# chemistry
## in new zealand

Vol 54 No 4 August 1990

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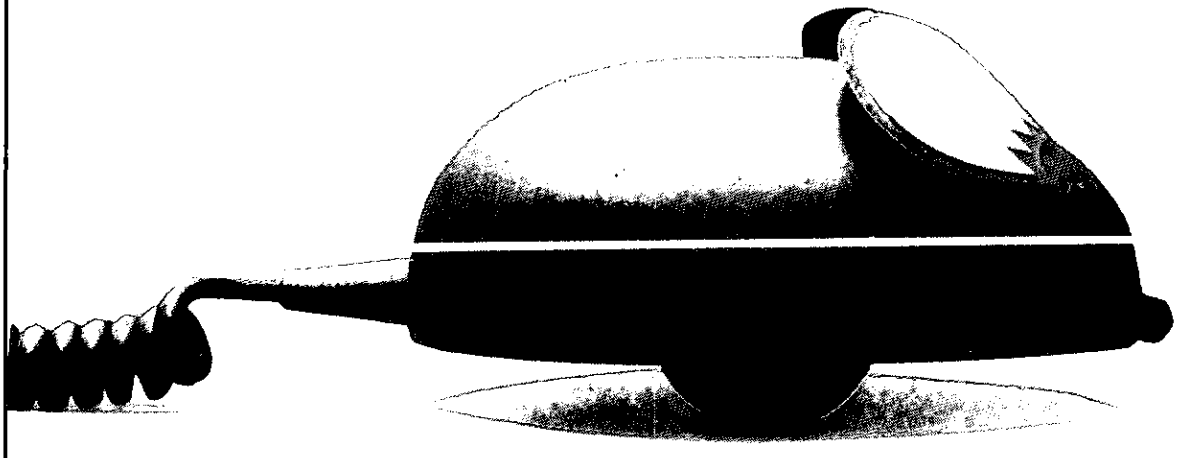

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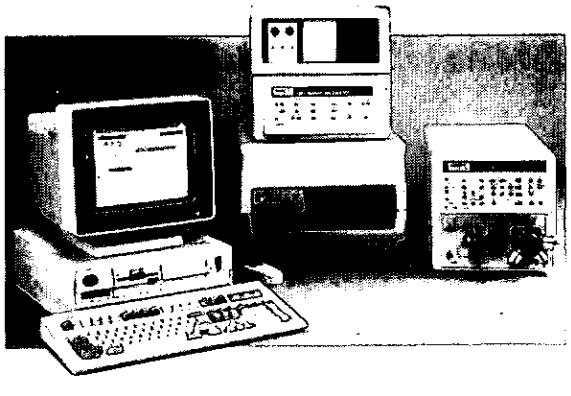

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Vol 54 No 4 August 1990





Published on behalf of the New Zealand Institute of Chemistry (Inc).
PO Box 12-347, Wellington,
Ph (04) 739-444
Fax (04) 732-324
President: Dr. J. Walters,
Hon. Gen. Secretary/Executive Officer: Alan A. Turner
Hon. Treasurer: D. P. Karl


## CONTENTS




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Advertising Manager Carl Roze, Phone Auckland 521-5151.


# EDITORIAL

The announced closure of the Warner Lambert - Park Davies plant is the latest in a long line of plant closures. It raises a number of issues for the New Zealand Institute of Chemistry.

A more worrying issue that arises from the closure is that of the advantages that companies can gain by shifting production out of New Zealand. The dogma of the level playing field has been loudly proclaimed by treasury. As a profession we have come to accept no incentives for research and import duties disappearing. We are also familiar with the problems New Zealand industry faces in response to the unlevel playing field in Australia. Investment incentives and bounties mean that New Zealand industry must be much more attractive before it will get the sort of investment it requires.

Fortunately in the latest rounds of CER negotiations some of these issues have been raised and assurances given that they would be addressed.

Closer Economic Relations raises another concern that our monetarist government chooses to ignore. Australian owned companies are much more concerned about the political results of what they do in Australia than the political results of what they do in New Zealand. It is intriguing to note that over the last year the Australian economy has been suffering problems which has put some Australian companies under pressure. What better way of keeping the Australian plant in work than to close down the New Zealand branch and move the production to Australia? Thus most company closures in New Zealand have involved shifting production to a parent Australian plant. The political effect on the company of out of work New Zealanders is nil while the effect of out of work Australians could be embarrassing. Thus closer economic relations lacks the controlling influence of political relations and New Zealand industry suffers again.

Australia is not the only country to which the New Zealand market has been opened. This has been in the interests of free competition but has coincided with the reduction of government spending in a wide range of policing functions. These functions have traditionally been part of Government responsibility since the nineteenth century. The ones that impinge on the chemical industry are those of drug and food regulations. New Zealand prides itself on having some of the highest standards in the world for drug and food production. The Health Departments approach to maintaining safety in food and drug production has always been based on a system of inspection and licencing of the production facilities. The New Zealand companies have to comply because they are established in the country and can be inspected.

Imported drugs and certain foods have to have their production facilities registered while some other foods are routinely stopped by customs to allow health protection officers to inspect them. The number of personnel available to carry out inspections has dropped has dropped dramatically in the interests of the economy. In Auckland, for example, they have dropped from thirteen to six. This has reduced the amount of surveillance possible at the very time when the amount of imported goods has burgeoned. Thus the importation of goods not complying with New Zealand regulations becomes more and more possible. So we have adulterated Chilean wine, exploding Spanish tinned tomatoes and spray cans which do not comply with New Zealand labelling regulations. It could be said that these examples are successes in that some action was taken but then only the successes become public knowledge.

The registration of drug production facilities around the world is variable. A comment was made recently that it is possible to import drugs from overseas, produced in premises that in New Zealand would not be fit for production of pet food. This is not a problem with the multinational drug companies where the parent company enforces standards but can be a problem with independent producers of generics in some third world countries. Unfortunately, this reflects on New Zealands producers of generics who have to meet over higher standards of production imposed by the health department. These same standards are one of the factors pushing the multinationals out of production in New Zealand.

New Zealand industry needs the levelling of the playing field in food and drug regulations. Products imported into New Zealand are officially certified according to international standards or are inspected by health protection officers. However Government parsimony has created the situation where New Zealand industry in practise has to meet higher standards than imported products. To expect New Zealand industry to produce in competition with products produced to lower standards is not realistic. It is the role of bodies such as the New Zealand Institute of Chemistry to publicize this sort of anomaly not just for the interests of chemists but before a major tragedy occurs from some contaminated imported food or drug product.

# LETTER FROM THE PRESIDENT

Dear Member

This is the last letter I write as President since I hand over to my successor on 1st September. The past year has been an interesting and enjoyable one for me and I have been most grateful for the help and support I have received from members and especially for the hospitality extended to me during my visits to Branches.

Despite these good times it has not been an easy year.

The difficulties experienced by the country as a whole and by members of the profession in particular have, not unnaturally, been reflected in the affairs of the Institute. Getting these in order, both administratively and financially, has required much effort on the part of the Executive Officer and Council and I feel that the past year has been a period of consolidation rather than spectacular progress. On the one hand this is a source of disappointment but on the other, I hope that the year has provided a firm basis for future progress.

During 1991 the Institute will celebrate it 60th Jubilee. I hope that all members will not only rejoice in this achievement but will also rededicate themselves to supporting our organisation and profession. In these days of uncertainty, distractions, and pressures it is easy to neglect voluntary organisations, yet it is just at this time that we should be standing together, making our voice heard and protecting our interests. The role of the Institute is to further these aims. It is deserving of our interest and support, not only for what we can get from it, but also as our contribution to the common strength and to the future. The founding members in 1931 took up a challenge, we now have the opportunity of carrying this forward into our seventh decade and into the 21st century. I hope that all members will feel a sense of obligation as well as achievement as our 60th anniversary approaches. The 21st century has been described as heralding a new "Chemical Age" and it belongs to those who most successfully apply science and technology to the problems and needs of the material world. Chemistry is the key discipline and we, it's practitioners, are key players. The future is ours if we, in New Zealand, have the courage to grasp it.

Yours sincerely

Joyce Waters

# Student Prizes

NZCS Chemistry 5

The top student for New Zealand in the national 1989 Chemistry 5 examinations was Ms Caroline Wilson who studied at the Auckland Institute of Technology.

Caroline is a highly valued member of the National Testing Centre staff. The Centre screens all the newborns of New Zealand for metabolites indicating the presence of metabolic disorders which can kill or damage babies. The screening programme enables detection and treatment of the condition before the damage occurs. Her work involves microchemical, bacterial inhibition and radioimmunoassays as well as hplc and other instrumental work; lab computing and data management.

She has found the ATI chemistry course content comprehensive and valuable, including the parts not directly related to day-to-day problems on the job. The course itself was challenging and the Mastery method of assessment used in Stage 4 a good way of keeping a steady rate of progress through the year.

Future plans for Caroline include finishing the final papers for her NZCS and further study, maybe in the applied science area. Her prize recognizes her hard work and outstanding achievement.

The students gaining the highest marks for Chemistry 5 in the Wellington region were Matthew Bruce, a Southlander from Edendale who studied at the Central Institute of Technology and Dawn Holden from Wellington Polytechnic.

Canterbury Prizes

The Institute of Chemistry Prize for 1989, sponsored by the Canterbury Branch of the NZIC and presented to the top Honours 1 student at Canterbury University was awarded to Novalina Lingga. Novalina is from Jakarta, Indonesia and has been in Christchurch for three years. She will use her prize money to purchase a textbook on organic chemistry.

The Mobil Student Chemical Society Prize is awarded annually to the member of the Student Chemical Society (affiliated to the NZIC, Canterbury Branch) who attains the top mark in the Scholarship chemistry examination. In 1989 there was a three-way tie. The winners were Imogen Dickie of St Margaret's College, Dan Sinclair of Christchurch Boys' High School and Michael Causer of Burnside High School. All three winners are currently studying at the University of Canterbury. This prize is generously sponsored by Mobil Oil NZ Ltd.

# CONFERENCES

## "Inorganic Chemistry 1991 Conference"

### University of Waikato - 28 Jan - 1 Feb 1991

This conference is organised under the joint auspices of the Inorganic Division of RACI and the Inorganic Specialist group of the NZIC and runs from midday Monday 28th January until midday Friday 1st Feb 1991.

The programme consists of eight formal Plenary lectures, the Burrows lecture, a series of twelve section lectures, and a full array of poster-presentation papers, covering the whole spectrum of Inorganic Chemistry.

The Plenary lectures are as follows:

Professor George Christou, (Indiana University), "The Inorganic Chemistry and Biological Relevance of Manganese and Iron Carboxylate Clusters"

Dr Terry Collins, (Carnegie Mellon University), "The Stabilisation of Highly Oxidised and Highly Oxidising Middle-Transition Metal Complexes"

Professor Gottfried Huttner, (Heidelberg University), "Organometallic $\pi$ Systems"

Professor Akira Nakamura, (Osaka University), "Importance of Conformational Effects in Metal Thiolate Bonding in some Metalloenzymes"

Professor Philip Power, (University of California, Davis), "Unusual Bonding and Coordination Numbers and Reactivity in Main Group and Transition Metals"

Professor Alan Sargeson, (Australian National University), "Chemistry of Encapsulated Metal Ions"

Professor Ken Wade, (University of Durham), Title to be announced.

Dr Karin Weiss, (University of Bayreuth), "Metathesis and Polymerisation Reactions with Homogeneous and Heterogeneous Carbene and Carbyne Complexes"

The Session Lectures are to be presented by:

Dr Ed Constable, (Cambridge);

Professor Dave Curtis, (Michigan);

Dr Dainis Dakternieks, (Deakin);

Professor Ian Dance, (NSW);

Dr Catherine Housecroft, (Cambridge);

Professor Brian James, (British Columbia);

Professor Colin Raston, (Griffith);

Dr Ward Robinson, (Canterbury);

Professor Warren Róper, (Auckland);

Dr David Weatherburn, (Victoria);

Dr Tony Wright, (Nottingham);

Professor Akira Yamasaki, (University of Electrocommunications).

A full social programme is planned as part of the Conference, and this will include a trip to some of the scenic delights that are accessible from Hamilton. Participants from overseas and from within NZ who arrive in Auckland during the preceding weekend can be accommodated in O'Rourke Hall and a social event in Auckland is being arranged for the evening of Sunday 27th. A bus will then transport delegates to Hamilton on the Monday morning.

To encourage as many students as possible to attend a special registration fee and accommodation package is offered. Full details and registration forms are now available, and registrations should be sent to: Dr B.K. Nicholson, Chemistry Dept, University of Waikato, Private Bag, Hamilton.

# NZIC SPECIALIST GROUPS

At the end of June, Chemistry in New Zealand wrote to the NZIC Specialist Groups as listed in the Procedures Manual. The responses reveal a wide range of activity amongst the groups and the replies (with editorial interference in some cases) are reproduced below. To start, however, is a statement from Dr Harry Percival, the Council member charged with liasing with the specialist groups. In conclusion are notes from NZIC members who are also members of the RACI and the RSC as to how these other bodies interact with their own specialist groups.

