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NZIC Chemistry IN NEW ZEALAND

ISSN 0010-5566

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UP FRONT...

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For further details see the cover story on page 2

NZIC Chemistry IN NEW ZEALAND

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IN THIS ISSUE...

COMING UP...

September 1995 - Focus on the Dairy Industry

November 1995 - Focus on Plastics, Resins, Coatings, Inks

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5th of the month of publication

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COVER STORY

NEW N.Z. DISTRIBUTOR FOR A&D LABORATORY BALANCES APPOINTED

Labsupply Pierce (NZ) Limited, have recently been appointed as the New Zealand distributor for the A&D laboratory balance range. They can provide balance purchasers with comprehensive national support through their four branch offices, located in Auckland (Head Office), Wellington, Christchurch, and Dunedin. A&D balances are the number one selling balance in Australia, and Labsupply Pierce plan to emulate this success in New Zealand.

New Budget Priced Analytical Balance

The A&D HR Series analytical balance provides precision weighing to 0.1 mg at an affordable price. The balance features a large, easily accessible weighing chamber, which provides an excellent environment for weighing operations.

A clear, easy to read LCD display ensures a minimum of operator error when transferring weight data to hard copy. This feature can be further enhanced with the addition of the AD8121 printer option, which provides automatic hard copy at the touch of a button or when a weight reading becomes stable.

The HR-200 has a capacity of 210 g as well as being able to weigh in carat, ounce, momme, tael, and other measurements. This makes the HR-200 ideal for weighing jewellery, pearls and other forms of valuable product.

A rechargeable battery option is available giving the operator the ability to weigh either in the laboratory or on site. This handy feature makes the HR-200 one of the most flexible analytical balances available.

Selectable digital filtering can be used to suit the environment the balance is being used in. If the weighing environment is hostile, the filtering will ensure the balance's weight display remains constant.

The HR-200 can be interfaced to a computer for input of tare weight and recording and tracking of weight readings, such as the daily weight gain/loss measurements of small animals.

Moisture Balance Range

The A&D range of moisture balances, cover a wide range of user requirements. The top of the range model, the AD4713, can weigh samples between 1 and 300 g and has a moisture determination accuracy to 0.01%. The high efficiency, infrared heating lamp can be set between 50 and 200 °C to suit a variety of moisture determination applications. A total of seven time setting modes provides complete drying flexibility.

A unique Predict Measurement mode, allows the operator to obtain moisture determination for most samples, in just five minutes. The AD4713 also comes with a remote keyboard, which controls all balance functions and makes the AD4713, one of the simplest moisture balances to operate.

Two more A&D moisture balances are available. The AD4712 and AD4714 moisture balances offer some of the AD4713 features at a lower cost.

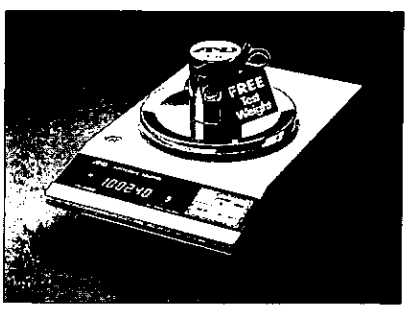
The AD4712 allows quick determination of the moisture content of a sample to an accuracy of 0.1%. By using a powerful, long-life, sheathed ceramic heater, measurement errors such as uneven heating and burning of the sample, are almost eliminated.

The AD4714 is an economically priced moisture balance, which also offers fast and easy moisture determination. Any time setting up to 99 minutes can be set, or the temperature can be controlled manually.

New HF and HF-G Top Pan Balances

The new HF and HF-G series from A&D, with their advanced ergonomic design, ensure easy and error free operation. The rugged aluminium alloy construction gives the balances reliability and long life. The balances have many standard features including overload protection to protect the weighing mechanism from accidental shock loading, built-in underhook for weighing magnetic material and density measurement, and a security ring to prevent theft.

The HF series can count, percentage weigh and measure in ten different weighing units other than grams. A unique ACAI (Automatic Counting Accuracy Improvement) function improves the reliability of product pieceweights when in counting mode and the balances conform to GLP (Good Laboratory Practice) requirements.



An optional RS232C serial interface and current loop output enables the balances to send and receive data from a PC. A printer or remote weight display can also be added to output weight data. The HF and HF-G balances are also ideal units for field work when fitted with the optional rechargeable battery pack.

For further details on the range of A&D balances, please contact your closest Labsuppy Pierce (NZ) branch.

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Dunedin	Ph: (03) 488-1969	Fax: (03) 488-1948

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1995 BUDGET

The 1995 Budget was presented to Parliament by the Minister of Finance on Thursday 1 June 1995. Science and technology will benefit from increased funding. The Research, Science & Technology Vote content is summarised as follows:

- $45 million of new funding to apply from 1997/98, with this funding to be allocated as follows:
  - $11 million to the Marsden Fund
  - other allocations to be announced nearer the time, but the single largest allocation will be to the Public Good Science Fund administered by the Foundation for Research, Science and Technology
- New funding continues and accelerates the pattern of funding increases announced in the 1994 Budget
- Allocations of existing additional funding in 1995/96 are confirmed including the following new allocations not announced in 1994:

$0.18 million	to new James Cook Fellowships
$0.4 million	to International Science
$0.5 million	to assist co-ordination of science and scientific advice on public policy to new programmes
$1.0 million	to new programmes in technology uptake and innovation

FELLOWSHIPS

Overall funding

- Funding increase of $1.58 million in 1995/96 with total now $4.9 million per annum.

Enhancement of existing schemes

- S&T Post-doctoral Fellowships (FRST)
  - Increased by $575,000 to $2,535,000
- Teacher Fellowships (Royal Society)
  - Increased by $195,000 to $620,000
- Graduates in Industry Fellowships (FRST)
  - Increased by $630,000 to $1,560,000

Introduction of new schemes

- New James Cook Fellowship scheme (Royal Society)
  - Two in 1995/96, $180,000

TECHNOLOGY UPTAKE AND INNOVATION

Technology for Business Growth (TBG)

- Funding to continue at $10.6 million for 1995/96

New TechStart Scheme for 1995/96

- Trial basis with $800,000
- Proactive identification of firms needing assistance
- Formulation and then implementation of technology action plan including participation in other schemes such as TBG
- General linkages to Tradenz, Manfed, BDB

New Visiting Technologies Scheme from 1995/96

- Trial basis with $200,000
- Will assist groups or firms to bring eminent technologists from overseas on planned visit/teaching programmes

OTHER RELEVANT PORTFOLIOS

Museum of New Zealand

Government will contribute $64.8 million this year to capital works for MONZ with the operating budget reduced by almost $3 million to $66.6 million.

The National Library

The National Library receives extra funding for heritage collections and advanced reference and research.

Environment

The environment vote targets specific areas of concern requiring research. $3.5 million extra has been allocated over the next three years to address the risks associated with organochlorines. An additional $3 million over three years has been allocated to further develop a information base on the state of the environment. An additional $1.5 million will be spread over the next three years to fund the Energy Efficiency and Conservation Authority (EECA). This Authority gained $8.45 million in the 1994/95 budget spread over three years. EECA is to assist the implementation of Government's three year 10-point strategy on energy efficiency and the reduction of environment energy impact's use. Expenditure on the environment remains unchanged overall.

Conservation

The Government is providing an extra $3 million for the protection of threatened species representing a 17% increase in funding from the 1994/95 appropriation of $18 million. In total the Government is committing $10 million more to threatened species over the next three years.

DoC spending will be in the following key areas: predator management, ecological restoration, offshore island programmes, intensively managed mainland sites and, particularly bird programmes in the threatened species category. Possum control has been given special attention for a further year with an extra $5 million added to the Vote for this purpose. MAF also has $5 million funding for this purpose.

Fisheries Research
$19 million has been voted for Fisheries Research in 1995/96 which is the same as for the previous year. The Budget item was not reduced by $3 million as previously proposed.

Education
Increased expenditure on education covers a wide range of specific areas. These include increased funding for schools and tertiary institutions, industry training, private school subsidies, Maori education, special education, anti-truancy, at-risk students and training and support for Boards of Trustees.

* * * * *

COUNTDOWN TO SCIENCE & TECHNOLOGY FESTIVAL

The first New Zealand Science & Technology Festival gets underway from 7-13 August. The festival week will emphasise the enjoyment of S & T, celebrate the achievements of our scientists and technologists and raise public awareness. The festival aims to achieve a higher profile than the biennial Science and Technology Week held in previous years, with activities not just for school children but for all age groups. Activities are being planned at local, regional and national levels. Leading speaker and head of science communications at the London Science Museum, Professor John Durrant, will tour the country during 6-19 August. Ernest Rutherford "returns" to New Zealand with a re-enactment on stage of the life and times of our Nobel Prize winning genius by actor Shane Bartle (Nurse Otis of Shortland Street). Most festival events will be locally organised through schools, local science and technology centres, polytechnics, universities, CRIs and industry. Support for the festival is needed through sponsorships, and provision of activities, people and resources. The festival is being co-ordinated by the Royal Society with the active support of the NZ Association of Science Educators.

* * * * *

TRANS-TASMAN GRAIN RESEARCH LINK

Dr Michael Dunbier, Chief Executive of Crop and Food Research, has been appointed to the board of Australia's $51 million a year Grain Research and Development Corporation. The GRDC administers grower levy and government-funded research on Australian grains. The appointment is an indication of new trans-Tasman research linkages. Crop and Food scientists are to collaborate in a NZ$11 million research programme at a new Cooperative Research Centre for Quality Wheat Products and Processes being established this year in Sydney. The centre is funded jointly by a number of the biggest baking companies in Australia and New Zealand, the Australian Wheat Board, the GRDC, other Australian government agencies and universities. The centre aims to generate scientific, technical and business knowledge to support added value at every level of the wheat industry. Some Crop and Food research staff may move to the Sydney CRC site.

* * * * *

IAN AXFORD 1995 NEW ZEALANDER OF THE YEAR

Eminent space scientist and science administrator Dr Ian Axford FRS has been named 1995 New Zealander of the Year.

Dr Axford said the award was a recognition of the importance of science. "I think people in New Zealand understand now that without plenty of investment in research and development and new technology we won't be successful," he said.

* * * * *

U.S. FILTER BUYS PERMUTIT

One of the world's largest water treatment groups has moved into the New Zealand market.

U.S. Filter has purchased Permutit from Thames Water. The buy-out includes the Permutit operations in the United Kingdom, the Middle East, Australia and New Zealand.

The acquisition has been welcomed by Des Belsham, New Zealand manager for Permutit.

"We are delighted to become part of a group of high-technology, specialised companies now grouped under the U.S. Filter banner," he said.

"U.S. Filter has expanded at an amazing rate in recent years to a point where they have more that 2000 employees in 21 countries".

U.S. Filter is a multinational company that designs and manufactures a broad range of water and wastewater treatment systems and equipment for industrial, commercial and municipal markets.

With corporate offices in Palm Desert, California, U.S. Filter serves customers worldwide through over 70 U.S. sales and service facilities, 30 international offices and 11 manufacturing plants.

The change brings to an end Permutit's long association with PWT, formerly known as Portals Water Treatment, Paterson Candy, International and before that, Candy Filters.

* * * * *

Now we'll all lose our noodle!???

The following appeared in the *NZ Herald* last month - *Ed.*

Noodle Paralysis

At least 76 villages have been paralysed from the waist down after eating poisoned noodles in Northern China. Authorities blamed a chemical poison called adenosine triphosphate.

THE IMPLICATIONS OF THE STRATFORD DECISION

The recent decision by the Minister for the Environment on the proposed Taranaki combined-cycle power station appears to contradict Government CO_2 policy by going against the 'no regrets', voluntary agreement policy, formulated only last year.

In 1994 the Government formulated its strategy for reducing net CO_2 emissions to 1990 levels by the year 2000. It was decided that 80% of the target could be achieved by new afforestation and that voluntary emissions reduction by industry could help to achieve the remaining 20%. Industries were given three years to reduce their emissions by entering into voluntary agreements with the Government and committing themselves to individual targets. As an incentive the Government planned to introduce a carbon tax if sufficient reduction had not taken place by the end of 1997.

This policy represents a 'no regrets' approach that would benefit the economy, regardless of whether or not climate change predictions were fulfilled. Voluntary agreements to achieve CO_2 reduction were seen as an incentive for industries to make persistent efforts to achieve maximum energy savings. This would result in a more efficient use of energy resources and lower production costs, which would have a beneficial flow-on effect in the economy.

The Stratford decision was made under the Resource Management Act. It requires the consent holder for the proposed power station to fully offset the effects of additional CO_2 emissions by increased efficiency elsewhere or by planting new forests. This new requirement will have insufficient benefit to justify the additional costs and the consequent reduction in export competitiveness.

