drinking water and waste water by ion exchange separation using both chemically suppressed conductivity and UV detection.
*UV detection method under EPA evaluation

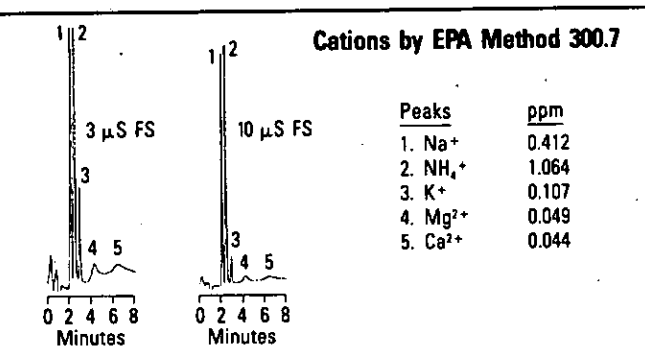


Figure 7. Determination of alkali and alkaline earth cations in a National Bureau of Standards (NBS) acid rain standard using ion exchange separation and chemically suppressed conductivity detection.

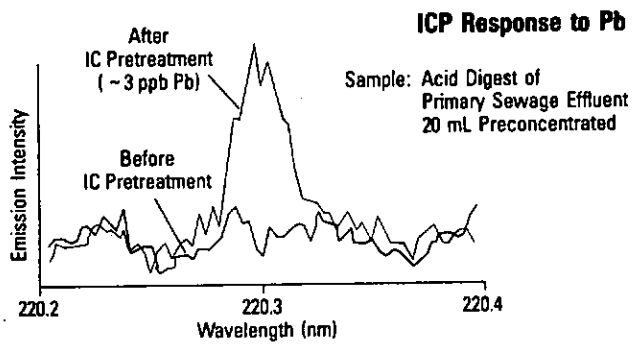


Figure 16. Determination of lead in waste water by ICP analysis using ion exchange chromatography for sample preconcentration and matrix elimination. Results—approximately 3 ppb Pb in the original sample.

Breakthrough In Water Safety Testing

Envirolab Services Ltd has gained the exclusive New Zealand agency for the recently developed Colilert Test. Developed in the USA, the test is designed to establish and monitor the sanitary quality and safety of water, giving a better assessment of public health risk.

The Colilert Test represents a breakthrough in Coliform Testing as it simultaneously detects, identifies and confirms total coliform and E.Coli bacteria in an easily performed test that requires less than 2 minutes actual "hands on" time and will give results within 24 hours.

Manager of Envirolab Services Ltd, Rob Fullerton explains, "coliforms are used as indicators of possible fecal contamination with E.Coli being the major coliform of fecal origin. Presence of even one coliform bacterium in 100 ml of water serves to indicate that fecal pathogens could also be present and that a potential health risk exists".

Colilert was developed to overcome limitations of the existing Multiple Tube Fermentation (MTF) Test and the Membrane Filtration (MF) Test. Instead of the two-six day delay in confirming results, the low cost Colilert test provides a rapid indication of the potential health hazard associated with unsanitary water quality, allowing corrective action can be taken. The USEPA is proposing to approve Colilert as a standard test.

The test can be performed in a laboratory, in the plant or in the field. It is a predispensed, dry blended reagent formulation supplied in two ready-to-use test formats. Incubation at 35°C-37°C for 24 hours is all that is required.

Positive samples are visibly detected via a clear colour change. Reading of results is simple and visual.

Agents for the Test in NZ, Envirolab Services Ltd, in Newmarket Auckland, specialise in analytical and consulting laboratory services for water, wastewater and air pollution requirements.

For further information please circle no. 2 on reader reply card.