NZIC COUNCIL COMMENTS

The Council recognises the following 10 Specialist Groups that are currently active within the Institute:

* Analytical Chemistry
* Chemistry Education
* Chromatography
* Electrochemistry
* Fats and Oils
* Inorganic and Organometallic Chemistry
* Organic Chemistry
* Physical Chemistry
* Polymer Chemistry
* X-ray Crystallography

In 1989 the Physical Chemistry Group was formed and now incorporates the former Thermodynamics and Electrochemistry Groups. However, it has been agreed that the Electrochemistry Group will continue to act as a distinct Group for the purposes of international co-operation (particularly with RACI). All of these Groups have Secretaries for administrative purposes, and some currently have Chairpersons and other office-holders (details available from the General Secretary or Executive Officer). Office-holders for the Groups are elected at Annual General Meetings of the Groups, normally held at the Institute Conference each year. Membership of one or several of the Groups is open to any person belonging to the Institute.

Council believes that Specialist Groups are important in promoting the 'learned society' component of the Institute's activities. They are an excellent mechanism to cover the wide range of special interests within the Institute's membership and provide extensions to the more general Branch activities. Core sessions at the Annual NZIC Conference usually correspond to the areas of interest of all or many of the Specialist Groups. Council also wishes to encourage the Groups to organise workshops, educational courses, and seminars.

It is in the best interests of our chemistry profession that Specialist Groups continue to operate within the umbrella of the Institute (separate groups outside the Institute would fragment the profession). Council has therefore moved to improve communication with the Groups by appointing this year the First Vice-President (currently Dr Harry Percival) as Council representative for the Specialist Groups. He has personally contacted all the Secretaries of the Groups to begin the liaison and is intending to keep abreast of the Groups' news and activities. Council has also approved of the General

Secretary's intention to forward copies of Council minutes to the Groups and to seek input into Council Agendas prior to meetings. Points to be raised will be channelled to the First Vice-President for action/consultation. In the future Council may invite, on a rotational basis, representatives from several Groups to attend Council Meetings as observers. All these actions should greatly strengthen the links between Council and Specialist Groups.

Council and the Specialist Groups can be mutually supportive of each other. Council is able to consider requests for grant or loan money for specific Group activities such as publishing a newsletter or monograph, inviting an overseas speaker, organising specialist conferences or workshops. The Secretariat also assists with membership and mailing lists. Specialist Groups can assist Council to draw on the expertise of its members by undertaking specific tasks on request such as helping with a submission to an Official Body, helping the Public Affairs Committee, or making recommendations on the awarding of a prize.

Although, according to Council guidelines, Specialist Groups may not presently charge an annual subscription, they may - and are encouraged to do so - charge a fee to cover expenses for the functions they organise (the financial responsibilites of the Groups are outlined in Guidelines available from the General Secretary). This has raised the question in Council's mind of whether it is fair to charge NZIC members in the Specialist Groups the same fees as non-NZIC members in the Groups. Council recognises that the non-NZIC members add vitality to the Groups, but it would like - in full consultation with the Groups - to explore further question of relative fees for members and non-members. The status of Specialist Groups relative to Branches could also be usefully discussed.

Harry Percival

**Analytical Chemistry**

With a membership for over 50, virtually all NZIC members, the activities have been confined to organising an analytical specialist session at the annual conference. The convenor, D.J. Hogan, 11 Wyn St, Christchurch 2, feels that more branch communication would be an advantage and suggests the possibility of collaboration with the RACI analytical group.

**Chemical Education**

The secretary is listed as D.T. Howarth, 44 Grahams Rd, Christchurch 4, but no reply was received before going to press. Membership is listed as 570, of which all but 150 are non-NZIC members.

**Chromatography**

The NZIC Chromatography Group was formed in February 1973 by Don Ferry, Peter Robinson and George Zabkiewicz. The aim of the group was to "promote the use of chromatography in NZ".

In the years since its inception the chromatography group has been very active in organizing seminars (1,2 or 3 day) on a wide variety of topics related to chromatography, assisted in coordinating speakers at NZIC conferences, invited (and paid for) overseas speakers to come to NZ and assisted in setting up, publicising and teaching short courses on GC and HPLC at Auckland and Waikato Polytechnic.

Our programme for the last 12 months is perhaps typical - organise and pay for speaker at conference, GC basic and capillary courses in November at Waikato Polytechnic, Ion Chromatography seminar in Huntly in April, the HPLC course at Waikato Polytechnic in May and a two day data handling seminar in Auckland in June.

To date we have instructed 192 students on our HPLC courses, 288 on basic GC and 123 on capillary GC.

Membership to the group is by default - if we know people are interested then they go on the list. All previous students are automatically on the mailing list. Only about 15% of our members are members of the NZIC. There is no membership fee as all our activities are self funding and we receive a small levy from the chromatography courses run at the polytechnics. NZIC provides us with support in maintaining our membership list and providing sticky labels. Finally, we would like to thank the many

trades people who involve themselves in the publicity and running of our courses - we could not do it without them. We rely on the loan of instruments from these companies in order to teach our students.

Current committee
Dr Diane Webster Secretary
Dr Peter Robinson Education Organizer
Dr Zabkiewicz Treasurer

**Electrochemistry**

As outlined in Dr Percivals' comments, this group along with the Thermodynamics Group has been incorporated into the new Physical Chemistry Group.

**Fats and Oils**

As a result of the enthusiastic response to 'Fats for the Future', an international conference held at Auckland University in 1983, the Oils and Fats Specialist Group of the NZIC was formed.

The Groups 126 members have a diversity of professional skills and interests ranging from chemistry, health, medicine, food, biochemistry and represent academic, industrial and commercial areas.

The purpose of the Oils and Fats Group is to promote an awareness of matters concerning oils, fats and Lipids and social exchange of ideas among interested people. Meetings are arranged when Lipid scientists visit New Zealand, or when interest by members in certain aspects of Lipids prompt a discussion Forum as a symposium or International Conference.

Two specialist interest meetings are planned later this year and a two day symposium 'Perspectives in Marine Natural Products' will be held 7-8 February 1991 at Auckland University.

For further information please contact:
Diana Fenton, Chairperson or
Geoff Webster, Secretary
C/- Abels Limited
Private Bag 18
Newmarket
AUCKLAND

**Inorganic/Organometallic**

This group consists of about 100 members, of which about 20 are non-NZIC members (mostly university research students). The membership is derived from universities (70%), DSIR and other government research institutes (10%), and private industry and other (20%). Its main activities consist of regular meetings held either in conjunction with the annual NZIC Conference or separately. The group has strong links with the Inorganic Division of the Royal Australian Chemical Institute (RACI) and is involved in the organization of joint RACI/NZIC Inorganic Chemistry conferences which are held at approximately 18 month intervals are various centres in Australia and New Zealand. The first New Zealand venue was Queenstown, where a very successful meeting was held in 1981, and the next conference of this type will be held at the University of Waikato in January 1991 (see separate announcement on p.82 of this issue). Although these conferences are aimed primarily at an Australasian audience, they have a strong international flavour, with eminent speakers from all over the world giving keynote lectures on the latest developments in their subject. This is probably the most important function of the Group, as it provides a means whereby we can overcome to some extent the disadvantages of our relative geographic isolation, and hear at first hand about recent development in our field, and to meet some of the key people who are involved in these developments. It has also resulted in valuable links between workers in Australia and New Zealand which, in some cases, have led to very fruitful collaboration between New Zealand and Australian research groups.

In addition to the joint RACI/NZIC meetings, there are regular meetings of the New Zealand members, usually with one invited overseas speaker. These provide a means whereby members can keep in regular contact, and are usually held fairly early in the year so that new research students can attend before other pressures later in the year begin to make other demands on their time. They are also run on a relatively low budget to keep registration costs to a miniumum, again to provide maximum encouragement for research students to attend.

A newsletter is issued to member and to new research students at (more or less) regular intervals, and serves to keep the membership aware of arrangements for coming meetings, and of the activities of other members.

G.A. Bowmaker
Secretary, NZIC Inorganic/Organometallic Specialist Group

**Organic Chemistry**

Dr A.D. Abell, Department of Chemistry, University of Chemistry writes: The Organic Specialist Group has been in limbo for a number of years now and it is only recently that I realized that I had inherited the job of Specialist Group Chairman, or is it Secretary? A number of people have expressed an interest in establishing a regular Organic meeting but as yet no firm commitment has been made. In light of the apparent success of the Inorganic Specialist Group meetings I think it inevitable that the Organic Specialist Group go in this direction. It has even been suggested that a meeting be set up in Canterbury to coincide with the visit of Carl Djerassi in 1991. The only problem I forsee is a disruption to the annual NZIC Conference. These matters need to be promptly addressed perhaps at this years NZIC Conference in Wellington.

**Physical Chemistry**

Now incorporating the Thermodynamics group. Unfortunately the Secretary Dr Alan Langdon is overseas. Enquiries should be addressed to Dr Tony Cartner at the University of Waikato.

**Polymer Chemistry**

The Polymer Group was formed in 1974 in response to the increasing number of chemists employed by polymer based industries in New Zealand. As a consequence, membership is dominated by scientists and technologists from industry and related research organisations, the lack of numbers from tertiary education reflecting the low profile of polymer science in both the chemistry and engineering departments of these institutions. In the chemistry field, the probable reason for this is that Degree courses developed around classical techniques and did not change with the advent of new technologies. As now, the split into inorganic/organic/physical fields represented the fundamental subjects common to all chemistry - there was insufficient time (and money) to diversify into new fields. The same situation existed in other countries (notably the USA), while in Japan polymer science has always been strong at the tertiary level of education.

Like the Japanese, the Australians have not been slow in realising the importance of research into new materials, polymers forming a major field of research in many tertiary institutions. The Polymer Division of RACI supports six state specialist groups, runs annual symposia on a scale equivalent to an NZIC Conference, publish books and run international conferences. Note that "chemistry" does not appear in the RACI Division name a deliberate choice to emphasize the multidiscipline nature of polymers. The Polymer Group of NZIC has established close ties with the RACI Polymer Division; the Chairman of our group is a coopted member of the Standing Committee of the RACI Polymer Division. In effect, this gives us a status equivalent to that of a State Polymer Group in Australia - it is probable that the NZIC itself will form closer ties with the RACI in the near future, hopefully our initiative will catalyze this process.

Assuming this union does occur, we would like to see the NZIC adopting similar policies towards Specialist Groups as the RACI, especially in regard to funding. In essence, the RACI provide financial support to their specialist Divisions thereby promoting their development. This is not an automatic process, finance being provided according to the degree of activity of each Division. This certainly provides a meaningful bond to the parent body, something that is not always so evident in the NZIC.

The NZIC Polymer Group is also a member of the Pacific Polymer Federation, an organisation of societies from pacific rim countries formed to advance polymer science and technology in the Pacific Basin. Membersip of the PPF has resulted in an increased exposure to overseas specialists and a rude awakening as to the depth of research and development taking place in the industries and tertiary institutions of our neighbouring countries. We are represented by the RACI on the Council of the PPF.

Membership of the NZIC Polymer Group (currently around

120) has gone through substantial change recently with the severe recession that has afflicted the chemical industry. Not all on the Polymer Group mailing list are NZIC members; on this issue we follow the Australian practice of welcoming all with an involvement in polymers - it is a multidiscipline field.

Non-members of NZIC wll no doubt be levied at sometime in the future - at present funds are generated from Symposia run at infrequent intervals, the last being an Adhesive Symposia in May of this year. Otherwise activities centre around visiting speakers and short courses (unfortunately all in Auckland), along with regular RACI and local newsletters. Future activities will continue these themes, with the added bonus of large meetings for those able to cross the Tasman. Forthcoming events include an IUPAC sponsored Conference Polymer 91 will be held in Melbourne next February and the 3rd PPF Conference in Queensland in 1993.

Secretary - E.F. Baggen, Petersen Chemicals Ltd, P.O. Box 19-041, Avondale, Auckland 7.

**X-ray Crystallography**

No reply received, membership is listed as approximately 25, virtually all NZIC members. Contact Dr. G.J. Gainsford, Chemistry Divn., DSIR, Private Bag, Petone.

## THE ROYAL AUSTRALIAN CHEMICAL INSTITUTE (R.A.C.I.) AND ITS DIVISIONS

At a point in time when closer economic relations (CER) between New Zealand and Australia have established a new climate of commercial cooperation, it is valuable to review the internal structure of the RACI and to identify steps which would facilitate closer scientific relations between the two countries. For members of the chemical community an obvious step in this direction would be to strengthen NZIC relations with the RACI. There are numerous ways in which relations could be enhanced in the short term (aside from complete institute amalgamation) including New Zealand representation on RACI committees, membersips of RACI Divisions, joint NZIC/RACI conferences and the holding of some of these joint conferences at New Zealand venues.

The RACI is governed by its Executive Council and thirteen associated Council committees (e.g. Charter and By-Laws, Qualifications, etc). The activities within the various states (N.S.W., Northern Territory, etc) are under control of eight Branch Committees. The specialist groups of the RACI are referred to as Divisions and generally include membership from all states. Each of these specialist Divisions has its own Committee and receives some financial support from the Institute. These Divisions are particularly vigorous in the major cities such as Melbourne and Sydney where it is not difficult to coordinate active groups of chemists with common specialist interests.