If this decision is extended to all new major fossil fuel based installations the extra financial burden can only be justified as an anti-greenhouse measure. Negligible benefit to the economy will occur. It fact, it will increase the cost of products. It certainly does not fit within the 'no regrets' policy framework.

For this reason the Petroleum Exploration Association has decided it will appeal the Stratford decision to the Planning Tribunal. Until the appeal is heard and a ruling given, New Zealand investors will not know whether all new fossil fuel developments will have to suffer the constraints imposed on the Stratford proposal. Some industries are afraid that regional councils may use the Stratford precedent to impose similar requirements on existing plant as well.

Both the Minister for the Environment and the Minister of Energy have expressed concern about whether the Resource Management Act is the best mechanism for achieving the Government's CO_2 objectives. Climate change is a global issue and requires a coordinated national response.

Simon Upton has said that he will be working through the implications of the Stratford decision for the existing climate change policy.

Source: *Coal Research Newletter* June 1995.

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ENVIRONMENTAL ISSUES

GUIDELINES HAVE BEEN RELEASED FOR THE PREPARATION OF MATERIAL SAFETY DATA SHEETS IN NEW ZEALAND

Chemistry in New Zealand, Vol. 59 No.1, (January 1995) page 3, in a brief article commented on Material Safety Data Sheets (MSDS) and the international standard ISO 11014-1 Safety Data Sheets for Chemical Products, Part 1, Contents and Order of Sections was reviewed.

In May of this year the Occupational Safety and Health Service (OSH) of the Department of Labour released guidelines which set down the minimum requirements for the completion and preparation of material safety data sheets for New Zealand companies to follow. The OSH document releasing these guidelines contains some 72 pages. Because the safe use of chemicals is a responsibility to be shared by all chemists sufficient outline is given in this article to illustrate the extent of the guidelines. Before preparing specific MSDS the reader must of course consult the complete guidelines.

The guidelines are made pursuant to the Health and Safety in Employment Act 1992 and compliance with the guidelines is recognised as a means of compliance with the Act.

Variations to the format outlined are permitted where a recognised international format such as those proposed by I.L.O, I.S.O, A.N.S.I. or the European Community is used as an alternative. The quality of the information provided must however be equivalent to that required by the guidelines.

In order to assist with the development of a national database on hazardous substances, users of the guidelines are asked to lodge a copy of all MSDS with the National Poisons and Hazardous Chemicals Information Centre, P.O. Box 913, Dunedin.

CONTENTS REQUIRED IN A MSDS BY THE OSH GUIDELINES

A brief summary of the topics to be covered, format and details required by the guidelines is as follows:

1. INTRODUCTORY DETAILS:

- Page Number and Number of Pages
- Date of Issue
- Statement of Hazardous Nature
- Company Details of the New Zealand Manufacturer or Importer:
  - Name
  - Address
  - Telephone Number
  - Emergency Telephone Number

2. IDENTIFICATION:

- Product Name
- Other Names
- Manufacturers Code
- UN Number and Dangerous Goods Class
- HAZCHEM Code
- Toxic Substances Schedule (Under Toxic Substances Regulations 1983 - if listed)
- Uses
- Physical Description/Properties:
  - Appearance
  - Boiling Point/Melting Point
  - Vapour Pressure
  - Specific Gravity
  - Flash Point
  - Flammability Limits
  - Solubility in Water
- Other Properties
- Ingredients, giving a description of the chemical composition of the substance:
  - Chemical Name
  - CAS Number
  - Proportion

Guidance is provided on the manner in which commercial confidentiality of product and formulation information can be recognised but essential safety information provided.

3. HEALTH HAZARD INFORMATION:

- Health Effects:
  - Information on acute and chronic health effects relating to human exposure.
  - Exposure routes.
  - The range of symptoms of exposure
  - The dose, concentration or conditions of exposure likely to cause injury.
- First Aid Measures
- Advice to Doctors

4. SAFE HANDLING INFORMATION:

- Exposure Standards
- Engineering Controls
- Personal Protection Measures
- Flammability
- Storage and Transport
- Management of Spillages

- Disposal Measures
- Fire/Explosion Hazard

5. OTHER INFORMATION:

Other relevant information available on the substance not covered in the other sections e.g.

- Animal Toxicity Data
- Ecotoxicity Data
- Biodegradeability
- Persistence in Soil or Water

6. CONTACT POINT:

The guidelines require specific information to be provided relating to the person/position/title from whom further information or bibliography relating to safety aspects of the substance can be obtained.

ADDITIONAL INFORMATION IN THE GUIDELINE DOCUMENT

The document also includes definitions, list of references, sources for obtaining CAS numbers, guides for selecting generic names for substances and sources of further information on chemical hazards including accessing on-line databases.

A MSDS checklist and a template are also given.

While not forming part of the guidelines an example is given of a Product Safety Card which may be used to provide workers with a more condensed version of the information present on the full MSDS. It is stressed that great care must be taken to ensure that sufficient information is provided to adequately protect workers, and that the data has been accurately transcribed onto any such abbreviated document.

SUMMARY:

Copies of the guidelines document can be obtained from local offices of the Occupational Safety and Health Services for the Department of Labour. All chemists should accept the responsibility for the health and safety of all involved with the use of chemical substances in their day to day activities. Familiarisation with these guidelines now becomes an essential part of this responsibility.

Norman Thom
Convenor, NZIC Environment Committee,
C/- School of Environmental and Marine Sciences,
The University of Auckland
Private Bag 92019, Auckland
Telephone: 09-3737599 ext. 6825
Fax: 09-3737042

* * * * *

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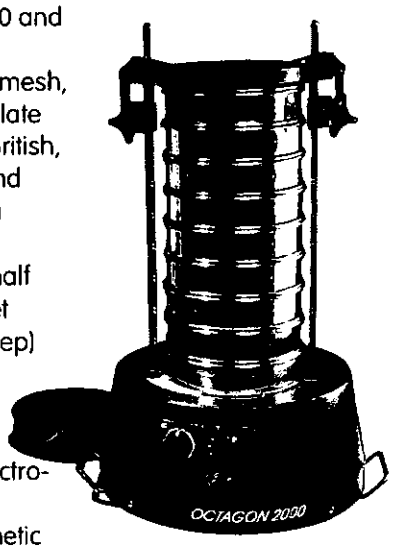

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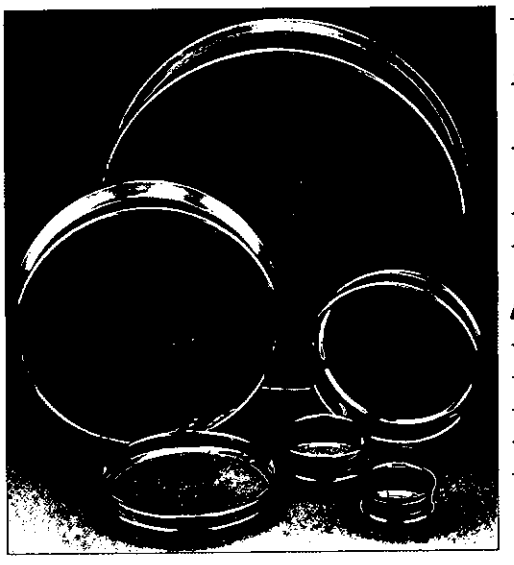

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LETTERS TO THE EDITOR

3 July 1995

7 Bamfield Place
Hillsborough
AUCKLAND 6

Dear Sir,

There has been correspondence in these columns recently that amounts to "misinformation" and misconceptions by members in relation to the secretariat of the Institute.

While the periodic examination of the role, and effectiveness, of the secretariat is a legitimate and necessary activity of the Institute members, such an examination must be carried out in a fair and reasonable manner.

The prime cause of concern, now that the financial drain of the Journal no longer exists, appears to come down to two issues:

The first is the expense of the Secretariat.
The second is the apparent decline in membership numbers.

Both issues are interrelated. The affordability of the secretariat appeared originally to be based upon budgeted income from members that did not exist.

The apparent decline in membership numbers stems from the careful purging from the membership database of those members who have resigned by default. That is, they have not paid their subscription for years.

We are now approaching the real level of membership numbers.

It is also true that the average age of members is increasing. Fewer and fewer of the younger chemists graduating are becoming members. Of those that do only a small proportion become long term members.

My question is this. How can this be the fault of the secretariat?

The total cost of the secretariat is about 40% of total operating costs of the Institute. This is not unreasonable. An examination of most small businesses will show that the wage and salary component is at about this percentage level.

Some unfavourable before and after comparisons of the cost of the secretariat against that of the old system have been made recently.

The comparison is like comparing chalk with cheese.

One figure quoted gave the wages paid to a part time person who assisted the then Registrar (unpaid). The unfavourable comparison was against the combined salaries of the secretariat, i.e. that of the Executive Secretary and an assistant.

The impression given in the comparison was that the Executive Secretary receives the total of this amount. The words "a substantial remuneration" have been used in another letter.

This is not the case. We employ a part time Executive Secretary and a part time assistant together with an unpaid part time Honorary General Secretary.

How has the establishment of the secretariat benefited members?

In terms of directly measurable financial returns to individual members. Probably little or nothing. But this is not necessarily the purpose of such a body. Surely we are here for the "greater good", not some selfish attitude such as "what's in it for me?" other than the peer recognition bestowed by election to membership. It is unfortunate that the modern business world is all "gimmee". This attitude, unfortunately, now extends to everyday life for a great number of individuals. Our members are not excluded from this attitude.

Amongst the indirect returns provided are:

- a central easily recognisable contact point for members
- a central easily recognisable contact point for invitations to submit to parliamentary select committees on matters concerning chemistry and related matters
- a central contact and coordination point for our "public good" type committees to operate through
- better organisation of the Council of the Institutes' affairs.
- greater assistance with organisation of conferences and seminars
- significant reductions in council meeting expenses
- savings achieved in reducing council meeting expenses applied to education matters, e.g. Chem 13 exam, Chem NZ expenses, Chemical Olympiad, Science Fairs
- organises the ANC Quiz for schools
- greater assistance with promotion of education to schools
- organisation of visiting shows e.g. Count Dracula Show, Chemical Magic Show

In trying to be brief I have not done justice to the case nor covered all aspects. Suffice to say that there are two sides to any story.

There are a number of clichéd sayings relating to sin and stones, and glass houses.

Remember them when necessary.

Yours sincerely

Dennis Karl
NZCS. MNZIC

10 July 1995

Cancer Research Laboratory
School of Medicine
University of Auckland
Private Bag 92019, Auckland
New Zealand

Dear Sir

This letter is to inform (NZIC) members of the progress being made by the strategic review committee. At its meeting after the Council meeting of February 22nd 1995, when all the submissions received to that point were studied, the committee formulated four possible scenarios for the future of the Institute, namely:

1) Refine and adapt the existing structure.
2) Covert to a much less centralised "scientific society".
3) Seek amalgamation with a number of other smaller groups.
4) Wind up the Institute.

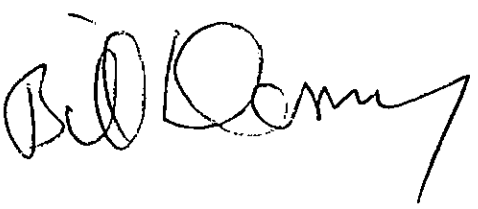
I then discussed these options with members who attended the various meetings during my tour of the Branches in March and April. It was clear from both the submissions and the feedback during my tour that there was a considerable (surprising) degree of unanimity about the broad form the Institute should take. Of the four options, most supported the first, provided that special attention was paid to the fee structure (lower), the role of the Specialist Groups (better links with the NZIC) and the functioning of the secretariat (more efficient attention to "personal" and less to "corporate" services). A smaller number preferred the second option (really a more far-reaching form of the first). In contrast, there was virtually no support for the last two options.

As noted partially above, the main concerns were:

1) The membership fees are too high, acting as a major block to increasing the membership.
2) The membership structure is too complex.
3) The Institute as a whole is not seen as relevant to the modern practice of chemistry.
4) A perceived lack of services to members, commensurate with the fee charged.
5) An increasing difficulty in finding people able and willing to fill Institute offices, especially at Branch level.
6) A need to increase the level of support from the secretariat in serving member's needs. A specific point was the need to increase the degree of communication to members of Council and other central affairs through better use of the journal, which was universally seen as a major asset of the Institute.
7) The role of the Specialist Groups within the Institute need to be clarified, particularly with regard to the participation of non-NZIC members.