IMPORTANT NOTICE

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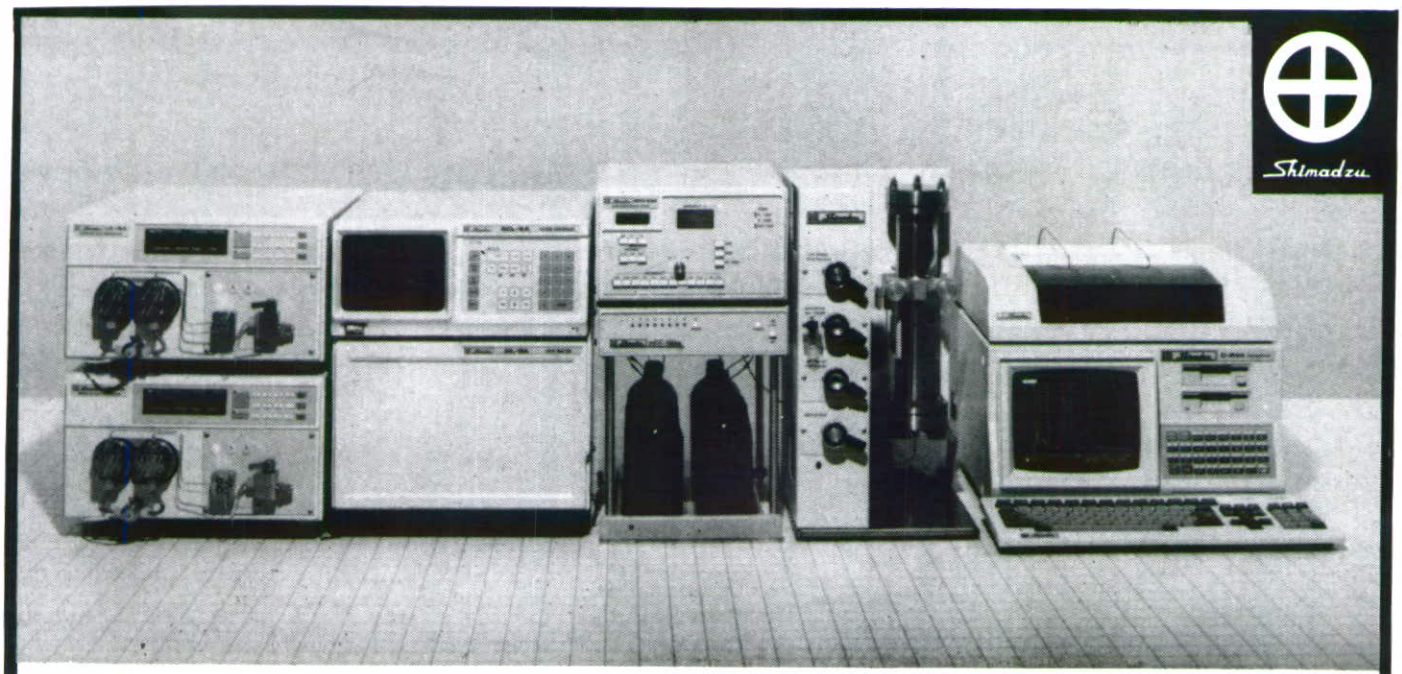

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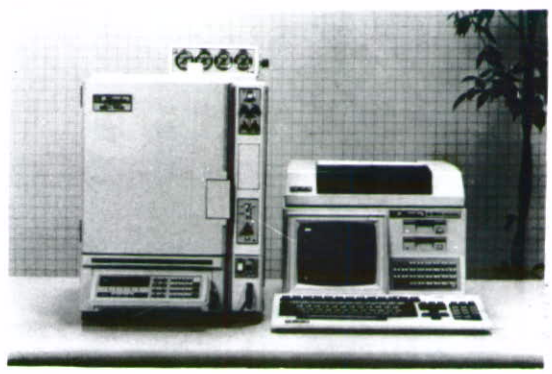

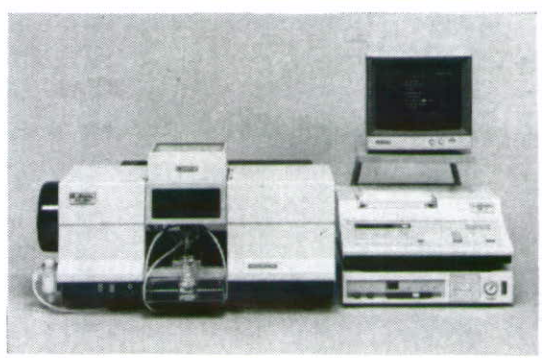

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