Typically, each Division may organize specialist national conferences, workshops, a programme of local lectures and even post-graduate level refresher courses on key topics.

The Division of the RACI incorporate the following specialist areas: Analytical Chemistry, Cereal Chemistry, Chemical Education, Colloid and Surface Chemistry, Electrochemistry, Environmental Chemistry, Industrial Chemistry, Inorganic Chemistry, Medicinal and Agricultural Chemistry, Organic Chemistry, Physical Chemistry, Polymer and Solid State.

There is already some New Zealand representation on the Division Committees with Professor Warren Roper (Auckland) on the Inorganic Chemistry Division Committee, Associate-Professor Graham Wright (Auckland) on the Electrochemistry Division Committee as well as my own membership of the Colloid and Surface Chemistry Division Committee. The membership and size of the Division Committees are an internal matter of each Division with some Committees being large and open-ended and others limited to a small formal set of office-holders. The current membership and office-holders for each Division Committee is given in Chemistry in Australia, January-February, 1990, p14. Members of the NZIC who wish to make contact with one of these specialist Divisions are advised to contact the appropriate Division Secretary whose name and address is incorporated in this list of the membership of the Division Committees.

A successful RACI Inorganic Chemistry Division Conference was held in the South Island some years ago and that Division is holding a second conference at Waikato University late in January, 1991. The Electrochemistry Division intends to hold its next conference in Auckland. Also the Organic Chemistry Division has indicated its interest in holding a future conference in New Zealand.

To illustrate the type of actvities within a Division. I will refer to those within the Colloid and Surface Chemistry Division. The 7th National Meeting of this Division was held as part of the Chemistry International Conference (which incorporated the Federation of Asian Chemical Societies Congress) in Brisbane in 1989. The Division also holds a Student Conference in which all verbal presentations are contributed by students and which is attended by senior academic and industrial scientists in the field. For the first time, several New Zealand students attended and presented papers at the Student conference held earlier this year at Camden (N.S.W.). Following that conference they had the opportunity to vsit various research laboratories. The Division plans to award a medal for outstanding achievement among the younger members within the Division. It also coordinates local membership and information for the International Association of Colloid and Interface Scientists (IACIS).

Ralph P. Cooney
(FNZIC,FRACI)

## THE ROYAL SOCIETY OF CHEMISTRY (U.K.)

On 31st December the Society had 41553 members of whom 7847 were outside the U.K. and Eire. The breakdown into grades is: Hon. Fellow, 61; Fellow, 7369; Member, 14045; Graduate, 4603; Licentiate, 5189; Student, 3414; Associate, 6872.

The President is Professor J.M. Ward and the Secretar-General is Dr J.S. Gow.

The Society has six divisions, each with its own president, secretary and treasurer. The Divisions, with 1989 membership numbers in brackets, are: analytical (7620); Dalton (inorganic)(1925); education (3180); Faraday (physical)(4016); industrial (10397); Perkin (organic)(4907). Within the divisions there are subject groups each with its chairman and secretary. Meetings, symposia and conferences are organised both by groups and divisions, and the Society has an annual congress and an Autumn meeting.

In Great Britain and Ireland there are 35 local sections each with its chairman and secretary. Local meetings and symposia are held, sometimes jointly with a division. There are 13 Overseas Sections (total membersip 3099) and there are local representatives in an additional 23 countries including New Zealand which has three representatives, Professors L.F. Phillips and R.J. Ferrier, and Dr J.E. Packer.

On paying the annual subscription to the RSC members can join two divisions free, and pay a small extra amount to be a member of further divisions.

The RSC has five Boards: Divisional Affairs; Professional Affairs; Publications and Information, Local Affairs, Qualifications and Education; and five committees; Benevolent Fund, Chemistry in Britain Management, External Relations, International and Membership Development. The Council of the RSC consists of Board Chairpersons, Divisional Presidents, National Members, Divisional Members, District Members, and Board and Committee Representatives; a total of about 45 members.

It can be deduced from this information that most of the scientific activity is carried out through the subject divisions which in many ways act as individual societies in organising meetings, symposia and conferences.

However the fact that each Division has two representatives on Council (a President and an elected member), and the strong central organisation (with full time Secretary General, Director of Information, Registrar, Secretary of Management Services, Scientific Secretary, Manager of New Publications, General Manager of Publications and General Manager of Secondary Services, plus 300 other full time staff) ensures that fragmentation does not occur, and the Society operates smoothly as a whole.

J.E. Packer
June 1990

# CHELATION THERAPY

## *(The Control of Metal Ion Concentration In Vivo)*

**S.E. Miller - Department of Chemistry, University of Canterbury**

The following paper is based on a Ph.D review seminar presented by Ms Miller to the Chemistry Department of the University of Canterbury in 1989. The seminar was very well received and earned her the award (conjointly with Ms Siew Tai Fong) of the Ralph H. Earle Jr. Seminar Prize, which is awarded annually for the best review seminar presentation given in the Department of Chemistry by second-year Ph.D. students.

Ralph H. Earle Jr. was a Post-doctoral Fellow in the Department around 1965. He has recently retired from a senior position with Hercules Corporation of Wilmington, Delaware and has continued to personally sponsor the above award (currently of $100 in value) since his time in New Zealand. His generosity has been continued as a gesture of thanks for the happy memories of his visit to the Department and also because of his strong belief that chemists should appreciate the importance of being able to verbally communicate their subject.

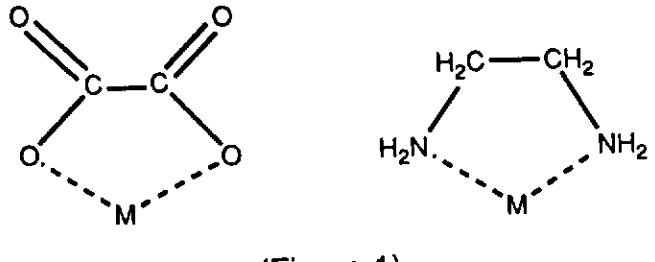
INTRODUCTION

Living organisms are finely-tuned, multi-metal multi-ligand systems,essential to which are alkaline and alkaline earth cations and trace amounts of first-row transition metal ions.[1] The *in vivo* concentrations of these metal ions are normally controlled within narrow limits, but if this physiological balance is disturbed by internal or external causes, disorders may result and the organism may no longer behave normally.[2]

If heavy metal ions are present in the body in excess, toxic effects can result from combination of the metal with one or more reactive groups essential for normal physiological function.[3] The heavy metals that today most commonly give rise to poisoning in humans are lead, mercury and iron.[2]

These are all "soft acids"[4] and bind to "soft bases", including proteinaceous groups such as thiol, sulphide, sulphydryl, amino and imadazole.[5] *In vivo* they displace essential metal ions such as copper and zinc from their normal binding sites. To be an effective antidote against metal poisoning a therapeutic chelating agent must compete with the binding sites of biomolecules for the undesirable metal ions. This requires that the reaction between the metal and the agent is rapid and that the compound formed is highly stable.

Chelation therapy is the oral, intravenous or intramuscular administration of a "chelating agent". It is often used to treat irregularities arising from an excess of metal ions.[5] A chelating agent is a ligand - a molecule that contains electron donating atoms (usually oxygen, nitrogen or sulphur),[6] which bind to the metal ion to form a complex. The term "chelation"[7] (from the Greek word "chele" meaning crab's claw) describes a type of complex in which the ligand contains at least two electron donating atoms and binds to a metal atom in such a way that at least one heterocyclic ring is formed (Fig.1).




(Figure 1)

The formation of such rings (especially five-membered ring) is accompanied by increased stability and resistance to substitution, known as the chelate effect.[8,9]

The intrinsic stability of a complex is quantified by the formation or stability constant $K_f$.[10] For the reaction

$$M^{m+} + L^{n-} \underset{}{\overset{K_f}{\rightleftharpoons}} ML^{(m-n)+}$$

the formation constant is:

$K_f = [ML^{(m-n)+}]/[M^{m+}][L^{n-}]$

where $L^{n-}$ is the chelating ligand

$M^{m+}$ is the metal ion and

$ML^{(m-n)+}$ is the complex ion

In the absence of other ligands, the fraction of the metal incorporated into complexes of the chelate is

$$F = \frac{K_f[L^{n-}]}{1 + K_f[L^{n-}]}$$

While formation constants do reflect an intrinsic strength of metal-ligand binding, a high $K_f$ value for a given complex does not necessarily mean that it will be formed *in vivo*. For example in aqueous solution, equilibria always involve competition with $OH^-$ ions[6] and the displacement of $H^+$ ions from ligands by metal ions which make the distributions of complex ions dependent on the pH of the solution. Other factors that contribute to species distributions *in vivo* include stability of the free chelating agent under biological conditions, the ratio of chelating agent to metal ion, competition from other metal ions and ligands, overall charge and lipophilicity and the rates of hydrolysis and chelate formation. As an example, the complex HgEDTA (EDTA = ethylenediaminetetraacetate) is highly stable ($K_f = 10^{28}$), but competition from common ligands in plasma (e.g. $OH^-$ and serum albumin for Hg(II), and $H^+$ and $Ca^{2+}$ for EDTA) means that there is virtually no binding Hg(II) by EDTA *in vivo*.[10,11]

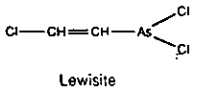
In addition to the purely chemical considerations above there are many other physical and biological requirements for a chelating agent to be an effective and useful antidote for metal poisoning. Both the chelating agent and the complex it forms with the metal must be less toxic than the metal ion itself. Neither the agent nor the complex should undergo significant metabolism and the complex should be water soluble to facilitate excretion (usually via the urine).[12] Finally, it is usually regarded as advantageous if the agent can be administered orally (for reasons of patient compliance) and binds specifically to one, or only a few, metal ions.

## 2. THERAPEUTIC CHELATING AGENTS AND THEIR USES

### 2.1 British Anti-Lewisite and Other Dithiols

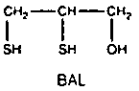
At the start of World War II it was believed that Germany would use the poisonous gas Lewisite - an organo arsenic complex (Fig. 2a). Lewisite acts on the exposed surfaces of the lungs and skin by deactivating the thiol groups of enzymes that metabolise pyruvate.[13] Peters, Stocken and Thompson, [14,15] who were asked by the British government to find an antidote to Lewisite, reasoned that the reaction with pyruvate oxidase could be reversed in the presence of other thiol containing molecules.[16] They selected 2,3-dimercaptopropan-1-ol (Fig. 2b) for testing because its adjacent thiol groups can form stable 5-membered rings with arsenic and remove it from its combination with the enzyme. The compound became known as BAL (British Anti-Lewisite) and was the first chelating agent with clearly demonstrated therapeutic properties to be used successfully in humans.

The action of BAL is schematically represented in Fig. 3.



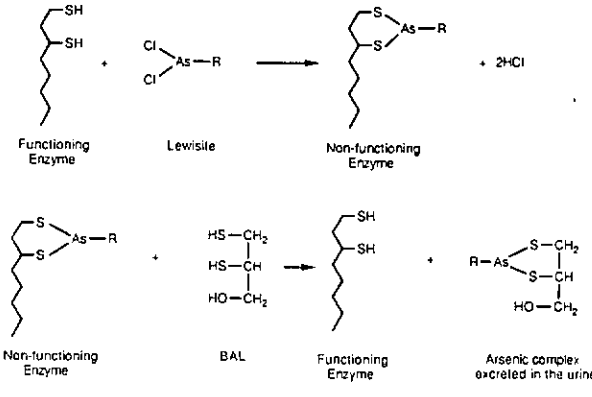
Lewisite

(Figure 2a)



BAL

(Figure 2b)




(Figure 3)

The resulting arsenic(III)-BAL complex is sufficiently water-soluble to be excreted in the urine. The degree of enzyme reactivation is found to diminish with time and therapy with BAL is most effective if provided early in the course of poisoning. This therapeutic principle applies to the clinical use of all chelating agents.[17]

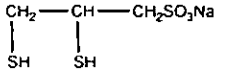
BAL has found use as an antidote not only for Lewisite gas but also for poisoning by arsenic, lead, mercury, strontium, gold and copper. Its main advantage is that it is lipid soluble and can therefore mobilise heavy metals after they have moved across a biological membrane and are no longer susceptible to attack by other chelating agents.[16] However, there are many disadvantages associated with the use of BAL.[3] These include rise in blood pressure, nausea, vomiting, headaches, burning sensations in the lips, throat and mouth, pains in the chest and hands, conjunctivitis, salivation, sweating, abdominal pain, occasional abcesses at the injection site and, an unpleasant garlic-like ordour that permeates the tissues of the patients. Toxic doses cause vomiting, tremors, convulsions and death.

Lipid solubility of the metal-BAL complexes can also lead to toxicity problems. There is grave risk when using BAL for poisoning by mercury or methylmercury [18-21] that the BAL complex may diffuse back into tissues leading to an actual increase in the amount of mercury in the brain. For pharmaceutical preparations, BAL is dissolved in peanut oil[3,6] and administered by injection (which can lead to problems of patient compliance).