Because of the degree of unanimity in the comments received, the committee decided it was not necessary to seek further input from members in the form of a questionnaire. Although the committee was not able to report their findings to the May meeting of the Standing Committee of Council as hoped (due largely to my being overseas twice), a draft report has now been written and is being studied by the committee. The final report to Council (to be presented at the meeting in early September) will contain a number of specific recommendations concerning the future structure and management of the NZIC. The collective aim of these is to ensure that the organisation can, as far as possible, achieve the goals set for it by the membership. This report and summary of the Council discussions on it will be published as soon as possible after that in the Journal(Chemistry in New Zealand).

Yours sincerely



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THE ANTIBACTERIAL PROPERTIES OF HONEY

Peter Molan, Department of Biological Sciences, University of Waikato, Private Bag 3105 Hamilton

An ancient medicine rediscovered

Honey is one of the oldest medicines: its use is recorded in Sumerian clay tablets estimated to be 4000 years old, and in many other ancient writings. It has continued to be used in medicine ever since, but only in quite recent times has this been a rational usage, based on an understanding of how it works. Although there are several reports in medical journals of the 1930s of honey being effective in clearing wounds of bacterial infection, it was not recognised in these reports that it had been established in laboratory work in 1919 that honey has antibacterial activity. It was not until the mid-1940s that more intensive laboratory studies were carried out, but by this time antibiotics were becoming available for the treatment of infections, and honey was displaced from use in medicine.

Despite the advent of antibiotics, honey has continued to be used in folk medicine, and it is from this pool of knowledge that the re-introduction of honey into modern medicine has come. There have been numerous reports in medical journals of this folk remedy being used as a last resort on infected wounds, burns and ulcers that were not responding to antibiotic treatment. The remedy was in all cases found to be remarkably effective. This effectiveness is being recognised in an increasing number of reports. An editorial in the *Journal of the Royal Society of Medicine* in 1989 expressed the opinion that "the time has now come for conventional medicine to lift the blinds off this 'traditional remedy' and to give it its due recognition".

Nature of the antibacterial activity:

Osmotic effect

Honey is a saturated or super-saturated solution of sugars, the water content usually being only 15-21% by weight. Of the solids in honey, 84% is a mixture of the monosaccharides fructose and glucose which mostly come from sucrose, the principal sugar in nectar: the bees secrete a sucrase enzyme into the nectar to bring about this conversion to a more soluble composition. The strong interaction of these sugar molecules with water molecules leaves very few of the water molecules available for microorganisms. This "free" water is what is measured as the water activity (a_w; see below), mean values for honey have been reported from 0.562 to 0.62. Although some yeasts can live in honeys that have a high water content, causing spoilage of the honey, the a_w of ripened honey is too low to support the growth of any species, no fermentation occurring if the water content is below 17.1%.

Many species of bacteria have their growth completely inhibited by the a_w being in the range 0.94-0.22 . These values correspond to solutions of a typical honey (aw of 0.6) of concentrations from 12% down to 2% v/v, calculated on the basis of the concentration being proportional to -log a_w. On the other hand, some species have their maximum rate of growth when the a_w is 0.99, so inhibition by the osmotic (water-withdrawing) effect of dilute solutions of honey obviously depends on the species of bacteria.

Staphylococcus aureus has an exceptionally high tolerance of low a_w: for complete inhibition of its growth the a_w has to be lowered below 0.86, which would be a typical honey at 29% v/v. This explains why, when sucrose syrup or paste is used as a wound dressing (another traditional remedy "re-discovered" by modern medicine), it is often found that infection with *Staphylococcus aureus* is hard to clear. Measurements that have been reported of the dilution occurring from the uptake of water from surrounding tissues when an abdominal wound was packed with sugar reveal that a saturated sucrose syrup containing undissolved granules becomes diluted in 7.5 hours to a concentration that is 30% of that of a saturated solution. Although the a_w of this solution is low enough to prevent the growth of most human pathogens, it is not low enough to seriously restrict the growth of *Staphylococcus aureus*, which is unfortunately the major wound-infecting species and is notorious for its ability to develop resistance to antibiotics. But *Staphylococcus aureus* is one of the species most sensitive to the antibacterial activity of honey. There have been many reports of complete inhibition of *Staphylococcus aureus* by honeys diluted to much lower concentrations, showing the importance of the other antibacterial factors in honey.

Water activity: is a measure of the consequential effect of the average intermolecular forces between water molecules being increased when water molecules become oriented on the surface of solute molecules. When a lot of the molecules are tied up in this way the water molecules are on average less free to act (e.g. to evaporate, or to hydrate something) so the "activity" is lower. For an ideal solution the water activity is equal to the mole fraction of the solute:

$$a_w = \frac{n_2}{n_1 + n_2}$$

where n_1 and n_2 are the number of moles of solute and solvent respectively.

Acidity

Honey is characteristically quite acidic, its pH being between 3.2 and 4.5. This acidity is due primarily to the content of gluconolactone/gluconic acid. This is present as the result of enzymic action in the ripening nectar, the bees secreting the enzyme glucose oxidase into the nectar, which catalyses the oxidation of the aldehyde group of glucose to a carboxyl group, thus forming gluconic acid. The carboxyl group then spontaneously forms an ester with a hydroxyl group within the gluconic acid molecule. This lactone hydrolyses spontaneously to maintain the equilibrium if the remaining free gluconic acid is neutralised.

The pH of honey is low enough to be inhibitory to many animal pathogens, with their optimum pH for growth normally falling between 7.2 and 7.4, and with minimum pH values for growth

of some common wound infecting species being: *Escherichia coli*, 4.3; *Salmonella* species, 4.0; *Pseudomonas aeruginosa*, 4.4; *Streptococcus pyogenes*, 4.5. Although the fairly strong buffering capacity of body fluids, with their high content of bicarbonate, would most likely neutralise the acidity of honey where there is a lot of dilution of honey, when honey is used as a dressing on a wound or ulcer, bacteria may be in contact with honey that is not much diluted, and the acidity could well be of importance. The lowered pH would also enhance the bactericidal action of white blood cells present in the wound.

Hydrogen peroxide

The major antibacterial activity in honey has been found to be due to hydrogen peroxide produced enzymically in the honey. A similar finding was made before in a different system: when following up Fleming's work on the antibacterial properties of *Penicillium notatum*, Coulthard *et al.* obtained erratic results which were traced to the potent activity of a second factor, notatin, present in addition to penicillin. They found notatin to be a combination of the enzyme glucose oxidase with glucose, and showed the activity of notatin to be due to the production of hydrogen peroxide. The glucose oxidase enzyme is secreted along with sucrase from the hypopharyngeal gland of the bee into the nectar to assist in the formation of honey from the nectar. The hydrogen peroxide and acidity produced by the reaction:

$$\text{glucose} + H_2O + O_2 \rightarrow \text{gluconic acid} + H_2O_2$$

serve to preserve the honey. The hydrogen peroxide produced at the same time would be of effect as a sterilising agent only during the ripening of honey however, as full-strength honey has a negligible level of hydrogen peroxide because this substance is short-lived in the presence of the transition metal ions and ascorbic acid in honey which catalyse its decomposition to O_2 and H_2O.

The enzyme has been found to be practically inactive in full-strength honey, it giving rise to hydrogen peroxide only when the honey is diluted. This is because the acidity procued in the action of the enzyme drops the pH to a point which is too low for the enzyme to work any more. On dilution of honey the activity increases by a factor of 2,500 - 50,000, thus giving a "slow-release" antiseptic at a level which is antibacterial but not tissue-damaging.

Phytochemical factors

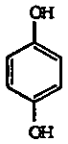
The evidence for the existence of other antibacterial factors is mainly in the form of the peroxide-generating system failing to account for all of the observed non-osmotic antibacterial activity, but there have also been some reports of isolation of antibacterial substances from honey that are not hydrogen peroxide.

The level of hydrogen peroxide accumulating in honey can vary according to the floral source because of negative influences from various other components which cause the break-down of hydrogen peroxide. It should be at its maximum in honey produced by bees fed on sugar syrup instead of nectar, because the negative influences from various plants would not be present. Yet it has been found that the antibacterial activity is low in honey from sugar-fed bees. The existence of non-peroxide antibacterial factors is indicated also by findings that the antibacterial activity does not correlate completely with the rate of accumulation of hydrogen peroxide in honey samples. Furthermore, it has been found that heating honey causes loss of activity against some species whilst it is retained against others. Although the stability of glucose oxidase can vary according to the presence of different plant-derived components in honey, there have been reports of honeys with stability well in excess of this variation, showing that there must be an additional antibacterial factor involved.

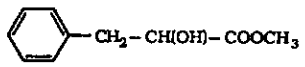
The most direct evidence for the existence of non-peroxide antibacterial factors in honey is seen in the reports of activity persisting in honeys treated with catalase to remove the hydrogen peroxide activity. Chromatographic investigation of some Swiss honeys led to the identification of pinocembrin as an antibacterial component. However, further investigation of this non-peroxide activity indicated that propolis was the most likely source of the pinocembrin. (Propolis is a resinous material collected by bees from the outside of buds on some types of trees.) Pinocembrin is the major flavonoid in propolis, and the flavonoid composition of honey and propolis have a similar pattern. However, flavonoids dissolve only a little into honey: the level of pinocembrin was found to be only 1-2% of what would be required to account for the observed non-peroxide activity.

A similar failure to identify the major non-peroxide antibacterial component was reported from a gas chromatographic analysis of the steam-distilled oil obtained from some Hungarian honeys. Although the terpenes and benzyl alcohol identified are known to be antibacterial, the quantities were far too low to be of any consequence.

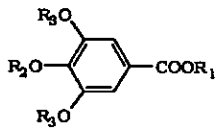
Research on New Zealand honeys carried out in conjunction with Dr Alistair Wilkins at the University of Waikato has likewise led to the identification of only minor antibacterial components. Investigation of an ether extract of manuka honey (Figure 1) by preparative thin layer chromatography led to the identification of 3,5-dimethoxy-4-hydroxybenzoic acid (syringic acid), methyl 3,5-dimethoxy-4-hydroxybenzoate (methyl syringate), and 3,4,5-trimethoxybenzoic acid as components with antibacterial activity. Another phenolic acid with antibacterial activity, 2-hydroxy-3-phenylpropionic acid, was identified by gas chromatography-mass spectrometry as the major component of the other extract. By the same method of study, 1,4-dihydroxybenzene was identified as the major component of the ether extract of vipers bugloss honey (vipers bugloss is a wild flower that grows profusely on open land in central Otago). From the quantitative data obtained by gas chromatography it was possible to determine that about 10% of the non-peroxide antibacterial activity of vipers bugloss honey could be accounted for by its content of 1,4-dihydroxybenzene, but in manuka honey only 1.6-3.2% was due to 2-hydroxy-3-phenylpropionic acid, and 0.2-0.35% to 3,5-dimethoxy-4-hydroxybenzoic acid. The other antibacterial components identified were found to make an insignificant contribution to the antibacterial activity. Additionally, 2-hydroxybenzoic acid (another known antibacterial substance identified in the ether extract by gas chromatography-mass spectrometry) was found to contribute 0.2-0.3%.



1,4-dihydroxybenzene



2-hydroxy-3-phenylpropionic acid



3,5-dimethoxy-4-hydroxybenzoic acid (syringic acid): $R_1 = R_2 = H$, $R_3 = CH_3$

methyl 3,5-dimethoxy-4-hydroxybenzoate (methyl syringate): $R_1 = R_3 = CH_3$, $R_2 = H$

3,4,5-trimethoxybenzoic acid: $R_1 = H$, $R_2 = R_3 = CH_3$

Variation in the antibacterial activity of honey

At the University of Waikato we have investigated how much variation there is in the antibacterial activity of honey likely to be used medically. Commercial apiarists (bee keepers) supplied 345 samples of honey from 26 different floral sources for the study. The samples of honey were tested against *Staphylococcus aureus*. The activity of each sample was compared with that of a reference antiseptic, phenol (carbolic). It was found that the activity varied from a level that was the equivalent of 58% phenol to a level that was below the limit of detection (2% phenol). One third of the samples tested were of this low level of activity. These results show the importance of selecting the honey used for medical purposes. Although all honey will stop the growth of bacteria because of its high sugar content, when the sugars are diluted by body fluids this antibacterial action is lost. The additional antibacterial components then become important. Considering that carbolic disinfectant is usually used with a phenol concentration of 4-5%, it is evident that selected honeys can remain antibacterial when extensively diluted by body fluids.

The unique antibacterial activity of manuka honey

Another finding in this research at the University of Waikato was that there was another significant antibacterial substance involved beside hydrogen peroxide in some of the honeys. When testing samples of the honeys with the enzyme catalase added to remove the hydrogen peroxide, it was found that only two of the 26 floral types of honey contained significant levels of this additional antibacterial activity. In one of these, vipers bugloss honey, the level of activity was quite low. In the other, manuka honey, the additional antibacterial activity was in some samples quite high, although it is important to note that half of the 60 samples tested had very low levels or none of this additional antibacterial activity.

This additional antibacterial activity was considered to be important enough to warrant further investigation. As a project for her MSc thesis, Dawn Willix compared the antibacterial activity of an average-level manuka honey with that of an average-level honey with activity due to hydrogen peroxide, testing them on seven different species of bacteria chosen as the ones most commonly involved in wound infection. The percentage (by volume) of each type of honey needed to completely prevent the growth of each species of bacteria was found to be:

	Manuka honey	Other honey
Escherichia coli	3.7	7.1
Proteus mirabilis	7.3	3.3
Pseudomonas aeruginosa	10.8	6.8
Salmonella typhimurium	6.0	4.1
Serratia marcescens	6.3	4.7
Staphylococcus aureus	1.8	4.9
Streptococcus pyogenes	3.6	2.6

Although some species are more sensitive to the action of one type of honey than they are to the other, on average there is little difference. The most notable point is that these "average" honeys can be diluted nearly ten-fold yet still completely halt the growth of all the major wound-infecting species of bacteria. Also notable is the finding that an "average" manuka honey will still halt *Staphylococcus aureus* when diluted with 54 times its volume of fluid.

The work has recently been carried further by microbiologists at Waikato Hospital looking at the effect of these two honeys on their collection of strains of methoxyllin-resistant *Staphylococcus aureus* (the "MRSA" that cause ward closures in hospitals because they are resistant to most or all of the commonly used antibiotics). All of the strains have been found to have their growth halted completely by the honeys diluted to 5-10%.

The true usefulness of manuka honey medically will only be known after clinical trials have been conducted, but its potential is high. Although on average its unique antibacterial activity is no higher than the hydrogen peroxide activity of other honeys, there is catalase present in serum which could inactivate hydrogen peroxide produced on the surface of a wound.

Another potential medical use of manuka honey is for the treatment of stomach and duodenal ulcers. In the last few years it has been recognised that these are frequently caused by infection with a species of bacteria, *Helicobacter pylori*. In collaboration with microbiologists at the Waikato Hospital, we tested strains of *Helicobacter pylori* isolated from biopsy samples of stomach ulcers, using the same two honeys that had been tested on the wound-infecting species of bacteria. It was found that the honey with hydrogen peroxide activity did not prevent the growth of cultures of *Helicobacter pylori* when added at concentrations up to 50%, but the manuka honey completely halted growth of the bacterium at a concentration of 5%.

A clinical trial is now being organised to find out if manuka honey has the same effect on the bacterium in the stomach as it does when they are on agar plates. There is much interest in this possibility because conventional therapy for stomach ulcers is far from satisfactory. Drugs which prevent secretion of acid in the stomach may allow an ulcer to heal but it frequently re-appears. Only if *Helicobacter pylori* is eliminated is a lasting cure achieved, but it is a very difficult infection to clear. A combination of antibiotics and a bismuth compound is required, and unpleasant side-effects often result. There is also the consideration that a very large amount of money is spent on

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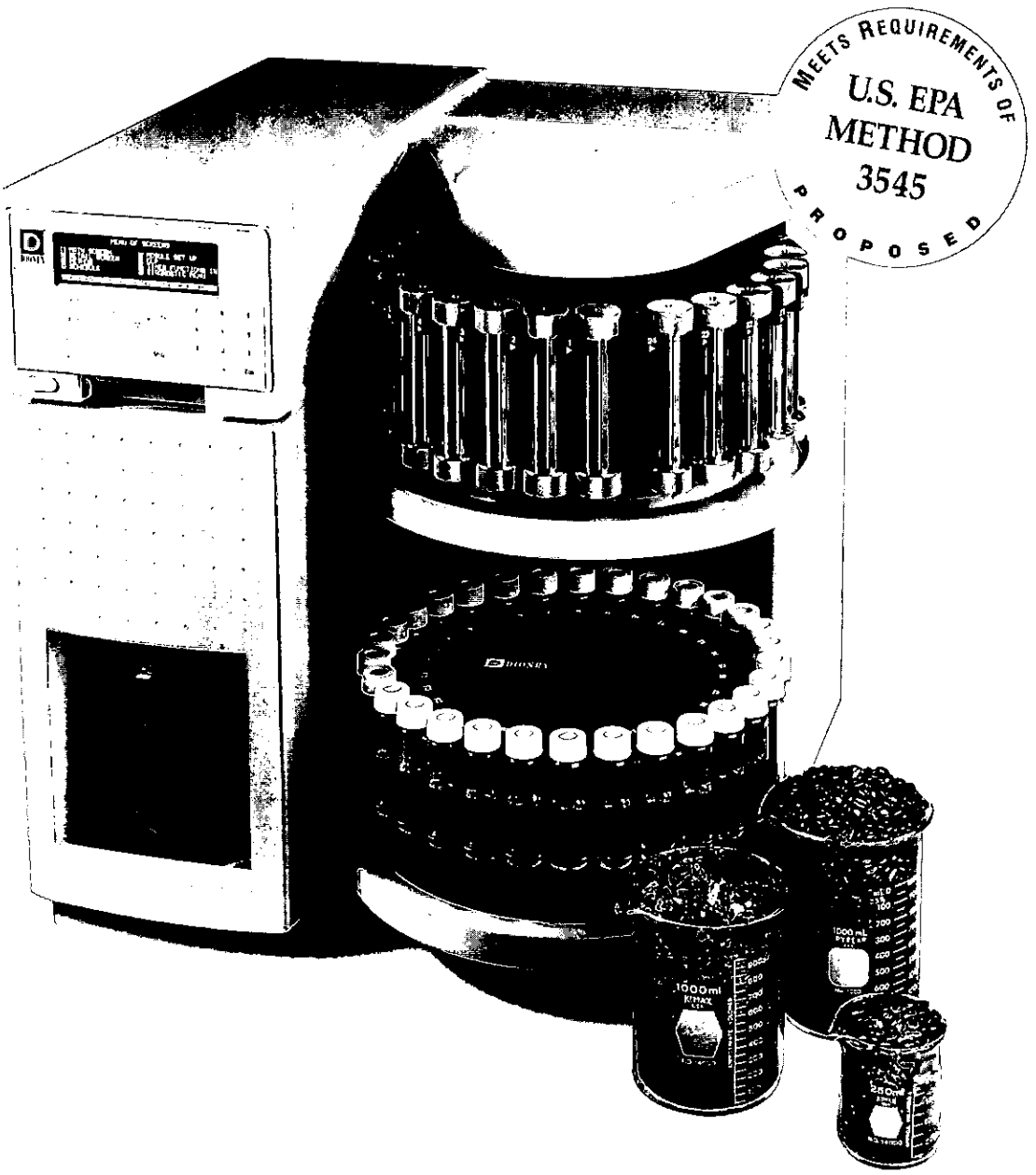

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the pharmaceuticals currently used to treat stomach ulcers. If honey is shown by clinical trial to be a reasonable alternative it would be a much cheaper option, although manuka honey is likely to become a lot more expensive as demand further exceeds supply.

The manuka source

We have now examined hundreds of samples of manuka honey from all over New Zealand as a result of increasing national and international demand for batches with high levels of antibacterial activity. Some regions of the country are good for yielding batches with high activity and some regions consistently yield batches with negligible levels of activity. A similar finding has been made by researchers working on the extraction of manuka oil (a steam distillate of the cut wood and foliage of the manuka tree). This extract, if from the right manuka, can have a potent antibacterial activity. Although it has not been well evaluated microbiologically, the oil from the closely related Australian tee tree has and is sold in large quantities as an antiseptic. Because of the commercial demand for manuka oil and manuka honey as antiseptics there is now a wish to conserve what is seen as a dwindling valuable natural, renewable resource, in conflict with those who wish to clear areas of manuka for development. (The Minister of Agriculture late in 1993 referred to manuka as "merely a weed".) There is obviously a need to distinguish the active from the inactive manuka.

The following article is about one of the Fellows of the NZIC and our readers and other members may find it interesting - **Ed.**

Notable for his incisive mind, Dr Brian Shorland is... ONE OF VICTORIA'S CHARACTERS

"The market is flooded with information. We are all lunatics and idiots. We think we know, but when it comes to the key questions we are all fools." - ***Dr Shorland***

One might wonder why an 86-year-old scientist who has won just about every award in the book doesn't just hang up his safety glasses and go home. But Dr Brian Shorland, honorary fellow in biochemistry in Victoria University's School of Biological Sciences, feels it is everyone's duty to be productive.

"Anyone who doesn't work should be locked up," is his view. And he practises what he preaches, working a full day, five days a week. He has worked at Victoria since his retirement from a top research position in 1969, first as an honorary lecturer and then as honorary fellow.

He began his career in the accounts office of the Department of Agriculture in 1927, but was soon transferred to the Agricultural Chemical Laboratory. By 1946 he was in charge of the newly established DSIR Fats Research Laboratory, where he remained until retirement. During that period his work included the development of chemistry behind the fish oil industry, and his DSIR lab was the first outside the United States to distill vitamin A from fish oil.

His qualifications include MSc (First Class) and DSc (Victoria), PhD and DSc (Liverpool), OBE, FNZIC, FRSNZ, IOM. He has produced some 300 scientific papers and reviews, and has often been described as the doyen of New Zealand working scientists.

Nowadays Dr Shorland is one of Vic's characters. He is well known for his current research, aimed at correcting what he considers misconceptions surrounding the role of animal fats in nutrition and to debunk the widely held belief that it is healthier to eat margarine than butter. He approaches the subject using known scientific experimental evidence and also looking at it from a historical perspective which recognises heart disease, angina and thrombosis as relatively recent diseases, whereas arteriosclerosis has been long documented in humans and other animals. Thrombosis has been recognised only this century as the prime cause of heart attacks among humans. Its cause remains unknown, but he says it appears to be related neither to smoking nor the use of animal fats such as butter.

Currently Dr Shorland is also editor of the *NZ Science Review*, and has a contract to write a book on nutritional aspects of ruminant meat and milk fats.

But well beyond his own specialist field, he is also known for his incisive mind, his cunning wit and his critical questioning of everything and everyone.

Dr Andrew Dowsett, chair-person of the School of Biological Sciences, says that in addition to being a most distinguished scientist, Dr Shorland is "particularly notable for his inquisitive mind, his willingness to question the most basic assumptions, his eagerness to debate and discuss ideas with anyone in the School and his unflagging dedication to science. "In many ways Brian is the prototypical scientist, intellectually incisive and always questioning and searching. He is a joy to have in the School".

Dr Shorland has an opinion on everything, be it the need to develop the use of wind power as an alternate source of electricity (another active interest of his), or the current information explosion, which he says has resulted in a corresponding increase in ignorance of everyday scientific knowledge among the general public. "The market is flooded with information," he laments. "We are all lunatics and idiots. We think we know, but when it comes to the key questions we are all fools."

Dr Alan Clark, reader in biochemistry, who has known Brian Shorland for 25 years, says: "He is formidably active and his name is still internationally recognized. He produced a major invited review on human nutrition when he was about 80. "He is now at the stage where he doesn't have to worry about his career, so he is free to pursue slightly unorthodox scientific interests. Science progresses by exploration of unorthodox ideas. "It is great that we have someone in the department who is in the position to do this without having to defer to the establishment. He is a bit of a gadfly, and the university needs gadflies!"

Dr Shorland holds an OBE for services to science, and has the premier awards of the Royal Society of New Zealand, the New Zealand Institute of Chemistry and the New Zealand Association of Scientists, as well as may other distinctions and awards. He was recently awarded the International Order of Merit, an award which is held by only 500 worldwide.