Less toxic, water-soluble derivates of BAL have been sought.[16]

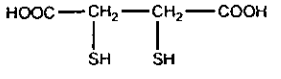
Two compounds of special interest are sodium 2,3-dimercaptopropane-1-sulphonate (DMPS;Fig. 4a) and 2,3-dimercaptosuccinic acid (DMSA;Fig.4b). Both are water soluble and can be orally administered. They have a lower toxicity than BAL and react with the same group of heavy metals.

DMPS has the disadvantage of being difficult and expensive to prepare, whereas DMSA is easier and cheaper to prepare (it costs about one quarter as much) and is among the least toxic of all the therapeutic chelating agents. Although it's clinical use is uncommon, DMSA appears to be the best compound presently available for clearing methylmercury from the mammalian brain.[22] It also forms very stable water soluble complexes with the radioactive ions of technetium, gallium and indium, and is employed in the form of such complexes as a constituent in radiocontrast agents.[23]



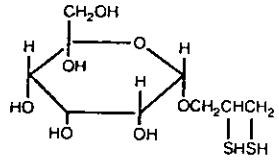
Unithiol (DMPS)

(Figure 4a)

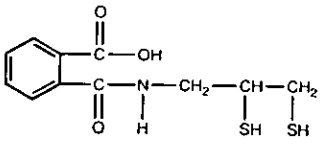


2,3-Dimercaptosuccinic Acid (DMSA)

(Figure 4b)



(Figure 4c)



(Figure 4d)

Several BAL derivatives have been synthesised for use in chelation therapy. Of these, BAL-glucoside (Fig.4C) appears to have some of the most promising properties. It is effective against arsenic,[24] lead[25] and cadmium[26] but is not commercially available.

Another derivative of BAL (also not commercially available) is N-(2,3-dimercaptopropyl)phthalamidic acid (Fig.4d), which is reported to be an antidote for lead and mercury poisoning.[27-29]

### 2.2 The Aminopolycarboxylic Acids

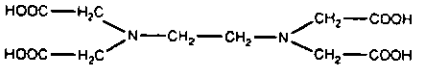
The aminopolycarboxlylic acids are a class of structure derived from amines by the successive replacement of N-H linkages by N-$CH_2COOH$[16] (Fig.5) They all possess a similar basic arrangement of oxygen and nitrogen donor groups which allows 5-membered chelate rings to be formed where both nitrogen and oxygen are bound to the same metal ion. By about 1950, the ability of these chelating agents to form stable complexes with most of the common metal ions was established and it makes this class one of the most useful groups of chelating agents. They undergo little, if any, metabolic changes in the body and have a very modest toxicity.

As a consequence of their lack of specificity, the aminopolycarboxylic acids must be administered as their calcium complexes to prevent rapid depletion of the free serum calcium concentration *in vivo*.[30] The calcium complexes are usually administered intravenously, and the complexed toxic metal ion is excreted via the urine.[31] This group of chelating agents is used in cases of poisoning by cadmium, iron, magnanese, lead, mercury, lanthanides and actinides.[13,16]

Ethylenediaminetetraacetic acid (EDTA;Fig. 5) was originally used as an antidote for lead poisoning[30,32,33] for which it is very effective and gives rise to comparatively few complications. However, its use has somedisadvantages. It must be administered intravenously as only small amounts of $Na_2CaEDTA$ can be absorbed via the gastrointestinal tract.[34] It does not act directly on the undesirable metal ion *in vivo*, but removes the metal ion from solution (serum) thus causing eventual release of the bound metal ion as the equilibrium is reestablished.[2] This means that treatment is long and drawn-out, and nausea, diarrhoea and fat kidney damage (due to large amounts of chelated metals passing through the renal tubule) are sometimes the consequence.[3,35,36]

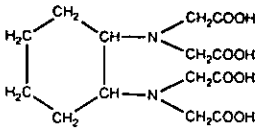
EDTA has also found use in fringe medicine where the disodium salt $Na_2H_2EDTA$ is used and it appears that the object of the treatment is to remove calcium from various parts of the

body. According to the New Zealand Chelation Therapy Society (NZCTS), the diseases that can be treated by this intravenous administration of $Na_2H_2EDTA$ are,[37,38] arteriosclerosis, cardiovascular disease, cardiac arrythmias, digitalis intoxication, sclerotic diseases, calcinosis, hypercalcemia, arthritis, circulation problems, senility, hypertension, heavy metal poisoning and complications of diabetes.



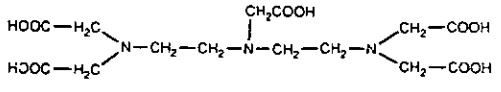
Ethylenediaminetetraacetic acid, EDTA

(administered as the $Ca^{2+}$ complex)



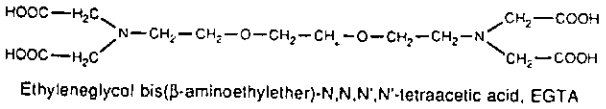
Cyclohexanediaminetetraacetic acid, CDTA

(administered as the $Ca^{2+}$ complex)



Diethylenetriaminepentaacetic acid, DTPA

(administered as the $Zn^{2+}$ complex)



Ethyleneglycol bis(β-aminoethylether)-N,N,N',N'-tetraacetic acid, EGTA

(Figure 5)

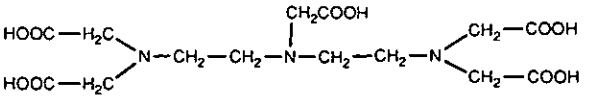
The mode of operation of EDTA in the treatment of these diseases is not entirely clear. For example the NZCTS claims that $Na_2H_2EDTA$ acts to lower blood calcium levels and that the parathyroid glands then work to maintain the level of blood calcium by dissolving it from plaques of cholesterol, fatty material, proteins and calcium in the artery walls. When calcium is removed, the plaque disintegrates and is carried away in the blood stream. However J. Sprott gives a different explanation in the November 1989 "More" magazine. He claims that it is metals such as mercury, cadmium, arsenic and copper as well as small amounts of calcium, rather than calcium on its own, that lead to the hardening and clogging of veins and arteries. Apparantly, "The EDTA removes these metals and facilitates the natural replenishment and oxygenation of cells forming the arterial walls, and ultimately permits an increased volume of blood flow to all organ tissues and cells."

In recent years, in orthodox medicine, EDTA has been replaced in many of its therapeutic applications by diethylenetriaminepentaacetic acid (DTPA;Fig.6a). DTPA forms complexes with the same types of metals as EDTA but with higher formation constants, and it is frequently found to be a more effective therapeutic chelating agent than EDTA. Initially the calcium salt of DTPA was used clinically but was found to have toxic side effects.[39,40] Its strong tendency to tie up zinc can lead to fetal mortality and congenital malformation[41] and it can impair the synthesis of DNA, RNA and proteins.[42]

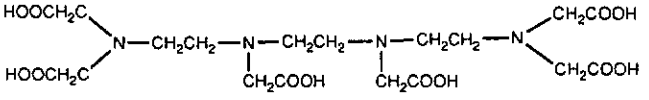
The zinc complex $Na_3ZnDTPA$ is now preferred due to its lower toxicity and the fact that it does not deplete serum calcium levels.[16,43,44]

DTPA was at one time the most effective known chelating agent for the removal of transuranium elements from human tissues, [45] one of it's most important applications being in the decorporation of plutonium.[12] There are special problems associated with poisoning by radioactive elements. Subsequent to their ingestion, many of the radioactive elements are gradually immobilised in the bone.[31,46] This immobilisation is one of the methods employed by the body to detoxify metal ions and it is largely successful for non-radioactive ions. However for radioactive ions, the process exposes the bone marrow and adjacent tissues to an enhanced level of radiation.

Many chelating agents have been investigated for their possible use in the total decorporation of radioactive elements from the body and in particular from the bone.[3,6,47] These include esterified versions of EDTA and DTPA and tetracatechols.[6] However, the most effective treatment so far discovered involves a combination of DTPA and triethylenetetraaminehexaacetic acid (TTHA:Fig.6b). TTHA on its own is also found to be an effective antidote for acute cadmium[48] and nickel[49] poisoning and is more effective than DTPA in removing $^{144}$cerium from bones (while DTPA is more effective in removing it from the liver).[47]



(Figure 6a)



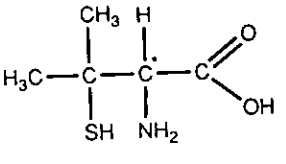
Triethylenetetraaminehexaacetic acid (TTHA)

(Figure 6b)

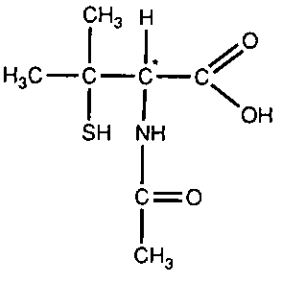
2.3 D-Penicillamine and Other Cysteine Derivatives

The basic structural feature of D-penicillamine and other cysteine derivatives is the combination of three different types of donor groups:[16]-SH,-$NH_2$ and -COOH (Fig.7). The coordinating ability of the combination is fairly general and such chelating agents form stable complexes with many toxic metals that prefer thiol groups as well as metals that prefer nitrogen and oxygen donors.

The cysteine group is of great biological importance and the mammalian body possesses enzymatic systems capable of transforming it quite rapidly. In order for chelating agents based on cysteine to be therapeutically useful, their structures must be modified in such a manner that the rate at which they are metabolised is reduced. The structural change that has been exploited most thoroughly is the one where two methyl groups are placed on the carbon that nears the thiol group, the simplest of this type of compound being penicillamine (Fig.7a).



(Figure 7a)



(Figure 7b)

D-Penicillamine (β,β-dimethylcysteine;Fig.7a) was introduced by Walshe[50] in 1956 for the treatment of the hereditary disorder Wilson's Disease (or hepatolenticular degeneration). In a patient suffering from this disease, copper accumulated in the liver, brain and kidneys and death finally results from cirrhosis of the liver.[6,51]

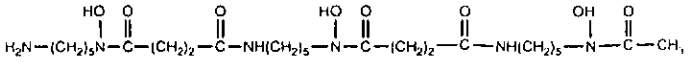
Advantages of D-penicillamine include its low toxicity and ability to be administered orally. These combined make it one of the safest and most satisfactory agents for the treatment of poisoning by copper as well as lead, mercury, gold and platinum.[16] In some individuals treatment with D-penicillamine results in an allergic reaction (fever and rashes) which precludes it's further use[52] and about 10% of patients develop an absolute intolerance.[53] When administered to individuals over a period of years, it can lead to disorders of the immune system.[54] Loss of

taste for salt and sweet have also been reported during treatment.[55]

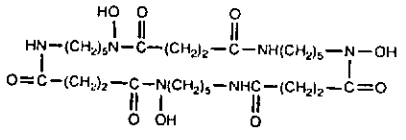
Many other compounds related to D-penicillamine have been studied, such as N-acetyl-D-penicillamine, (Fig.7b) which was introduced as an antidote for acute mercury poisoning in 1959.[56] Acetylation of the penicillamine molecule destroys most of the donor properties of the nitrogen atom but allows the resultant compound to penetrate cell membranes more readily. As a consequence, N-acetyl-D-penicillamine can remove mercury and methylmercury from tissues such as the brain more effectively than D-penicillamine.[57]

2.4 Chelating Agents for the Control of Iron Overload

Over millions of years living systems have developed some extraordinarily specific chelating agents to retain essential metal ions. Examples of such compounds have been isolated from bacteria and subsequently characterised and synthesised.[58-63]



Desferrioxamine B

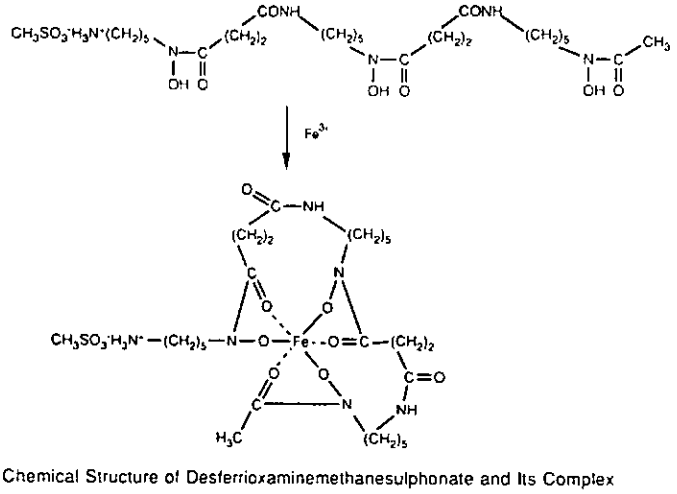


Desferrioxamine E

(Figure 8)

One such group of compounds are the desferrioxamines. These naturally occurring, iron(III) selective chelators were originally isolated from *Streptomyces Pilosus*.[3] They bind to iron(III) via hydroxamic acid groups to form very stable chelate structures (Fig.9).