- *Farida Tilbury*

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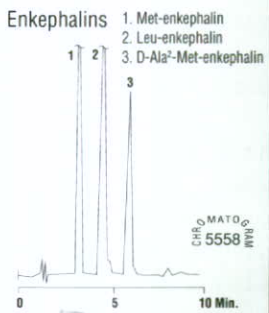

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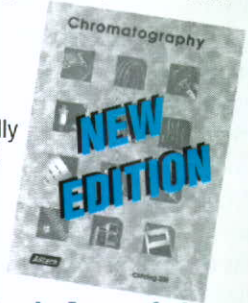

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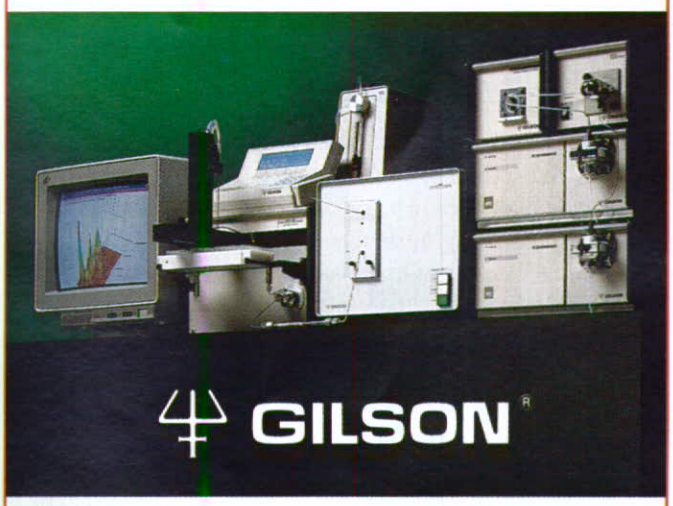

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A ? OF CHEMISTS

Marvin D. Silbert, FCIC
from "Chemputing", Canadian Chemical News, June 1995

The following article appeared in the June 1995 issue of *Canadian Chemical News*, and the author has asked for comments and suggestions from New Zealand chemists - Ed.

In the English language, we have a number of most interesting collective nouns to describe groupings. These include a parliament of owls, a gaggle of geese, a pride of lions, a pod of whales and many more that leave you questioning both their origins or logic. When it comes to a collective name for a group of chemists, there is no term. In the February 1995 issue of *Canadian Chemical News*, we asked for your suggestions. As an incentive, Chemputing offered the Word-perfect edition of *The Collins Dictionary of the English Language* as a prize for the best entry.

Entries came in by telephone, Fax and Internet. One member even came knocking on the door with his ideas. Suggestions came from places *a mari asqua ad mari* and beyond. Some people sent in a single entry; others sent several. A number of entries included some very interesting explanations that ranged from ingenious to sarcastic. This month's issue summarizes the entries and lets you in on some the comments that came with many of the entries (Table 1.).

Table 1. List of Entries For A ? of Chemists

activity	equilibrium
aggregate	flux
aliquot	froth
allotrope	fugacity
barrel	fume
battery	fundless
beaker	fusion
bond	group
bonding	mash
bubble	mole
cabal	nucleus
cacophony	octet
catalyst	pHundless
chain	plume
colloquium	pollution
composition	reflux
concentrate	reticulation
concentration	ring
condensate	sample
conglomerate	spectrum
contamination	stink
coven	suspension
distillate	symposium
emulsion	titre
ensemble	valence

The first entry to arrive came by Fax from Matthew Clark, a student at the University of Toronto. He suggested an **octet** of chemists as that "is the most stable configuration". Jack Clark, MCIC, suggested a **chain** of polymer chemists for a small group and a **reticulation** for a large group. He also suggesting a **ring** of organic chemists.

George Auld, FCIC, of White Rock, BC sent his entry via CompuServe to my Internet mailbox complete with that typical winter greeting from British Columbia to the rest of us, "The crocuses are up". He noted a recent inter-change of Letters to the Editor and suggested that a **cacophony** of chemists might be appropriate. That term also came up in a number of conversations with several other members, but George was first. Several entries included comments about that exchange of Letters to the Editor, but Walter Brown handled this best with a poem that I hope will be the last word on this subject:

There was a brash engineer from Temiscaming
who avidly read articles on Chemputing.
Said he "these are humorous
and motivate the curious
because they're so clearly refreshing".

Walter also suggested that we should have included, within our contest, a collective term for chemical engineers. Where Walter suggested a **barrel** or a **kettle** of chemical engineers, the equivalent might be a **beaker** of chemists.

Bob Hudgins, FCIC, at the University of Waterloo suggested a **valence** of chemists. He went on to say that "Chemistry is so specialized these days, that the quantum mechanics and the spectroscopists and the organickers have little in common. What they do have in common is an interest in phenomena that result from the sharing of outer electrons. The name suggests sharing of outer electrons. The name suggests that once a valence of chemists is formed, it may contain many a distinctive bond that may take a lot of energy to break apart".

Janis Bumbulis, FCIC, of Scarborough asked a very interesting question as part of his submission. "When is the last time you received a business card that states 'chemist' (except for British pharmacists)? Usually it is 'xxxx chemist'." I grabbed one of my business cards and called Janis to see where I stood on this one as mine says "Consulting Chemists". No; I'm not one those 'xxxx' chemists. I graduated many years ago from a CIC accredited course at McMaster University with an honours BSc in chemistry. It was agreed by those involved that I had demonstrated some proficiency in all areas of chemistry including: analytical, physical, organic and inorganic and could call myself a chemist. Somehow when I went into graduate school, I was expected to fit into one category. Does this mean I was forced to give up the others? Too many of us have been hiding behind a narrow 'xxxx' label for too long. We have an interesting field and should take every opportunity to explore beyond our 'xxxx'.

Duke Duyck, MCIC, of Mississauga suggested a **conglomerate** of chemists. If the group was heterogeneous it could be an **aggregate**; if homogeneous an **emulsion**. When they are listening to an interesting lecture, they could be called a

suspension of chemists. Syd Brownstein, FCIC, of Lanark, ON suggested an **ensemble** of chemists. He indicated that this word comes from statistical mechanics and implies an average group of unspecified size and perhaps most important in the Canadian context, it can be used without change in both English and French.

Jeffrey Hetherington sent his three entries via the Niagara FreeNet. He suggest a **symposium** of chemists, a **colloquium** of chemists and a **sample** of chemists. I particularly liked the symposium term. *The Collins Dictionary* gave its classical Greek meaning as, "a drinking party with intellectual conversation, music, *etc.*", but did not elaborate on the *etc.* term.

David Bradley sent his from Cambridge, U.K., via the Internet. Rather that adapting an existing chemical term, he suggested a new collective noun, that sadly describes the essence of a group of modern chemists: a **fundless** which might with usage change to a more scientific moniker: a **pHundless**. On this "f/pH' issue, Janis Bumbulis questioned the role of IUPAC to force one spelling over another, especially when the Germans use Schwefelstoff. Normally, the mere mention of the virtues of the "f" *vs.* "pH" in the spelling of sulfur is enough to get a tidal wave of pro- and anti-British and American sentiments going.

Standardized Spelling

My hour is almost come,
When I to sulphurous and tormenting flames
Must render up myself.

Alas, poor ghost! Although The Glove and Mail recently introduced a new style guide, you must still suffer the sulphurous spelling of Shakespeare's day.

Few words surpass "sulfur" in their ability to initiate heated arguments over the virtues of U.S. versus U.K. spelling. Sulfur is a chemical species and whether we are in the United States, the U.K. or playing the middle group in Canada, the International Union of Pure and Applied Chemistry provides standardized names and spellings. The IUPAC Commission on the Nomenclature of Inorganic Chemistry recommends the "f". I would not suggest rewriting the words uttered by the ghost of Hamlet's father, but I do suggest that The Glove and Mail should follow the IUPAC recommendations and in anticipation of the next letter, IUPAC recommends aluminium, not aluminum

Marvin D. Silbert, Willowdale, Ont.

Figure 1. Letter to the editor of The Glove and Mail.

I should note that our National newspaper, Toronto's *The Glove and Mail* was recently (April 1995) doing an expose on the use aluminium sulfate in drinking water and could neither spell its name properly nor describe its action in the coagulation-flocculation processes used to treat a municipal water supply. While few of us would consider this newspaper to be a good source of chemical information, we should also note the *The Globe*'s editors were informed about the IUPAC recommendations, but failed to heed a letter to the editor published in their 1991-Mar-11 issue (Figure 1.).

Several entries made comments on the use of **orbitals** of chemists, but directed them specifically to the national executive. They felt that certain properties of orbitals such as 'going in circles' and the role of the Heisenberg Uncertainty Principal in making them "unable to define where they were' particularly applicable to members of these groups. There were no entries from the national executive applicable to members of these groups.

How do we pick a winner from this list? In order to choose a collective noun from the large selection, we must make a collective decision. Send in your vote and specify whether it applies to chemists, chemical engineers, chemical technologists or all three. If you are going to use the term, you must be part of its creation. Copies of the Chemputing column will be distributed to other national and provincial chemical societies. We may have started something. Send your votes to me by mail to 23 Glenelia Avenue, Willowdale, ON, M2M 2K6; Fax them to 416-225-4551 or Internet to silbert@io.org.

I faxed Marvin Silbert to indicate that New Zealand chemists? may like to contribute with a little (or a lot) of our "kiwi" ingenuity. Marvin's reply was that they would like to include our vote and any unique entries we might come up with and would hold the vote cut-off until 1 September 1995.

So come on New Zealand! Chemistry in New Zealand would like to publish the New Zealand vote and any novel suggestions so please contact me with your votes and entries - Ed.

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THE WWW AND SCANNING PROBE MICROSCOPY ARE A PERFECT MATCH

Technical Information Regarding Scanning Probe Microscopy is Now Available Through TopoMetrix's New Site on the World Wide Web

TopoMetrix now has a site on the Internet's WWW (http://www.topometrix.com) with over 30 pages of colourful scanning probe microscopy (SPM) images and technical information - making this Web site particularly enjoyable to visit and a superb use of the WWW's capabilities. TopoMetrix's mission for this new Web site is to provide both technical information about the SPM technique and its applications and product information. The site is updated frequently in an effort to provide visitors with the most recent information regarding the latest developments in SPM.

The technical information currently available on TopoMetrix's Web site includes:

- *Latest Technical/Application Note* - A copy of the most recent technical or application note produced by TopoMetrix.
- *What's New* - The latest product and technical offerings.
- *Images* - Several full-colour images of the latest SPM applications in material science, electrochemistry, semiconductor manufacturing, biological science, and other fields.
- *NSOM References* - A resource to the technical articles and papers regarding near-field scanning optical microscopy, one of the "hottest" areas in SPM today.
- *Latest Press Release* - A copy of the most recent news release from TopoMetrix.
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TopoMetrix designs and manufactures scanning probe microscopes for worldwide distribution. Scanning probe microscopes are used by industry, government, university, and research laboratories to characterise materials by providing extremely high-resolution three-dimensional images of surfaces. This rapidly growing technology builds upon the Nobel Prize-winning invention in 1981 of the scanning tunnelling microscope and its ability to image indiviual atoms.

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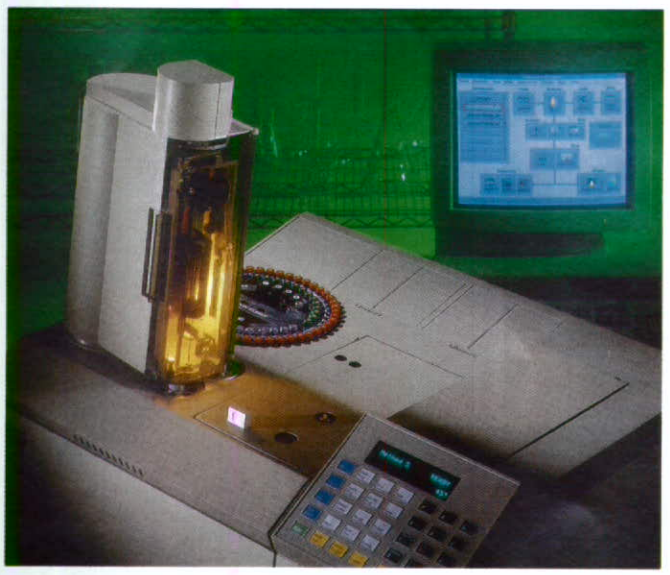
INTRODUCING THE NEW AUTOSYSTEM XL GAS CHROMATOGRAPH FROM PERKIN ELMER

Perkin Elmer is proud to introduce the new AutoSystem XL Gas Chromatograph. The AutoSystem XL will complement the current AutoSystem GC offering. With the AutoSystem XL, Perkin-Elmer is taking a further step ahead in the market, combining increased performance with dramatically increased productivity.



AutoSystem XL incorporates the latest available technology in electronics as well as innovative pneumatic and chromatographic accessories. The innovations have been added to the proven hardware of the AutoSystem GC, including the autosampler, injectors and detectors. The AutoSystem XL GC, including all pneumatic functions and temperature programmable inlets, can be controlled from the integrated 35-key control pad or externally by Turbochrom GC Plus for full documentation and GLP compliance. The documentation includes all system parameters as well as chromatographic quality through the optional Turbochrom System Suitability Software.

The outside appearance of the AutoSystem XL is very similar to that of the AutoSystem. The main difference is the absence of pneumatic control knobs if the instrument is fitted with PPC™ (Programmable Pneumatic Control).

The pneumatic modules available include the conventional constant pressure and constant flow modules known from the AutoSystem GC. In addition, the AutoSystem XL is offered with a full range of PPC modules to control up to 2 carrier gas zones, 2 split vent zones, 4 auxiliary zones and up to 4 detector gases. Every injector and detector is available with PPC. The carrier gas control can be performed in 4 software-selectable modes: Programmed Pressure, Programmed Flow, Constant Flow and Programmed Linear Velocity Mode. Vacuum compensation mode for use with Mass Spectrometers is software selectable.

PPC can increase the speed and quality of GC analysis, since the carrier gas flow can be kept at the optimum throughout the entire chromatographic run. A carrier gas leak test performed before every analysis, along with the built-in detector flame-out check, ensures that no sample is lost by injection into a non-functioning system. Through timed events combined with PPC, the gas cost per analysis can be minimized by reducing the split-flow after injection has taken place. Furthermore, a built-in sleep-mode can automatically set the instrument when not in use, to a pre-defined method to save gases and reduce operating costs. Built-in pressure and temperature sensors ensure that variations in ambient temperature and barometric pressure are compensated for in the carrier gas control. This provides maximum reproducibility under all circumstances and ensures complete portability of methods, user to user, instrument to instrument and laboratory to laboratory.

The unique PreVent™ accessory is offered with the PSS (Programmable Split/Splitless) injector and requires the PPC option. PreVent can be used in 3 different modes of operation and offers entirely new possibilities to the analyst in terms of productivity and performance.

PreVent™ in the Time-Saver mode allows the user to selectively prevent unwanted components such as high-boiling analytes or residues from going through the chromatographic separation system and the detector. This reduces analysis time and improves system stability and overall up-time. PreVent Time-Saver is a productivity tool.

PreVent Enhanced Solvent Purge mode allows large volume injection and on-line sample preconcentration for dramatically increased sensitivity, setting new standards of performance. Solvent flooding of the column is eliminated and solvents are kept from the column and detector. This allows the use of solvents like methylene chloride with an ECD. PreVent Enhanced Solvent Purge is a performance tool.

The PreVent Isolation Mode allows a septum change or inlet liner maintenance without interrupting carrier gas flow. These procedures can be performed while chromatography is in progress since the injector is pneumatically isolated from the column and detectors. PreVent Isolation Mode is a productivity tool.

AUTOSYSTEM XL OVERVIEW

Keyboard:
Designed for easy operator interaction, a single logical keypad with only 35 keys controls all GC operations and autosampler functions. The 2-line by 20 character display provides all necessary information and guiding text to easily and intuitively operate the AutoSystem XL.

THE SIMPLEST KEYPAD!

Oven:
The AutoSystem XL oven is developed to provide easy access to two columns. The small oven volume gives excellent temperature control and fast cool-down for maximum productivity. All temperature and time functions are microprocessor controlled and are shown on the vacuum fluorescence display. Software selectable coolant timeout and coolant cut-in temperature ensure economical subambient operation.

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Injectors and Detectors:
The AutoSystem XL can be configured to have up to 2 injectors and 2 detectors built in (if the PID/ELCD combination is chosen, it is possible to fit a total of 3 detectors). In addition to the built in detectors, the Q-Mass 910 Mass Spectrometer or the Model 2000 Fourier Transform Infrared Spectrometer can be added as external detectors. Gas Sampling Valves can be mounted in the GC.

PSS - Programmable split/splitless capillary injector:

- Temperature programmable inlet
- Large Volume injection of up to 50 µL with autosampler, 150 µL or more manually in the solvent purge mode.
- Three step temperature program
- Oven Tracking mode for simple operation
- Split ratio easily adjustable for a wide range of analysis conditions
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PSS with PreVent™ - NEW!!:-

- Unique Perkin Elmer sample management system
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- PreVent Enhanced Solvent Purge mode isolates the column and detector from the effects of high levels of solvent. Eliminate solvent flooding of the column or allow the use of solvents such as methylene chloride with an ECD detector saving sample preparation time
- PreVent Isolation Mode allows a septum or liner change without interrupting carrier gas flow
- Perform maintenance on the inlet while chromatography is taking place

PreVent SOLVES CUSTOMERS PROBLEMS!

Other available injectors:

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THE BEST SELECTION OF INJECTORS!

Autosampler:

Built on the hardware of the AutoSystem GC, the AutoSystem XL GC has a unique built-in autosampler, which was designed as an integrated part of the system - not as an afterthought. The integrated sample tray holds up to 82 samples plus a priority vial. It is suited at the top of the instrument, insulated from the heat generated by the GC oven by a well ventilated space. The autosampler can be controlled through the GC keypad as well as through external control from Turbochrom or 1022GC+. Able to access both available injector ports automatically, the AutoSystem XL autosampler offers the customer maximum flexibility and maximum use of both channels of the Gas Chromatograph. After performing an injection, the Autosampler syringe is immediately removed from the hot inlet, the needle is immediately rinsed up to 15 times in up to 2 solvents and the tower moves to the standby position away from the heated injection ports. This ensures efficient rinsing of the syringe and eliminates "caking" of sample residues on the needle, since it is not kept hot. Keeping the needle cool also allows the AutoSystem to handle low-boiling solvents without reproducibility or precision problems due to bubble formation. Optional external cooling of the Autosampler tray lets the AutoSystem XL handle samples with low-boiling solvents even at high ambient temperatures. The 4 Wash and 4 Waste vials allow different analyses to be performed using different needle rinse solvents during the same automated sequence. Up to 32 syringe washes and 15 extra syringe pumps ensure compatibility with the most difficult samples like paints, emulsions etc. Through programming of the speed of the syringe piston movements, the autosampler can handle even quite viscous samples without prior dilution.

Three Injection Modes:-

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"Normal" - for Normal, On-Column or Large Volume injection
"Slow" - for Large Volume injection

Unlike most competitive systems, the AutoSystem XL does not require removal of the Autosampler to perform routine maintenance on the injectors or to do manual injections. This advantage gives the customer higher productivity.

THE BEST AUTOSAMPLER!

Detectors:

A wide choice of detectors optimized for sensitivity and selectivity are available for use with the AutoSystem XL. All built-in detectors include an automated background compensation feature that offsets column bleed. Whether you choose the Flame Ionization Detector, the Thermal Conductivity Detector, the Electron Capture Detector, the Mass Spectrometer, and/or environmental specific detectors, all conform to the highest industry standards for reliability and performance. Every detector is available with PPC or conventional pneumatics. Up to two detector modules may be installed and operated simultaneously with independent temperature and pressure control. Detectors available are:

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Thermal Conductivity Detector (TCD)
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Nitrogen Phosphorus Detector (NPD)
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Photo Ionization Detector (PID)
Electrolytic Conductivity Detector (ELCD)
PID/ELCD combination in series
Mass Spectrometric Detector (MS)
Fourier Transform Infrared Detector (FTIR)

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The full range of pneumatic options provides optimum performance with all types of columns and detectors for every application. The AutoSystem XL is available with conventional pneumatics or PPC (Programmable Pneumatic Control). Each instrument zone may be configured with or without PPC by specifying the pneumatics for every injector, detector and auxiliary function. The modular design allows full flexibility and easy modification. All PPC modules are mounted in the back of the instrument. A combination of PPC and conventional pneumatics can be chosen.

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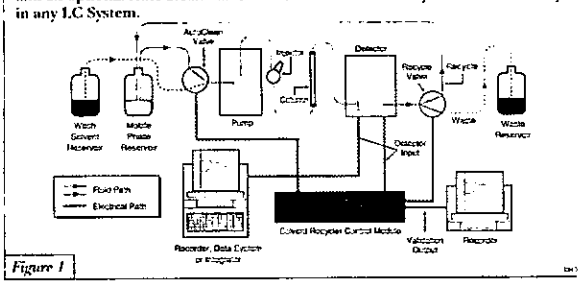

Figure 1

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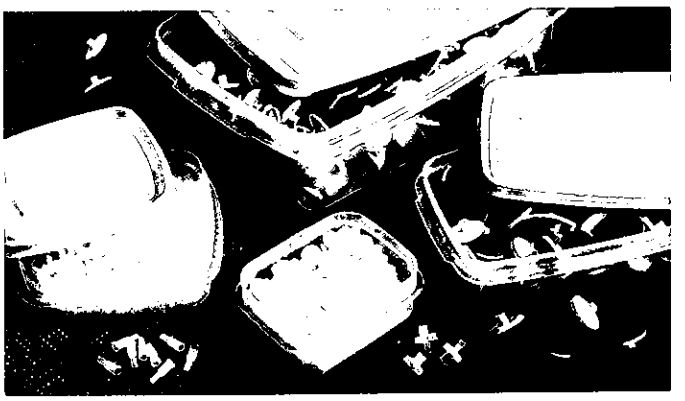

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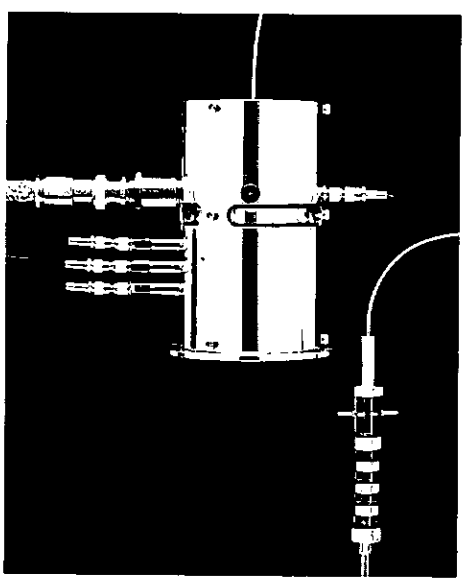

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NEW! - THE RE/SEAL CAPPING SYSTEM

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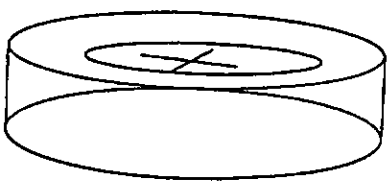

A RE/SEAL cap has almost no evaporation, does not create an aerosol when opened and offers a high degree of spill protection.

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NEW DIGILAB SPECTROMETER AND SOFTWARE KEEPS BIO-RAD AT THE LEADING EDGE OF FTIR TECHNOLOGY

Bio-Rad's Digilab Division in Cambridge, Massachusetts has recently introduced a new high-end FTIR spectrometer, the FST 6000, together with an advanced software package, Win-IR Pro, to satisfy the most demanding needs of researchers around the world.

The FTS 6000 is the latest and most sophisticated of Bio-Rad's line of FTIR spectrometer systems, and is designed for scientists who need the ultimate in speed, precision and sensitivity. It includes a "step scan" capability, based on a patented methodology, which is invaluable in studies on samples whose properties are changing rapidly. Another feature, called "Integrated Experiments" allows the user to easily connect and control a variety of accessories and data collection devices for more complex studies.

A typical user of the FTS 6000 might be a corporate research department developing new polymers, like polystyrene or plastic films. Studies using this instrument can help them find ways to make the materials more elastic, so they return to their original shape after being stretched or compressed.

Another major application is for electronic companies which are trying to better understand the properties of liquid crystals. These are now being used extensively in flat panel displays for laptop and notebook personal computers. By applying an electric field the crystals change their orientation, causing their colour to change. This process can be studied by the FTS 6000 at the molecular level, with the objective of making the response time faster and manufacturing these devices more reliably and at lower cost.

Bio-Rad has also begun shipping its new Win-IR Pro software package, which takes the data produced by the FT-IR spectrometer and allows it to be viewed, analysed and manipulated by the user. It can also compare the data to a computer library of known compounds to help identify the sample. The new software package is designed to run on Windows NT, a more sophisticated 32-bit version of the extremely popular Windows operating system used on many personal computers.

Win-IR Pro takes full advantage of the speed and power of newer Pentium-based PCs and provides advanced graphic features. These include the capability to produce 3-D images and rotate them, making it easier to locate data regions of interest.

The software has built-in networking capabilities, so researchers can exchange and share data. It also allows scientists to run an experiment in the laboratory and then return to their office to access and work with the data on their desktop computers.

Win-IR Pro features a built-in spread-sheet interface to keep data organised and a reprocessing feature which lets the user retrieve the raw data for further analysis without having to rescan the original sample.

Contact: Bio-Rad Laboratories
P O Box 100-051, Auckland
Ph: (09) 4433099, Fax: (09) 4433097, Freephone: 0800-805500
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COMPLETE PORE SIZE ANALYSIS FROM MICRO TO MACRO PORES IN ONE ANALYSIS

The Oliver-Conkin DFT method bridges the gap between micropore, mesopore and macropore distribution calculations using innovative mathematical, statistical, and numerical techniques for interpreting data from the ASAP2000 or 2400 series instruments. It is the only commercially available method that offers a unified approach to analysing the entire adsorption isotherm from beginning to end. All pores, from the smallest to the largest, are reported using a single data reduction technique based on statistical thermodynamics. Now for the first time, all pores accessible by the adsorbate qualify for analysis using a single, unified method. There is no need to compile several reports, switching from t-plot, to BET, to BJH method in order to piece together fragments of the whole picture. Because density functional theory (DFT) describes the behaviour of gas adsorption on a molecular level, the results show an all-inclusive and precise picture of adsorption activity as it occurs in reality.