Desferrioxamine B or "desferrioxamine" (Fig.8) has found uses in chelation therapy in the enhancement of iron excretion. The parent compound is not very soluble in water so the salt wth methanesulphonic acid (Fig.9) is used.[3,13] The chelation process is found to be quite selective for iron(III),($K_f=10^{30.6}$) and is coupled with a very low affinity for calcium ($K_f=10^2$).



Chemical Structure of Desferrioxaminemethanesulphonate and Its Complex With Ferric Ion.

(Figure 9)

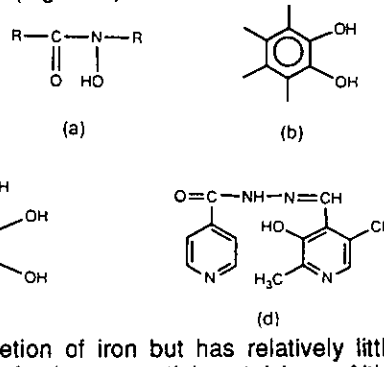
The conditions under which desferrioxamine B finds therapeutic use fit mostly into two categories.[3,13,16] The first of these is in iron storage diseases such as Cooley's Anemia, where regulatory mechanisms governing the body's iron uptake and excretion are not in balance. Before the clinical introduction of desferrioxamine B, there was no effective way of preventing an ultimately fatal accumulation of iron in individuals with Cooley's Anemia. The second is in cases where individuals (usually children) have ingested a large number of "iron pills" to constitute a toxic dose.

Desferrioxamine is readily excreted and does not mobilise or enhance the excretion of essential elements such as copper, zinc, manganese, magnesium or calcium. However, the desferrioxamine B-iron complex does turn the urine a reddish colour.16 Desferrioxamine B is not efficiently absorbed from the gastrointestinal tract and must be given intravenously. It is also subject to a combination of metabolic destruction and rapid excretion. In individuals suffering from iron storage problems as a result of transfusions, the use of ascorbic acid with desferrioxamine B considerably enhances the amount of iron excreted, although this rapid mobilisation of large amounts of iron can lead to cardiac dysfunction.[12,64]

Desferrioxamine B has two more major disadvantages. It is an extremely expensive drug to use on a long-term basis and is only effective in achieving negative iron balance when administered by subcutaneous infusion. This markedly reduces the quality of life and introduces the problem of patient compliance.[65]

The ineffectiveness of orally administered desferrioxamine B has led to a search for other chelating agents for iron(III). The donor arrangements that have been incorporated into these chelating agents include the hydroxamic acid groups (Fig.10a) and the catechol (orthodiphenol) structures (Fig. 10b), which are found in the highly selective compounds synthesised by microorganisms to extract iron(III) from their environment.[12]

Two compounds that can be administered orally are 2,3-dihydroxybenzoic acid (Fig. 10c) and pyridoxal isonicotinoyl hydrazone (Fig. 10d). The former increases the urinary and



(a) (b) (c) (d)

(Figure 10)

fecal excretion of iron but has relatively little effect on the excretion of other essential metal ions. Although it can be administered orally, its clinical use was disappointing with no obvious retardation of the rate of accumulation of iron(III) in the liver.[66] The latter compound is one of a series of closely related structures that mobilise iron(III) from the liver and spleen and enhance both the urinary and fecal excretion.[67]

2.5 Conclusion

Some very superior therapeutic compounds have been proposed for certain applications as chelating agents over the last 30 years but have been little used for a variety of reasons. Some are useful for detoxification in situations that arise only very rarely whereas others have been difficult to synthesise and are therefore of limited availability. Of the drugs that are available for clinical use as chelating agents, many owe their availability to their use for quite separate applications which have carried the costs of their introduction.

Chelating agents have been responsible for very significant advances in the treatment of most types of heavy metal poisoning within the last 50 years. The problems they give rise to are small in comparison with the enormous benefits they have provided to afflicted people. As to their use in the treatment of heart disease, the medical profession still remains highly skeptical, although research is currently underway in the U.S.A. (at Walter Reed Hospital) into their possible safe use for this purpose.

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# DEVELOPING PROFESSIONAL SKILLS IN CHEMISTRY UNDERGRADUATES - AN INITIAL STUDY

**Christopher M Kirk, Department of Chemistry, University of Waikato**

NOTE: The substance of this paper has been presented to the ASERA Conference (1988)[1] and subsequently published in the Proceedings of the Conference[2]

Chris Kirk is a Senior Lecturer in the Chemistry Department, School of Science and Technology, University of Waikato. He also directs the School's Technology Education and Liaison programmes which includes the BSc (Technology) and MSc (Technology) degrees. He is actively involved with Chemical Education research (in conjunction with the Science and Mathematics Research Centre) and developing Education - Industry collaboration through co-operative Education programmes. He is a member of the Technology for Business Growth Committee recently set up by the Foundation for Science, Technology and Research.

After graduating from the University of Canterbury, Chris worked at York and Otago Universities, Christchurch and Taranaki Polytechnics prior to shifting to the Waikato.

Chris has played representative cricket in each province and has being playing for "far too long".

## INTRODUCTION

In 1978 the Chemistry Department at the University of Waikato introduced an industry-orientated Bachelor of Science (Technology) degree. This four year programme includes the components of a normal Bachelor of Science degree integrated with additional vocationally-related courses and a total of twelve months of industrial experience. It was set up "to meet the needs of students who have an interest in an industry/applied career in chemistry and to meet the demands of employers for graduates with some working experience in such courses".[3]

To extend awareness of the employer's perspective, an investigation into the needs and expectations of industrial employers was undertaken. The main aim was to identify the professional skills and attributes employers look for in new chemistry graduates. It was intended that this information could then be used to design a wider investigation of the skills required by professional chemists and of the role of university degree courses in developing these.

This report contains the main outcomes of this initial study.

## PROCEDURE

A "naturalistic" approach[4] involving detailed interviews with a limited number of subjects was adopted for this project. (This methodology is commonly used in science education research). Selected industrial plants and laboratories were visited and audiotaped discussions were held with appropriate personnel (Chief Chemists, Technical Managers, etc) on a range of issues relating to tertiary chemistry courses and the needs of the workplace. Background material was supplied well in advance of these interviews. Emphasis was placed on how well prepared (first degree) graduates were to meet "chemistry in the real world" and, in particular, on identifying skills or knowledge areas in which graduates seemed to be inadequately prepared. Interviews occupied approximately 40 minutes.

The industries chosen for these discussions represented a cross-section of the New Zealand chemistry scene. All employed chemistry graduates. Thirteen sites were visited and 21 in-depth interviews were carried out. it should be noted that the term "industry" is used here to denote any area outside of the educational sector from Government research laboratories to privately owned companies.

## ANALYSIS OF DATA

Analysis and presentation of the information obtained was carried out by trascribing the audiotapes, analysing for the main issues raised, then grouping these issues into general areas.

The professional qualities thus identified by the employers as being desirable for graduates to possess upon entering a chemistry-based workplace can be grouped into 5 broad categories. A summary of the major issues within each category is given below along with a brief commentary. It has to be recognised that in a study of this kind, the views expressed result from a wide diversity of backgrounds and experiences and inevitably reflect a range of often conflicting opinions. Since the context in which individuals saw issues add an important reality and richness to the view expressed, extensive use has been made elsewhere[5] of direct quotatons (in italics) to present viewpoints in their true perspective. Only a few examples are included here.

### 1. Issues Associated with Analytical Chemistry and Quality Results

Summary

The major issues identified were the need for improved:

- analytical skills
- understanding of analytical methodology
- data handling and interpretative skills
- awareness of the implication of quality assurance for analytical methods/results

Comment

Disappointment at the level of manipulative analytical skills, from the very basic (use of a pipette was a favourite) through to maximising instrument performance, brought considerable comment. It appears that, after three years of tertiary chemistry, many graduates are not able to perform basic laboratory techniques adequately. *"...often have very poor practical skills like how to use a pipette. We really have to take them through a basic laboratory skills programme for the first few weeks."*

The point was made that if graduates are to be placed in charge of groups of technicians it is essential that they know and understand the correct technique and why it is important. They need to be able to check, trace and indentify problems associated wth analytical methodology.

It was felt that many graduates lack a real "feel" for the principles and underlying difficulties of performing accurate analysis and for the general applications and limitations of analytical methods and instrumentation.

*"Time and time again we find new graduates joining us who have a general familiarity with techniques, with what they will do, but they do not have a very good familiarity with the way that you really have to tread very cautiously and check perhaps nearly every stage when doing an analysis that might have gone wrong."*

It was also suggested that graduates are generally unaware of the role and importance of standards in industrial analyses and that they are not familiar enough with the standard reference method texts of analytical chemistry. Pleas were made for full recognition of the value of analytical chemistry as a specialty area in it's own right,rather than treating it as a service course. The importance of being able to handle analytical data and to interpret it was stressed repeatedly. The need for improved familiarity with microprocessor/computer systems (not programming) and the application of basic statistics to obtain useful interpretations from cumulative data were emphasised.

### 2. Issues Associated with Communication

Summary

The major issues were identified were the importance of:

- report writing skills
- general communication (and people) skills
- group-working skills

Comment

Report-writing skills received a great deal of negative comment. From this it would appear that for any course aiming to "meet the demands of employers", careful consideration should be given to the education opportunities to develop this skill (cf. positive comments made about this aspect of Chemical Engineering education).

*"Many chemistry graduates are not good at writing reports. Their English is often poor and they appear to have had little experience or practice in report-writing. Our chemical engineers on the other hand are better trained in this area when they arrive."*

It was claimed that graduates are generally unaware of how to write reports that are reader-orientated, contain clear interpretations of data and results, are logical and well presented, and include a concise summary.

Perhaps most disturbing were the assertions that current chemistry degree programmes are actually a disadvantage in developing report-writing skills.

*"With report-writing, graduates start well behind people who have not been to university (that is, it is an actual disadvantage). It is because they are taught to be too self-centred and their orientation is all wrong. Their focus is on what I am writing, what I have done, what I have found interesting, what my theories are, whereas in fact the report should be addressed to what the reader needs to know, what are the most important things for him, what is relevant to him - and these two approaches are not the same usually. So (graduates) have a lot of trouble. It is obvious why they have been taught to focus on themselves - they are being examined on what they have done and what they have learnt, but I do not give a damn about that when someone is working for me. What I want to know is: what are the answers, what action do we need to take, and also I want to know in words I can understand. So for that reason, I think they do start at a disadvantage, and this is a reasonably wide-spread opinion too."*

The importance of communication in general (and oral in particular) in the workplace was repeatedly stressed. It was emphasised that there is little point in knowing or doing "chemistry things" unless the information can be passed on effectively.

3. Issues Associated with Problem-Solving

Summary

The major issues identified were the need for:

- an ability to look up information, to use data bases, to carry out computer searches
- an introduction to various strategies for problem-solving
- an awareness of time and cost constraints, approximate vs complete solutions
- some practive at solving "real" problems, evaluating choices and making decisions.

Comment

Solving problems is a major function for many chemists in industry. The type of problem-solving referred to here is the process of finding a solution (or a range of solutions) to the real problems that a professional chemist is often confronted with. Usually the solving of such problems calls for the development of a strategy rather than just the application of known procedures. It appears that current chemistry courses, for all their worked examples and problem sheets, do little to enhance the development of broader problem-solving skills. These are considered particularly valuable and relevant to the education of applied chemistry students.

Several suggestions were made on how to promote these broader problem-solving skills. For example, being familiar with a range of problem-solving strategies, adopting a broad overview as well as the specialist detailed approach, appreciating the realities of time and cost pressures and the appropriateness sometimes of quick and approximate solutions (cf. the complete answer) were mentioned. In particular, the opportunity to have some experience in dealing with the "industrial" type of problem (rather than "pure" chemistry problems only) was commented on.

Another important skill related to problem-solving is the ability to use efficiently relevant library sources, data bases, etc. to gather information pertinent to an investigation. While some graduates were reasonably proficient, the need for opportunities to develop this ability were emphasised.

4. Issues Associated with Management

Summary

The major issues identified were the need for some introduction to:

- project management skills
- the role and importance of industrial economics
- laboratory management
- general people skills

Comment

The discussions suggested that, for both graduate and employer, an introduction to selected management and related skills would be desirable. Very little, if any, exposure to these areas appears to be available in a traditional chemistry degree. The topic areas suggested as being valuable for any chemistry graduate to have had an introduction to included:

(a) Project Management: an introduction to evaluating projects before undertaking them and during their progress.

(b) Economics/Business Management: an introduction to industrial economics, balance sheets, cash flows, etc.

(c) Laboratory Management: an introduction to selected activities associated with routine laboratory management, such as ordering equipment and chemicals, safety aspects, organising and planning, people interaction.

(d) Interpersonnel Skills: an introduction to the general area of interacting with people (given high priority by industry).

5. Issues Associated with Learning at University and the Transition to Industry.

Summary

The major issues identified were:

- traditional values of university education
- adequate levels of knowledge of general academic chemistry
- need for awareness of differences between university and industry chemistry
- miscellaneous topics for inclusion in applied study programmes

Comment

It is worth noting that the qualities traditionally associated with a university education - the ability to learn, to think logically, etc - were favourably commented on and are still considered important.