This molecular approach in the micropore range at very low relative pressures produces far more realistic results than other micropore methods. For example, the Horath-Kawazoe method, by definition, fails at pore sizes greater than 10 to 20 Å in diameter. However, DFT makes much more accurate assumptions which are applicable to all pore sizes. In fact, the validity of DFT thermodynamics produces results in the larger pore size range that confirms results obtained from the Kelvin equation.

An advantage DFT has over classical methods is range. None of the classical methods (including BJH) for determining larger pore sizes work for micropores. Classical methods can only average bulk properties for a large aggregate of molecules and are better suited for analysing mesopore and macropore systems.

Classical methods fail with tiny micropore systems at low relative pressure where there are no bulk properties to average. The Oliver-Conkin DFT method, however, overcomes these limits with modern mathematics and up-to-date scientific models of adsorption physics.

Working on a molecular model, Oliver-Conkin DFT moves between micropores and macropores seamlessly. In fact, it is the only method available in the marketplace that can realistically analyse a broad pore size distribution ranging from 4 to 1000 Å in diameter. The entire data reduction is completed in thirty seconds or less. Before the Oliver-Conkin method was introduced, these types of calculations required the use of super-computer platforms to achieve practical calculation times. Now the Oliver-Conkin method brings DFT out of the computer centre and into the laboratory using today's desktop computers.

Contact: Particle & Surface Sciences Pty Ltd
P O Box 494 Gosford, NSW 2250, Australia
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FLUORESCENT LATEX MICROSPHERES

Interfacial Dynamics Corporation (IDC) manufacture a wide range of very high quality Fluorescent Microspheres.

This product line consists of six colours, with excitation and emission levels compatible with standard filter sets.

The yellow-green microspheres are excited very efficiently at 488 nm by an Argon Laser while orange is well suited to the 514 nm line. Although the red microspheres are centred at 578 nm the excitation band is broad enough to signal intensities at 605 nm. The complete range covers wavelengths from 360 nm to 645 nm.

Tests have shown these microspheres to be many fold brighter than other manufactures.

Typical applications include:

- Immunological markers for surface antigens
- Immunodiagnostics where their high fluorescence intensity makes then well suited for diagnostic applications
- Tracers in cell biology
- Phagocytosis research

For more information concerning these or any of IDC's other products

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MANY ACHIEVEMENTS AT CAMBRIDGESOFT CORPORATION

CambridgeSoft Corporation (or CS for short) will be known to many readers by its products, CS ChemOffice, CS ChemDraw, CS Chem3D and CS ChemFinder, rather than by its present name, or by its former name Cambridge Scientific Computing. The products are vital, of course, and for this company they have resulted in a 1995 Readers Choice Award,

from *Scientific Computing and Automation* magazine, and an Elite award from the readers of *Research & Development* (R&D) magazine.

1995 has seen a large amount of development work by this company, making it hard for users of their software to keep up with the current situation. Much of the development was directed to finishing the Windows versions of their originally Macintosh products. ChemDraw is a program for drawing chemical structures quickly and accurately. The Windows Version was finished early in the year. Chem3D is used for modelling and visualisation, helping you to gain insight into molecular behaviour by using real time animation and by performing energy and molecular dynamic calculations. The Windows version of this program was released in April.

However, development does not stop at this company! They have now released version 3.5 of ChemDraw for the Macintosh and for the Power Macintosh. The major new feature of this release is chemical intelligence, that calculates formula, mass, molecular weight, and elemental analysis. The program recognises charged species and radicals, and correctly interprets functional group nicknames such as Bu, i-Pr, TMS and Gly. Improvements to drawing tools and syntax checkers are also included.

CS packages groups of its programs under the name ChemOffice. One of the great strengths of this package in the Macintosh environment is the program ChemFinder, which is designed to allow you to control all aspects of chemistry research, by creating customisable electronic notebooks or reaction card files. You can then search for text, chemical reaction data, or chemical substructures among many other things. These searches can include links to databases in formats such as Chem Abstracts, MACCS, Beilstein and many others. Examples of the productive interaction between CS and other companies are common.

CS is working now with the French company Questel-Orbit to develop the use of ChemDraw as an interface to the DARC database, which includes all of the 12-million plus compounds indexed by Chem Abstracts.

The Fujitsu company developed the program MOPAC 93 from the public domain program MOPAC. CS and Fujitsu and CS together are now developing CS MOPAC, which will integrate the industry-standard computational features of MOPAC with the graphical interface of CS Chem3D. Dr James Stewart, the original developer of MOPAC, is also supervising the development of CS MOPAC, and says "This is a marriage made in heaven. Both Chem3D and MOPAC have proved very successful when used independently, and the combined package will be even more successful." The first version to be released will be the Windows one later this year.

CS is working with the publisher Saunders College Publishing to bundle the Ltd. version of CS ChemOffice with a selection of chemical textbooks, including *Organic Chemistry* by Brown, and *Biochemistry* by Garrett and Grisham.

Finally, some points of nomenclature. CS produces various versions of its programs. It used to call the highest specification version the "Plus" version. It no longer uses this description. Also, it no longer produces a "standard" version of CS Chem3D. There are "Ltd." versions of CS ChemDraw and Chem3D, designed as introductory chemistry packages for people in the "edutainment" market. That means that you can buy ChemDraw Pro, Standard or Ltd., Chem3D Pro or Ltd., ChemFinder Pro (Mac only), and ChemOffice Pro or Ltd. And in English or Japanese!

If you are on Internet, and want to know more, or to download demo files, try the Web site at http://www.camsci.com.

Contact: Hoare Research Software
P O Box 4153 Hamilton
Ph: (07) 839-9102, Fax: (07) 839-9103
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REMEDi HS DRUG PROFILING SYSTEM RECEIVES FDA CLEARANCE

Bio-Rad has announced that the U.S. Food and Drug Administration has recently cleared its REMEDi HS™ Drug Profiling System to be marketed for diagnostic purposes. This system is designed for use in hospital emergency rooms to help doctors determine what drugs a patient has taken. It provides results quickly and accurately in situations where time is critical.

A considerable number of these systems have already been placed in international markets, as well as U.S. hospitals who have been using them on an investigational basis.

REMEDi stands for Rapid Emergency Drug Identification. If a patient is brought unconscious into a hospital emergency room, the REMEDi HS system can produce a profile of which drugs are present in less than 30 minutes, helping doctors determine the best course of treatment.

The system not only detects drugs of abuse, like cocaine, but also sleeping pills, tranquilizers, antidepressants, antihistamines, cardiac medications and other prescription durgs. The system also detects metabolites produced as drugs are broken down by the body.

The REMEDi HS system uses a combination of technologies to create a graphic representation, called a spectrum, of the drugs present in the patient's sample. It then identifies the drugs by comparing the sample spectrum to a library of known compounds stored in the REMEDi HS computer. Information on a broad range of drugs and metabolites is included in the library, with the capability of adding new compounds.

Geriatric medicine is another area where the REMEDi HS system is now being used. It assists doctors in determinng the different drugs a patient is taking, including ones which should not be given in combination with others.

Additional applications include forensic studies and drug treatment compliance programs, as well as the detection of drug abuse in psychiatric patients.

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RHEOMETRIC SCIENTFIC STRESS RHEOMETERS SR 200, SR 500

The Dynamic Stress Rheometer is the most advanced controlled stress instument available. It provides fast and accurate creep, creep recovery and dynamic measurements in a small, easy to use, low cost instrument. Designed for QC and product development applications, the Rheometric Stress Rheometer can test a wide variety of fluids: simple solutions; complex structured fluids such as suspensions and emulsions; soft solids such as foods; adhesives and polymer melts.

- Active Inertial Control (AIC) during measurement ensures accurate elastic characterisation of rapidly changing systems free of inertial effects.
- Micro Strain Resolution extends the modulus testing range to weak systems (such as beverage thickness) and stiff materials (such as ultra high molecular weight polyethylene).
- Precision Stress Control provides a truly constant stress through the full rotation of the stress head regardless of the material being tested.
- Third harmonic monitor gives in real time an indication of the non-linear behaviour of the material.
- Auto gap and Auto zero give consistent sample loading and make the instrument simple to use.

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THE RHEOMETRIC SCIENTIFIC DSC+

The most advanced heat flux plate instrument available. In a single box small footprint design, it offers the sensitive yet robust cell with modern intelligent electronics ensuring low noise and excellent repeatability of results. The integral cooling facility, used in conjunction with the AutoCool unit, allows automatic control of cycling between sub-ambient and high temperatures.

- The wide temperature range (-160 °C to +770 °C) allows a very wide range of materials to be tested.
- The powerful interactive information display panel allows continuous monitoring of status, on-line temperature and purge gas flow plus a built-in alarm facility.
- Accurate atmosphere control with optional automatic gas switching facility for applications such as oxidative inductive stability tests.

In addition to the standard instrument, Rheometric Scientific offers two more instruments in the DSC range:

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DSC QC - Equal in performance to the standard model, this instrument is intended for quality control monitoring and research applications where budget is limited.

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RHEOMETRIC SCIENTIFIC DYNAMIC ANALYSER RDA II

The RDA II can test liquids, melts and solids and can accommodate materials ranging in shear modulus from 10 to 10^{11} Pascals. This makes it the ideal instrument for evaluating polymeric materials, including thermoplastics, thermosets and elastomers.

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- Auto Tension - to minimise operator intervention for materials studies over wide temperature ranges.
- Multi-Wave Option for the study of frequency dependent material properties in a fraction of the usual test time.
- Programmable testing feature gives the ability to pre-programme test procedures and evaluation routines, allowing alteration of the test pass conditions depending on the test results.

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RHEOMETRIC SCIENTIFIC DYNAMIC MECHANICAL THERMAL ANALYSER DMTA III

The DMTA III is technologically the most advanced Dynamic Mechanical Analyser available. The instrument offers unrivalled versatility in choice of deformation modes as well as its highly automated operation, which allows for a wide variety of experiments with minimum user intervention.

The DMTA III has the ability to cover a wide frequency range from 0.01 to 200 Hz and to frequency multiplex over the wide temperature range of -150 °C to 500 °C (optionally 800 °C).

- Just one instrument covers the measurement modes of bending, shear, tension and compression in vertical or horizontal mode. TMA and creep modes are also available.
- Rapid automatic calibration for ease of use.
- 4.5 decades of dynamic stiffness range.
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RHEOMETRIC SCIENTIFIC SIMULTANEOUS THERMAL ANALYSERS STA 625, 1000, 1500 AND 1640

The Rheometric Scientific Simultaneous Thermal Analyser (STA) is the most advanced and versatile instrument of its type. In an STA the two techniques of DSC and TGA are performed simultaneously on a single sample of material. This technique removes uncertainties associated with the separate techniques of TGA and DSC. With the STA, problems of sample inhomogeneity, sample geometry, variations in operating conditions and temperature accuracy between instruments are totally eliminated. Accurate calibration of the TGA and DSC is possible using the melting points of metal standards.

- The STA has an accurate atmosphere control system which, together with the small swept volume surrounding the sample, is ideal for studying gas dependent reactions.
- The gas handling capability can be extended further with the simple addition of mass spectrometer and/or FTIR instruments which can be coupled to the STA, giving Simultaneous STA-FTIR or STA-MS or both.
- Wide temperature range of -125 °C to +1640 °C in four modules. The STA is unique in offering interchangeability between the STA 625 and the STA 1500 with an optional conversion kit.

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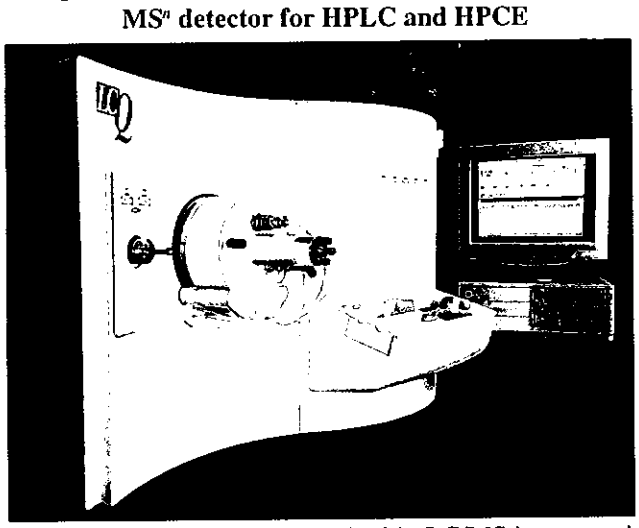
NEW BENCHTOP MS^n SYSTEM FOR HPLC

Finnigan MAT introduces the LCQ, a compact benchtop MS^n detector for HPLC and HPCE



The LCQ represents a new standard in LC/MS incorporating proven technology in a novel platform to offer high sensitivity, full scan spectra, the selectivity of MS/MS and even MS^n! For routine and research applications, the versatile LCQ offers powerful and practical solutions unequalled by any other MS system.