Generally, employers found little fault with the level of academic chemistry knowledge possessed by graduates (cf. practical skills above). Employers did not expect graduates to have a detailed knowledge about their own specific industry or products and generally found new graduates well capable of learning the specific new chemistry "knowledge" relevant to that employment.

However, it was suggested that some awareness of the differences between the role of a chemist in a university setting and in industry would assist in the transition from student to professional chemist.

A number of additional topic areas were considered important enough to be recommended for inclusion into courses preparing graduates for industrial careers[5].

DISCUSSION

The main purpose of this report is to present the data gathered in this investigation in some ordered way. It is not considered an appropriate forum for a full discussion of the many and complex issues associated with the "university-industry interface" that this study impinges on.

From the limited data gathered, there appears to be a considerable mismatch between those professional qualities desired in graduates by industrial employers and those generally found at present. It is clear that in addition to a knowledge of the facts, theories and techniques of modern chemistry, a professional chemist is expected to have numerous other qualities.

From both the employer's and the graduate's point of view, the ability to achieve results is probably the most important attribute a newly-graduated chemist can bring to the workplace. The evidence indicates that to do this a wide spectrum of qualities is needed:

- those which relate to specific knowledge and skills (eg devising a synthetic method, using an instrument, reading the literature)

- those which are more generalised (eg problem-solving, decision making, ability to learn, communicating, planning, working in a team)
- those which relate to attitudes (eg confidence, commitment, enthusiasm)

Questions immediately arise as to the extent these qualities should be developed within the formal education system and how much they should be learned on the site of employment. It appears from the views expressed in this study that currently there is a very considerable learning curve for graduates in their first jobs. What would shorten this? What is important for the longer-term professional development of the graduate?

In searching for general reasons for the perceived mismatch (from the employer's viewpoint) between desired and achieved qualities, some general comments may be made. For instance, the notable lack of criticism of 'knowledge' in the traditional content areas of the academic subject 'Chemistry' was significant. University Prescriptions indicate that in most chemistry courses, the majority of effort and achievement (by staff and students) is weighted heavily towards 'knowledge'. Knowledge is important - skills have little value unless they are combined with chemical knowledge. It may be considered by some that knowledge is so important that there is insufficient time to develop other professional qualities (to any significant extent). But does the teaching of 'knowledge' need to be at the expense of developing other professional skills and attitudes, or are there methods of teaching that can encourage the learning of 'skills' and 'attitudes' at the same time as 'knowledge' (and vice versa)?

Another notable (and unexpected) feature of the opinions found in this investigation is that they seem to question the common assertion that the study of chemistry develops problem-solving and decision-making skills. It is suggested that current chemistry courses may do little to help with problems where the solution calls for the development of a strategy rather than just the application of known procedures. Could the use of alternative teaching approaches or alternative types of problems enhance the development of these wider problem-solving skills - and perhaps involve aspects of decision-making and innovative thinking as well?

From such considerations a number of general questions arise - for instance:

1. Where does responsibility lie for developing specific professional qualities?
2. Should these professional qualities be addressed only by industrial/applied chemistry courses?
3. Can skills and attitudes only be developed at the expense of chemical knowledge?
4. Are there alternative teaching and learning strategies by which more emphasis could be given to developing skills and attitudes in traditional chemistry courses?

CONCLUSIONS

The limited data gathered in this pilot study suggests there may be a considerable mismatch between those professional qualities desired by industrial employers and those they generally find in new chemistry graduates. The issues raised seem sufficiently important to warrant a wider investigation. The data found in this initial study has been used to design a more detailed survey in a second phase of this project. It has also been used to develop some alternative teaching approaches in undergraduate chemistry courses. Results from these projects will subsequently be reported.

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3. ANON (1980) Chem NZ, 44,232
4. COHEN, L & MANION, L (1980) Research Methods in Education , Croom-Helm, London
5. KIRK CM (1987) Report on Developing Professional Skills in Chemistry, Department of Chemistry, University of Waikato, New Zealand.

# ANNUAL REPORT FOR 1989/90

Once again the annual report on Institute affairs is presented.

Secretariat

The Secretariat is now firmly established in Wellington and the Executive Officer has been busy setting up new office routines to fit in with those of IPENZ from whom we get secretarial help. A monthly newsletter to Branches has been initiated giving information, detailing matters for discussion at Branch level and setting out deadlines by which information should be received. The Procedures Manual has been rewritten and distributed to Office Holders in Branches and Specialist Groups. Attention is still being paid to the membership list to ensure that it is correct but even after considerable effort errors and omissions continue to surface. Address changes received by the secretariat are up-dated on a daily basis.

Chemistry in New Zealand

During the last twelve months we are grateful to those members who have helped with production of the Journal. Mr Ron Hall was appointed as the new editor in August 1989 but later in the year he left New Zealand on an extended overseas trip. Dr Bernie Swedlund stepped into the breach for several issues but he too had planned an overseas visit from mid-April. We were fortunate to have persuaded Dr Tony Herd, a previous editor with the assistance of Dr Roger Whiting, to help us out for the June and August issues. We are most appreciative of the efforts of these members in keeping the Journal operational. Ron Hall returns to NZ shortly and will pick up the reins once more.

Education, Training and Research

The Institute continues to take an active interest in education. Production of CHEMZ, the publication for secondary school teachers, has been transferred to Canterbury Branch who will now be responsible for it. The Secretariat will assist by seeing to its printing. Branches around the country have mounted their own individual programmes and these activities have been reported in the Journal, from time to time. Members of the Auckland Branch have recently re-established the Education Sub-Committee of the Institute with Associate Professor John Packer as Convenor.

The Authority for the Accreditation of Vocational Awards (AAVA) has been replaced by the NZ Qualifications Authority (NZQA) with five categories for it's activities. The Institute was asked to provide nominations for these and this has been done, but at the time of writing, the success or otherwise of these nominations is not known. We are grateful for the efforts put in to AAVA over many years by Mr Walter Freitag, the Institute's representative on this body.

During the 1989/90 year the Foundation for Research, Science and Technology was established by the government and nominations from the Institute for this were also sought. It is pleasing that one of our members, Professor Ian Watson, was selected to serve.

The needs and nature of the Environmental and Hazardous Chemical Committees are being re-assessed. We are grateful to the members of these committees and their convenors Professor Richard Laverty and Dr John Love, both of whom are stepping down, for their efforts. We are appreciative of the work done by other sub-committees, particularly the Membership Committee, and Council Representatives on other organisations.

Specialist Groups

Activities within the ten specialist groups has varied with some organising successful seminars over the past 12 months. One change is that the former Thermodynamics group has been assimilated into the new Physical Chemistry group. Eventually the Electrochemists will join as well but this will not occur until after the International Conference on Electrochemistry planned for the beginning of 1992.

***Cont. on page 96***

# NEW ZEALAND INSTITUTE OF CHEMISTRY INC.
# CHEMICAL EDUCATION TRUST
# FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 APRIL 1990

## INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 30TH APRIL 1990

| | | | Last Year |
|---|---|---|---|
| **INCOME** | | | |
| Interest Received | 4,067 | | 5,897 |
| | | 4,067 | 5,897 |
| **EXPENDITURE** | | | |
| Administrative Expenses | 77 | | 319 |
| General Expenses | 248 | | - |
| | | 325 | 319 |
| **NET INCOME** | | 3,742 | 5,578 |

### NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30TH APRIL 1990

**STATEMENT OF ACCOUNTING POLICIES**

1. **General Accounting Principles**
   The general accounting principles recognised as appropriate for the measurement and reporting of earnings and financial position on an historical cost basis have been followed by the business.
   Accrual accounting is used to match revenue and expenses.
   Reliance is placed on the fact that the business is a going concern.
2. **Particular Accounting Policies**
   The following particular accounting policies which materially affect the measurement of earnings and the financial position have been applied:
   - Investments have been stated at cost or, where applicable, with the addition of interest compounded to date. A small distribution from Equiticorp Holdings Ltd (In Receivership) has been credited to capital against previous writedown.
   - These accounts have been prepared on a G.S.T. inclusive basis.
3. **Changes in Accounting Policy**
   - The accounting policies have not changed since last year.

### BALANCE SHEET AS AT 30TH APRIL 1990

| | | | Last Year |
|---|---|---|---|
| **TRUST FUNDS** | | | |
| Balance at the Beginning of the Year | | 32,687 | 40,783 |
| Donations Received | | 827 | 7,325 |
| Writedown of Equiticorp Holdings Ltd Debenture | | - | (20,999) |
| Equiticorp Distribution | | 735 | - |
| Undistributed Income for Year | | 3,742 | 5,578 |
| | | 37,991 | 32,687 |
| **REPRESENTED BY:** | | | |
| **CURRENT ASSETS** | | | |
| Interest Accrued | 731 | | 310 |
| Bank of New Zealand Current Account | 1,699 | | 8,376 |
| B.N.Z. Autocall Account | 8,048 | | - |
| | | 10,478 | 8,686 |
| **FIXED ASSETS** | | | |
| **INVESTMENTS** | | | |
| A.G.C. Ltd Debenture 17% Due 22/09/89 | - | | 15,000 |
| Equiticorp Holdings Ltd (In Receivership) | 1 | | 1 |
| A.G.C. Ltd Debenture 13.5% Due 07/11/91 | 9,000 | | 9,000 |
| N.Z. Govt. Stock at Cost 12.7% Due 15/07/92 | 18,512 | | - |
| | | 27,513 | 24,001 |
| **TOTAL ASSETS** | | 37,991 | 32,687 |

These accounts should be read in conjunction with the attached notes.

**AUDITORS REPORT**

We have audited the financial statments of the New Zealand Institute of Chemistry Chemical Education Trust in accordance with accepted auditing standards, and have carried out such procedures as we considered necessary.

In our opinion, the financial statements give a true and fair view of the financial position of the Trust as at 30th April 1990.

**MARKHAM AND PARTNERS**

Chartered Accountants

# THE NEW ZEALAND INSTITUTE OF CHEMISTRY (INC)

# FINANCIAL STATEMENTS

### BALANCE SHEET AS AT 30TH APRIL 1990

| | | | | Last Year |
|---|---|---|---|---|
| **CAPITAL FUNDS** | | | | |
| Balance at the Beginning of the year | | | 36,862 | (432) |
| Less Net Loss | | | 5,148 | (37,294) |
| Development Fund | | | 46,699 | 46,699 |
| Easterfield Account | | | 567 | 567 |
| | | | 78,980 | 84,128 |
| **REPRESENTED BY:** | | | | |
| **CURRENT ASSETS** | | | | |
| Petty Cash on Hand | | 25 | | 941 |
| Prepayments: Re Future Conferences | | 1,000 | | 1,000 |
| Accounts Receivable | | 13,961 | | 19,862 |
| Prepaid Travel Acocunt | | 1,372 | | 3,795 |
| Subscriptions in Arrears | | 19,410 | | 2,123 |
| Bank of New Zealand Current Account | | 10,907 | | 12,546 |
| B.N.Z. Autocall Account | | 62,777 | | 27,171 |
| N.Z.I. Bank | | - | | 28,769 |
| Interest PAYE | | 172 | | - |
| Stock of Wallcharts on Hand | | 24 | | 24 |
| Stock of Ties & Scarves on Hand | | 3,339 | | 3,339 |
| | | | 112,987 | 99,570 |
| **FIXED ASSETS** | | | | |
| Office Equipment | 582 | | | 582 |
| Less Accumulated Depreciation | 209 | | | 116 |
| | | 373 | | 466 |
| Presidential Chain | | 360 | | 360 |
| | | | 733 | 826 |
| **INVESTMENTS** | | | | |
| Equiticorp $21,000 Debenture | | 1 | | 1 |
| Lyttleton H.B. Stk. 6.25% 1998 | | 500 | | 500 |
| | | | 501 | 501 |
| **TOTAL ASSETS** | | | 114,221 | 100,897 |
| **CURRENT LIABILITIES** | | | | |
| Subscriptions in Advance | - | | | 984 |
| Goods and Services Tax | 5,379 | | | 4,860 |
| Accounts Payable | 29,862 | | | 10,925 |
| | | 35,241 | | 16,769 |
| **TOTAL LIABILITIES** | | | 35,241 | 16,769 |
| **NET ASSETS** | | | 78,980 | 84,128 |

These accounts should be read in conjunction with the attached notes.

### INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 30TH APRIL 1990

| | | | Last Year |
|---|---|---|---|
| **INCOME** | | | |
| Subscriptions from Members | | 109,034 | 96,750 |
| Publication Sales | | - | 1,042 |
| Sale Ties and Scarves | | - | 39 |
| Periodic Table Wallcharts | | - | 24 |
| Conference Surplus 1989 | | 11,698 | 12,976 |
| Chem 13 Exam Fees | | 2,743 | - |
| Chem Education Subscriptions | | 425 | - |
| I.U.P.A.C. | | 145 | - |
| Interest - BNZ | | 6,960 | 3,155 |
| Interest - Local Body Stock | | 31 | 31 |
| Interest - NZI | | 587 | - |
| | | 131,623 | 114,017 |
| **EXPENDITURE** | | | |
| Accountancy/Audit Fees | 2,099 | | 2,300 |
| Accommodation Expenses | 3,638 | | - |
| Ballot Costs | 1,125 | | 398 |
| Branch Expenses - Capitation Fees | 14,010 | | 14,514 |
| Branch Expenses - Student Travel | 3,000 | | 2,805 |
| Chem 13 Expenses | 508 | | - |
| Computing, Address Labels etc | 1,856 | | 1,301 |
| Conference Registrations | 734 | | 1,280 |
| Depreciation | 93 | | 116 |
| General Expenses | 6,654 | | - |
| Honoraria & Allowances | 1,405 | | 8,267 |
| Interest and Bank Charges | 542 | | - |
| Journal - Publisher | 25,876 | | 18,014 |
| Journal - Editor | 1,800 | | 1,123 |
| Publication - Chemistry in N.Z. | - | | 1,052 |
| Sundry Publications for Resale | - | | 797 |
| National Chemist Day Expenses | 519 | | - |
| Overseas Visitors Expenses | 500 | | 1,400 |
| Printing, Stationery, Postage | 7,233 | | 5,674 |
| Prizes | 1,520 | | 100 |
| Rent to I.P.E.N.Z. | 2,689 | | 2,095 |
| Secretarial Services | 9,980 | | - |
| Salaries | 27,062 | | - |
| Secretarial Set-Up Costs | 2,275 | | 1,700 |
| Subscriptions | 5,131 | | 847 |
| Survey Expenses | 3,000 | | - |
| Telephone & Fax Charges | 1,478 | | - |
| Travelling Expenses - Internal | 10,297 | | 12,940 |
| Travelling Expenses - External | 1,747 | | - |
| | | 136,771 | 76,723 |
| **NET LOSS** | | 5,148 | (37,294) |

These accounts should be read in conjunction with the attached notes.

### NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30TH APRIL 1990

**STATEMENT OF ACCOUNTING POLICIES**

1. **General Accounting Principles**
   The general accounting principles recognised as appropriate for the measurement and reporting of earnings and financial position on an historical cost basis have been followed by the business.
   Accrual accounting is used to match revenue and expenses.
   Reliance is placed on the fact that the business is a going concern.
2. **Particular Accounting Policies**
   The following particular accounting policies which materially affect the measurement of earnings and the financial position have been applied:
   - Accounts receivable are stated at their estimated net realisable value.
   - Inventories have been stated at the lower of cost or net realisable value on a FIFO basis.
   - Fixed assets are stated at cost less aggregate depreciation. Depreciation has been calculated using the maximum rates permitted by the Commissioner of Inland Revenue and these are considered appropriate.

   The rates used are as follows:
   Office Equipment 20% DV
   - These accounts have been prepared on a G.S.T. Exclusive basis.
   - Investments are stated at cost or, where applicable, with the addition of interest compounded to date.
3. **Changes in Accounting Policy**
   - The basis of depreciation has changed from the straight line basis to the diminishing value method.

**AUDITORS REPORT**

We have audited the attached Financial Statements in accordance with accepted audditing standards and have carried out such procedures as we consider necessary.

In common with other organisations of a similar nature control over income prior to its being recorded is limited and there are no practical audit procedures to determine the effect of this limited control.

We have not sighted membership or subscription records and have received the Treasurer's certificate regarding subscriptions in arrears.

In our opinion the Financial Statments give, subject to the notes to the accounts, a true and fiar view of the financial position of the Institute as at 30th April 1990 and the results of its activities for the year to that date.

**MARKHAM AND PARTNERS**
Chartered Accountants

## ANNUAL REPORT

*continued from page 94*

At the February 1991 Council the First Vice-President, Dr Harry Percival was asked to contact all the specialist groups with a view to determining what support and services are appropriate for the Institute to be giving them. It is hoped that better communication between Council and specialist groups will result. .

Development Plans

Branch committees have been asked to consider directions in which the Institute should be heading and although some replies have been received comments are still to come from others.

A number of members have been concerned that the Institute should have a much closer relationship with our Australian counterpart, the Royal Australian Chemical Institute, although opinions differ on the extent to which this should occur. As a first step in this direction the RACI has formally recognised the equivalent status of Institute members as far as registration at Conferences under their auspices is concerned. The Institute has reciprocated. As well, it has been formally agreed that there will be an interchange of news items for the respective Journals of the two organisations.

As a step in strengthening professional aspects of the Institute, a register of expertise and interest is planned and information on members has been sought for this. Mr Stan Winter, the second Vice-President has been instrumental in organising this. Limited information regarding the specialist groups to which members elong is already available and the new database will be an extension of this. Initially, only a relatively modest amount of information will be included.

Recruitment

The Institute is continually in need of new members, particularly in the younger age groups. Tertiary students have been targeted and it is pleasing that recruitment efforts have been successful here with 27 names being added to the membership role. In other grades there has been a steady trickle of new members in both corporate and non-corporate classifications. However, at the same time it is sad that we have also lost members.

Finance

Considerable attention has been focussed on the Institute's finances and ways of pruning expenses have been sought. A breakdown of expenditure has been given in an earlier issue and will not be repeated here. Rising costs have not been easy to assimilate and have resulted in this year's subscription rise. Unfortunately the financial constraints have not allowed us to promote as many programmes as we would wish, particularly in the education area.

There has been a need to restrict activities for the moment but this is, we hope, only a temporary measure.

Many members have freely devoted their time and energies in organising seminars, science fairs, school visits and other professional activities. Their efforts are much appreciated. It is these voluntary programmes that bring credit on the Institute and make it more visible in the community. The job of Council is to aid and direct these tasks but it is the members in the Branches who are the Institute and who are responsible for its vitality and reputation.

J M Waters
President

# Cosmetic Chemists Present Chroma Meter to Auckland Institute of Technology

On the evening of the 17th July a group of New Zealand Society of Cosmetic Chemists gathered at Auckland Travelodge to present a Minolta Chroma Meter to Auckland Institute of Technology Chemistry Section. The Chroma Meter was purchased for Auckland Institute of Technology using funds received from the International Federation of Societies of Cosmetic Chemists for the Lester Conrad Award. The Lester Conrad Award is granted by IFSCC to member societies for work done in developing education in cosmeticology. The 1989 award was won by the New Zealand Society of Cosmetic Chemists in response to their involvement in courses set up at Auckland Institute of Technology by Roger Whiting. The courses developed are Cosmetic & Manufacturing Chemistry for technologists in the cosmetic, toiletries and pharmaceutical manufacturing industry and a Compounders and Process Operator course for factory floor personnel. Both these were areas in which the Society had identified a lack in existing courses in chemistry.

The decision to purchase a Chroma Meter for the award was based on the rapid growth in interest in this technique shown by a wide range of industries. Chemiplas, who supplied the instrument, report that companies from diverse fields are starting to use Chroma Meters. These fields range from assessing whether biscuits are suitably brown coming out of the oven, matching paints in restoration of paintings, measuring colour loss in fabrics after washing and even to measurement of erythoma in sunburn studies.

In the Institute of Technology the meter will find use in courses on paints, printing, graphic art and textiles besides the cosmetic courses. Local industry will also be able to hire the instrument to use either in-house or at ATI. This will allow the industry to gain familiarity with the technique and to assess its usefulness to their operations.

*Mark Russel (right) President NZSCC, presents the Chromameter to Ian Shearer, Dean of the Faculty of Science and Engineering, ATI.*

The meeting was addressed by the Rt. Hon. Ian Shearer - Dean of Faculty of Science and Engineering at ATI, who thanked th society for their generosity and committment to the training of the coutry's youth. He also spoke on the role of University's and Polytechnics and their relaitonship to

# OVERSEAS CONFERENCES

IUPAC International Symposium Polymer 91

10-15 February 1991, Melbourne

An international symposium with a central theme of polymer research and technology. For further information contact Dr G.N. Guise, Polymer 91 Secretary, P.O. Box 224, Belmont, Victoria 3216, Australia.

Hightech '91

Exhibition and seminar to be held in Thailand 15-21 January 1991

The intention of the exhibition is to give the "vision of the future".

In the main, it will cover computers, material science and biotechnology and will be targeted at ASEAN members. Input, however, is required by the International Community.

The organisers wish to emphasise that any commercial organisation exhibiting at "Hightech '91" should include their latest model or even a concept model. This differentiates the conference from the conventional trade fair but nevertheless presents trading opportunities.

The floor area devoted to the exhibition covers 4,000 square metres plus an additional 400 square metres dedicated to the sole use of Chulalongkorn University. Booth sizes are 3 by 3 metres and cost 60,000 baht (approximately NZ$4,000).

For further information Hightech '91, office of the Vice Rector for Research Affairs, Chulalongkorn University, Pyathai Rd, Bangkok 10330, Thailand.

ACHEMA 91

ACHEMA 91, the 23rd Exhibition Congress and International Meeting on Chemical Engineering and Biotechnology, will take place in Frankfurt am Main from 9 to 15 June 1991.

For further information contact: Dechema, Postfach 970146, D-6000, Frankfurt am Main 97.

## Dialog Challenges ACS

Dialog Information Services has notified its users that it intends to ask a federal court to order the American Chemical Society to give it access on fair and reasonable terms to the CAS on-line database. Dialog will argue that despite $15 million government subsidies for the establishment of CAS online the Society has used its control over the database to put Dialog at an unfair competitive disadvantage.

# NEWS FROM ROUND & ABOUT

DSIR Restructures

Ilam DSIR Campus:

The Wheat Research Institute, now part of DSIR Crop Research will be relocating at the end of this year to the Lincoln Campus with the rest of Crop Research. WRI has also undergone a name change to the Grain Processing Laboratory.

Manawatu

On July 1st, DSIR Biotechnology Division was disbanded. NZIC embers have been transferred into DSIR Grasslands, Fruit and Trees and Plant Protection Divisions.

Canterbury

In June the Branch visited the Southern Industrial Development Division DSIR.

The meeting was informed and entertained by Dennis Hills of SIDD who likened the history of the organisation to that of Lincolns' axe - the one with four new handles and three new heads! In July, SIDD changed both director, with the retirement of Dennis O'Brien, and name with the DSIR restructuring. DSIR Industrial Development, as it is now called is onto its third and fourth directors and name, respectively.

The meeting continued with an extensive tour of the laboratories and workshops including, The Consumer Product Testing Laboratory of Consumer Magazine fame. This weeks test was the microwave "mozzarella cheese" test! The High Voltage Testing lab with bullet proof glass and mega watts of hair raising, near miss stories. And an automated, laser scanning, high pressure, water cutting, fish filleting machine!

The Canterbury Branch Committee thanks all the SIDD, sorry, DSIR, ID staff for all their time and effort.

WRONZ

Dr Peter Ingham recently returned from a visit to a number of research laboratories in Europe and two ISO meetings, the latter concerned with flamability of textile materials.

Dr Douglas Rankin recently returned from a years secondment to the Deutsches Wollsorschungsintitut (German wool Research Institute) in Auchen, West Germany. He spent most of his time there gaining experience in a variety of techniques used to study the chemistry of wool fibre and gaining knowledge of some sectors of the wool processing industry.

Manawatu Branch

The June meetng was addressed by Associate Professor Len Blackwell of Massey University. His topic "Human Steroid Analysis: a chemists eyeview of ovarian development" covered some twelve years of research leading to the development of a home kit for assessing ovarian activity (fertility) by urinary steroid assays. A "high-tech" competitive binding immunoassay in a "low-tech" package potentially will enable women at home to cheaply and reliably monitor their fertility. Some good discussion was provoked by the tension between the high and low technology aspects of medical fertility research.

Waikato Branch

A Public Meeting in Hamilton City Council Reception Rooms to consider "The Chemical Industry and the Waikato Environment" was well-attended by members of the Institute and general public. The meeting was organised by the Branch committee and heard presentations by Environmental Technology Division, who outlined the responsible approach of their respective companies to environmental issues. Dr Robert Mann, Editor of the NZ Environmental Journal, while commending their improved sensitivity to the environment, nonetheless challenged them in his address. He expressed profound dismay at prospects for the biosphere and insisted that far greater efforts are essential to avoid environmental disaster.

Representatives of the Waikato Regional Council, the Tainui people and the Kinleith Site union then addressed the meeting briefly, before comment was invited from the audience. Not surprisingly questions were mainly directed to the Industry representatives. The meeting was finally closed by the Chairman, Don Llewellyn, after each speaker had delivered a brief summary statement.

The overall success of the evening was judged by the large number of people who stayed to question speakers informally at the conclusion of official proceedings.

University of Waikato

The Chemistry Department was involved in two very successful publicity days recently. At the end of April, about 6,000 Intermediate to 5th Form Students visited the School of Science and Technology as part of Science and Technology Week. The hordes of students were entertained by a hard-pressed group of staff and demonstrators, with a range of "fun chemistry" demonstrations - the "banana hammers" (bananas frozen in liquid nitrogen) were particularly successful!

On a more studious note, 2,500 sixth and seventh formers visited the University as part of Information Day, at the end of May. Most departments ran demonstration mini-lectures, and the Chemistry lectures (given by Rick Ede) were very well attended; food for thought was provided by a superconductivity demonstration, while the senses were assaulted by some bangs and flashes. The other Chemistry contribution was a display of pyrotechnical devices by post-graduate student Martin Van Tiel, to a (slightly apprehensive) lunch-time audience!

Auckland Branch

The July meeting was addressed by my Jim May, Chief Executive Officer, AMIRA (Australia Mineral Industries Research Association), Melbourne. He gave a very stimulating address comparing R & D spending in several countries, before describing in detail the work of AMIRA.

AMIRA does not have research staff, only eight professional staff who act as "research brokers". AMIRA act as the interface between the 140 member companies and organisations (some in NZ) who contract to do the research independently. AMIRA is thus much more concerned with research output, than it is with inputs. Dr John Rogers proposed the vote of thanks.

On 2nd July, the Auckland Branch held a one day seminar on the quality and testing of water. Organised by the Centre for Continuing Education at the University of Auckland, the seminar attracted 66 enrolments.

The morning session, chaired by Graham Ryburn heard Frank Ashton from the Auckland Regional Council talk about the sources, composition, quality and future of Auckland's water supplies. He was followed by Richard Waters from Catoleum (NZ) who spoke on treating for potable water. Two industrially orientated papers took the seminar through to lunch, Nath Pritchard from the Huntly Power Station spoke on boiler water treatment and Steve Rubie of Catoleum (NZ) Ltd talked about boiling water - problems and remediend

In the afternoon the chair was taken by Raymond Hopgood who introduced Tex Lyndon of Gamlen and his talk on ionic impurities affecting process water. Brian Cook from W. Grayson and Associates described the microbiological testing of water and David Alchin of P.W.T. (NZ) Ltd (Portals) described methods for the elimination of microbiological contamination in process water.

The final session of the day and the paper that promoted the most discussion was by Andrew Thakurdas of TELARC who described the ChemAqua interlaboratory water analysis scheme.

The Branch is grateful to Lester Stonyer for his part in organising a successful day.

University of Auckland

Dr Jan Coddington and PhD student Patricia Shaw from the University of Auckland have attended the Magnetic Resonance 90 Conference held in Brisbane.

Jan gave a lecture and she and Patricia presented two posters.

Auckland Institute of Technology

Roger Whiting has been seconded from Auckland Institute of Technology to the National Zealand Qualifications Authority to coordinate the modularisation of the New Zealand Certificate qualifications.

The existing course structures have been around for over twenty years now.

The needs of industry are changng more rapidly now than in the past so despite syllabus revisions there is a need for courses to be more flexible. It is hoped that by breaking the existing subjects into smaller portions called modules it will be possible to break down the divisions which at present exist between disciplines. This will enable students to select those topics relevant to their work. Hopefully as new industries appear they will be able to pick the range of subjects which they feel their staff need. Eventually it is planned that this will extend between what are at present different certificates eg. New Zealand Certificate in Building and New Zealand Certificate in Engineering. Naturally, the appropriate background knowledge will be required before any particular topic could be studied.

Roger commented that industry has a lot of respect for the New Zealand Certificate qualifications and it will be important to ensure that whatever new course structure is developed it must retain that respect. It is hoped to have module prescriptions published for comment by industry by the end of September. This is coinciding with a major curriculum revision of the second and third years of the NZCS chemistry option.

## NOTICES

### Annual General Meeting

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

For Council
A.A. Turner
Hon. General Secretary

## RSC FUNDS AVAILABLE

The Royal Society of Chemistry wishes to remind members of the availability of funds from the Research Fund and also the Corday-Morgan Memorial Fund to assist in "stop-over" visits to chemical establishments in a Commonwealth country is open to non-members of the RSC. Further details from Dr J. Packer, University of Auckland.

# NZ CHEMICAL INDUSTRY IS HURTING

WARNER LAMBERT - PARK DAVIES has announced that as from October it will cease manufacturing from it's Mt Wellington plant. Warner Lambert has always imported half of its product range and now the half that was manufactured in New Zealand will be sourced from Australia.

The General Manager, Wal Galbraith, commented that world wide (as well as in New Zealand) there was pressure to upgrade facilities in terms of Good Manufacturing Practice. This was taking place at the same time as pressure was also being applied to pharmaceutical companies to reduce the price of medicines. The result of this is that Warner Lambert is rationalizing it's world wide operations.

At present Warner Lambert manufacture in about ninety countries but are planning to upgrade the facilities in only about eighteen of them. The remainder will be closed down.

Thus New Zealand which represents only about 0.1% of Warner Lambert's world wide sales will be supplied from Australia which represents 3 - 4% of the companies world wide sales. This means that the New Zealand plant will be closed down in spite of it's operation having traditionally been cost competitive compared to the Australian plant. Mr Galbraith also commented that the company found it more attractive to invest in a plant in Australia rather than in New Zealand because of the incentives offered by the Australian Government. While this did not prompt the shift it meant that further investment in New Zealand was never a real option once the import duties on pharmaceuticals were removed. Most staff are staying on until October. The company has been assisting with skill retraining for those wishing to change careers. Of the staff only about 4 or 5 may be transferring to Australia. In terms of Laboratory staff the company has traditionally employed at QA manager, a laboratory supervisor and two technicians.

DULUX has announced it has closed down it's Mt Wellington (Auckland) plant and transferred the production which was based there to it's plant in Gracefield (Lower Hutt). For some time now the Mt Wellington plant has only been making industrial coatings while decorative products have been made at the Gracefield plant. The decision to close the plant was made in December 1989 and most of the staff left by the end of May 1990. A skeleton lab staff of three will be based at the companies site in Avondale (Auckland) to service customer queries in the Auckland region. Some products which were previously made at the Auckland site will now be imported from Australia.

For some years now ICI paints has had some production problems and this restructuring will concentrate the production at its most efficient site.

PACIFIC STEEL has recently undergone a restructuring exercise. In the process it has shed approximately 90 people. This includes five from the technical/laboratory area. The changes have been forced on the company by the down turn in the construction industry. Most of the plant will go from three shifts per day to two while the rod and bar mills will cut back to one shift.

This will keep the plant idle over the late afternoon and early evening giving large savings in peak power charges. These changes were instituted from the first of July.

The restructuring has meant changes in the way the analysis of the molten metal is carried out. In the past the analysis has been carried out by a shift chemist for production control and quality assurance. This is now to be done by the production staff. Quality assurance is to be the responsibility of the new group called steel plant technicians drawn from the plant foremen and plant observers. This change will reduce overheads even though an extra spectrograph is to be purchased.

RECKITT AND COLMAN (NZ) have taken over WHITEHALL LABORATORIES (NZ).

Production of Whitehall products is to continue but will be transferred to the Reckitt and Colman plant in Avondale. The production staff are being offered positions in the Avondale plant. One member of the technical department of Whitehall will be absorbed into the technical department of Reckitt and Colman - the rest are being made redundant.

JOHNSON AND JOHNSON are closing their production Auckland facility by February 1991. It is probable that they will maintain a warehouse in New Zealand but the product will in future be imported. For the last two years now the Auckland plant has only been packing material produced in Australia.

# COMPANY PROFILES

## Scientific Supplies Limited

SCIENTIFIC SUPPLIES LIMITED was established 14 years ago as a private company supplying laboratory chemicals and consumables into New Zealand laboratories. We have research, medical, educational and industrial chemicals. Through our twelve staff in Auckland and two in Dunedin, we can offer one of New Zealand's largest laboratory chemical stock holdings at very competitive prices.

Of our twelve chemical agencies, the major ones are RIEDEL de-HAEN (well known for their Hydranal Karl Fischer range), RHONE POULENIC (May & Baker), ALDRICH, SERVA and SIGMA (the latter two are our main biochemical sources).

If you would like a complimentary wall chart of the Periodic Table of the Elements for your department please send us your name, position and department, with company address to the attemtion of Allan Sheppard.

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SALES REPRESENTATIVE - ALLAN SHEPPARD
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## Watson Victor

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For the latest inlaboratory equipment don't miss the Watson Victor exhibit at the NZ Institute of Chemistry conference.

Watson Victor, 100 years experience you can call on with complete confidence.

WATSON VICTOR AWARD IN BIOCHEMISTRY

The 1990 Watson Victor Award in Biochemistry has been won by Trevor Kitson of Massey University. Dr Kitson is an Associate Professor in the Department of Chemistry and Biochemistry there.

The award will be presented at the NZ Institute of Chemistry Conference at Victoria University in August, where Dr Kitson will deliver the Award address. Since its inception in 1984, the award has been given annually in recognition of a significant contribution to biochemical research.

As with previous years, this year's winner has an outstanding research record. Dr Kitson's particular area of interest is the mechanism of action of aldehyde dehyrogenase on studies on anti-alcohol drugs, and it is this work which is the subject of the 1990 Watson Victor Award.

## Applied Biosystems

Applied Biosystems is the leading supplier of systems and tools for biotechnology research and related applications. It currently manufactures and markets on a worldwide basis more than 25 different automated instruments, a wide range of chromatography columns and components, and several hundred associated chemicals.

As of January 1990, Applied Biosystems have had direct representation in New Zealand from their Melbourne, Australia Head office. For all enquiries, please call Duncan Jones on 61/3/808-7777 or fax on 61/3/887-1469.

Come along and visit us on stand 18 at the conference where we will be showing two major instruments, the Model 391A PCR-MATETM DNA Synthesizer and the Model 270A Automated Capillary Electrophoresis System.

The 391A DNA Synthesizer features fast coupling cycles with very high repetitive yields (typically > 99.5%). It can accommodate all the current, popular synthesis methodologies, including RNA synthesis.

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Applied Biosystems
26 Harker St, Burwood
Victoria 3125, AUSTRALIA
Tel: 61/3/808-7777 Fax: 61/3/887-1469

# COMPANY PROFILES

## Philips Scientific

Philips Scientific & Industrial Pty Ltd is an Australian and New Zealand business unit of Philips. It specializes in analytical, test and measurement instrumentation, communication and security systems and industrial projects.

It is part of the Philips Worldwide group of companies which are market innovators in Consumer products, Lighting, Electronic components, Industrial, Scientific and Medical Systems, Information Technology and Communication Systems.

Philips Analytical is active in Spectrophotometry -

| | |
|---|---|
| AA | XRD |
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| Gas | Electrochemistry |
| Liquid | PH |
| X-Ray Analysis | ISE |
| XRF | Conductivity |

It has centres in Auckland, Wellington and Christchurch

Auckland:
2 Wagoner Place (Private Bag, St Lukes) tel: 894-160

Wellington:
125 Wexford Rd, P.O. Box 14-282 Miramar, tel: 889-788

Christchurch:
224 Lichfield St, P.O. Box 1488, Christchurch, tel: 798-030

The company has two Service Engineers in Auckland, one in Wellington and one in Christchurch. There is also a Sales Engineer in each centre.

## Alphatech Systems Ltd & Co

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Europa Scientific - Isotope Ratio Mass Spec
Hanna Instruments - pH, Conductivity, Temperature Pumps
Hitachi - UV/Vis, Fluoro, Electron Microscopes, and AA Integrators
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35 Scarborough Terrace, Parnell
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Wellington - 63 Mills Road, Brooklyn. Tel: (04) 893-905

## Pharmacia LKB Biotechnology

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In order to provide full back-up for such instrumentation, Pharmacia LKB employ the services of Honeywell N.Z. Ltd.

Stocks are held in Auckland to facilitate overnight deliveries on most consumable items.

For all enquiries or orders please contact:
Pharmacia LKB Biotechnology
PO Box 1607
Auckland 1
PH: (09) 391-473
FAX: (09) 373-657

## DSIR Chemistry

DSIR Chemistry (formerly) Chemistry Division DSIR) is the largest chemical facility in New Zealand. It was established in 1865 as the Colonial Laboratory and has had several name changes in its 125 year history. We currently employ 275 staff comprising scientists, technicians and support staff.

It now operates a commercial R&D service throughout New Zealand for many overseas clients from its five sites in Auckland (2), Wairakei, Wellington and Christchurch. The range of expertise at DSIR Chemistry is considerable.

Although chemical problem solving is seen as our main speciality, chemical analysis of most materials can be offered with short turnround times and at competitive rates.

DSIR Chemistry's specialty areas include:

Paints and Surface Coatings; Glasses and Ceramics; Petroleum Products; Food and Water; Environmental Monitoring; Occupational Health Monitoring; Forensic Investigations; Geothermal Fluids; Pharmaceuticals; Plastics and Almost Anything Chemical.

Whether the problem is as major as an environmental impact assessment or as minor as identifying the grade stainless steel you want to use, you should consult us first. We're part of an organisation that covers virtually every scientific discipline. If we can't help you we probably know who can.

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**Standard units include one water tap and oblong sink.**
**A WIDE RANGE OF OPTIONAL EXTRAS ON REQUEST.**

## Thermoplastic Engineering Ltd.

*Pacemakers in Plastic Fabrication*
151 Park Road, Miramar, Wellington, New Zealand.
Box 15174, Wellington. Telephone (04) 882-092
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TP25