LCQ Standard Features

Integrated Divert Valve/Injection Port

- Automatically diverts solvent for rugged, unattended operation.
- Electronically-actuated sample loop injection port.

Integrated Syringe Pump

- Dual syringes allow automated infusion of sheath liquid and sample.
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- Proven API source technology used in hundreds of laboratories worldwide.
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- Snap-in capillary/skimmer design for ease of maintenance.
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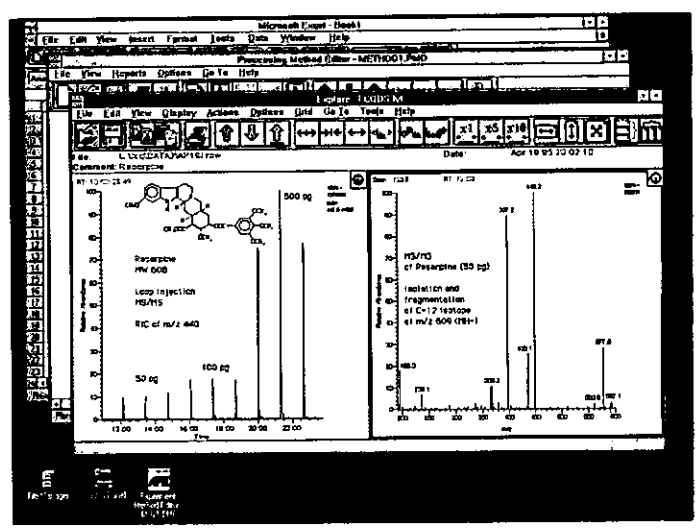
APCI Probe

- Accommodates liquid flows of 200 µL to 2 mL/min without splitting.
- Unique heater/sensor ensures efficient heat transfer to liquid effluent.

ESI Probe

- Accommodates liquid flows of 1 µL to 1 mL/min with splitting.
- Patented liquid sheath offers increased performance with 100% aqueous mobile phases and ultimate performance for HPCE interface.



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- Automatic tuning and optimization

Quadrupole Ion Trap Mass Analyser

- New RF system provides super stable operation for high mass accuracy.
- Unique analyser design for ultimate performance.
- Simple, rugged construction requires no tools for maintenance.
- Internally regulated helium flow for stable operation.

Scan Functions

- Full Scan ... sensitive ion trap analysis, produces full scan spectra often an order of magnitude more sensitive than traditional quadrupole analysers.

- SIM ... monitors selected ions, for target compound analysis.
- Full Scan MS/MS ... produces full scan product ion spectra with typically more than an order of magnitude higher sensitivity than traditional quadrupole analysers.
- SRM ... to detect or quantitate a known compound and improve detection limites, SRM monitors one or more ions in MS/MS or MS^n.
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SCIENTIFIC MARKETING

If your business involves:-

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- providing contract manufacturing or research and development services
- providing personnel consulting services

We have a product or service that will help grow your business, find you new customers, and give your business a greater profile.

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Instrument Use or Technique
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SCIENTIFIC MARKETING

NEW DIRECTIONS IN CANCER CHEMOTHERAPY

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Cancer Society Research Laboratory,
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Private Bag 92019, Auckland

Introduction

While cancer accounts for only about 20% of deaths in Western countries, the nature of the disease makes it arguably the major health concern. Despite substantial research, anticancer drugs are still far from satisfactory, although they do play a major role in the slowly improving treatment of cancer. To gauge this, one only has to look at the contribution of chemotherapy to the 5-year survival rates for cancer patients, which have been trending upwards for the last 20 years, and currently stand at 55% averaged over all types of cancers (US data, 1993). In an increasing (but admittedly still small) proportion of cancers, chemotherapy is clearly curative. For these cancers (e.g., testicular and ovarian), mortality rates are falling even while incidence levels are still rising. Nevertheless, there is a long way to go before curative drugs are available for most cancers. The major reason is that cancer cells are not foreign, but are derived from normal cells by subtle processes which we are only now beginning to fully understand at the molecular level.

Origins of Cancer; New Models

It is now clear that a cancer arises initially from a single normal cell, due to a combination of DNA damage which results in a small number of key genes (proto-oncogenes) in that cell, probably only 5-6 out of a total of perhaps 200,000 genes, becoming altered in critical ways (to form oncogenes). This model arises from studies in molecular biology, which have identified a number of such oncogenes and have deduced why their altered or over-expressed protein products result in cancer, and from epidemiological studies which show that the incidence of many cancers (e.g., non-familial colon cancer) increases as about the 5th or 6th power with age. Such rates of incidence fit well to mathematical models which suggest that about 5-6 separate genes have to be independently activated in a single cell before it is fully converted to a cancer cell, which is then capable of multiplying to form a tumour.

A cell's ability to divide and multiply is normally kept under very tight control via a network of signalling processes which are just beginning to be delineated at the molecular level. These pathways turn on genes involved in both the initiation and shut down of cell division, and many of the known oncogenes code for enzymes which form part of these signalling cascades, or other control systems in the cell. Some of the latter check for DNA damage and do not let a cell divide until the damage is repaired. If the damage cannot be repaired, these systems then direct the cell to commit suicide, in order to prevent the generation of mutant cells. Inactivation of these systems result in much higher rates of mutation, as partially damaged cells are permitted to replicate.

Implications for Drug Design

This new understanding of the subtle molecular changes which underly cancer initiation and development highlights the difficulties faced in developing truly cancer-specific drugs. The most successful single concept for anticancer drugs has been systemic anti-proliferative agents, able to distribute widely in the body and selectively kill dividing cells, primarily by attacking DNA at some level (synthesis, replication or processing). This approach resulted from an early recognition that many cancer cells share a common gross property of uncontrolled growth and division, whereas most normal cells are not rapidly dividing.

Many classes of clinically used drugs have resulted from application of this concept. In some cases this was by deliberate design (e.g., the antifolates and DNA intercalating agents), but it was more often accidental, since the majority of the biological assays used to screen for anticancer drugs select for compounds with such properties. These drugs are collectively very useful, being the mainstay of current chemotherapy. They are capable of improvement in some ways. For example, a common problem in cancer chemotherapy is the development of resistance by the cancer cells to the drugs, by a variety of mechanisms. Much effort is therefore devoted to the development of analogues of existing drugs which are less susceptible to the major mechanisms by which cancer cells can develop resistance (similar to much of the current work on new antibacterial drugs).

However, a common and more fundamental limitation of systemic antiproliferative drugs is that they do not target any of the basic changes discussed above which define a cancer cell, but rather a later consequence of these changes (i.e., rapid cell division). These drugs are thus not "cancer cell specific" so much as "dividing cell specific". The rapidly dividing normal cell populations in the body (e.g., gut epithelia, bone marrow) are therefore also attacked to some extent by such drugs, resulting in the major side effects of much cancer chemotherapy (nausea, immunosuppression, ulceration, hair loss). There is an increasing concensus that, while there is still important work to be done to improve drugs of this type (particularly in overcoming their susceptibility to resistance) and in finding new ones which work in the same overall way but by different molecular mechanisms (e.g., taxol), further improvements in the overall efficacy of cancer chemotherapy with such drugs will be slow.

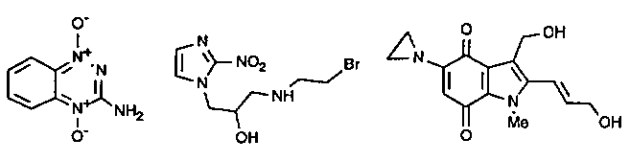
To achieve the quantum jumps in efficacy needed if chemotherapy of the common tumours is ever to be substantially curative, it is recognised that quite different approaches to drug design are required. Two concepts, which are not completely new but which are benefitting from the flood of new knowledge being gained from cell and molecular biology, are now emerging. One is to target classical antiproliferative drugs by selective activation of prodrug forms, and the other is to seek "non-cytotoxic" drugs designed not to kill cells directly, but to selectively block replication of cancer cells by interaction with targets specific to those cells.

Specific Targeting of Antiproliferative Drugs

One major advantage of the antiproliferative agents is that they do kill cells very efficiently. This is useful in many forms of cancer treatment, where large body burdens of tumour cells are encountered. However, as noted above, to make further significant progress, much more specific targeting must be achieved. Many attempts have been made in the past to do this by attaching cytotoxic drugs to various carrier molecules, seeking physical restriction of the drug to specific (cancer) tissues, but these have been largely unsuccessful. A more recent idea is not to seek physical restriction, but to mask the cell-killing agent in a prodrug form which is activated only in the target (cancer) tissue. The critical issue of selectivity is then determined by the nature of the activating process. Two activation mechanisms are being studied worldwide, and are illustrated here from work in progress in the Cancer Research Laboratory.

Bioreductive Activation of Prodrugs by Hypoxic Cancer Cells

In this approach, selectivity is based on the concept that chronic hypoxia (oxygen deprivation) is a consistent and unique property of cells in solid tumours (Coleman, 1988). In the body, the oxygen needed by cells for respiration is carried over long distances in the bloodstream complexed with haemoglobin, but has to get from the bloodstream to cells by diffusion. Because it is consumed by living cells, oxygen concentration decreases with distance from the nearest blood vessel, and at about 150 μm falls essentially to zero. In normal tissue the blood vessel network is so well-developed that all cells are well-supplied with oxygen, but virtually all solid tumours larger than about 1 mm in diameter possess a proportion (usually a few percent) of chronically hypoxic cells. Because such hypoxia does appear to be a consistent and unique property of cells in solid tumours, it is suitable to employ for selective activation of prodrugs. Much work has gone into this concept recently, and three compounds (**1-3**), specifically designed as hypoxia-activated drugs, are currently in clinical trials.



Drugs 1-3

We have recently proposed a general concept for the design of such prodrugs (Denny and Wilson, 1993) as comprising a trigger unit, an effector unit, and a linking mechanism (Figure 1). The initial prodrug needs to be non-toxic and capable of diffusing to the hypoxic cells in a tumour. The trigger unit must then undergo some change (metabolism) only in these hypoxic cells and nowhere else. Most designs currently employ bioreduction as the metabolic process, using trigger moieties which can undergo reduction by (pick up an electron from) ubiquitous cellular enzymes. While this process will occur in all cells to give a transient radical anion species, in oxygenated cells this first step will be rapidly reversed by the oxygen present to regenerate the parent prodrug. However in hypoxic cells this step cannot be reversed, and the radical anion can then react further, to activate the effector (see Figure 2 for a specific example).

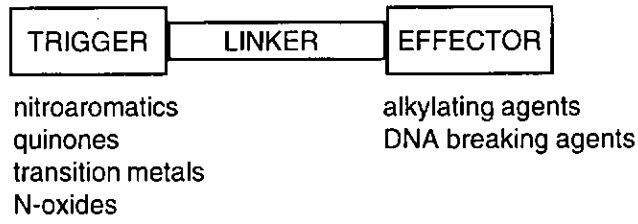


Figure 1

Suitable trigger moieties are nitroaromatics, transition metal complexes, quinones and aliphatic N-oxides. The most common mechanism for activation is by electron transfer, or by physical fragmentation of the molecule. The effector released or activated in this way must be a very cytotoxic species, but have a sufficiently-long half life (1-5 minutes) to be able to diffuse out of the (small proportion) of hypoxic cells where it is generated to kill surrounding tumour cells (ca. 200 μm). The most suitable effector units are DNA alkylators, particularly nitrogen mustards, which are toxic species with well-understood chemistry. They can be reliably deactivated in the prodrug form by decreasing the electron density on the nitrogen, and their reactivity (and thus lifetime and distribution range) when released can be modulated predictably.

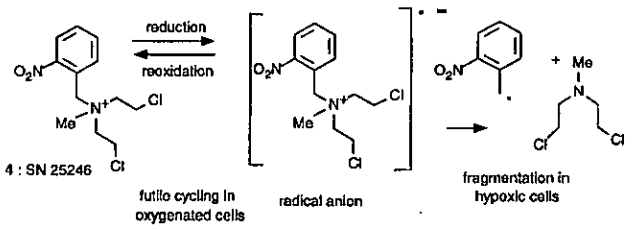
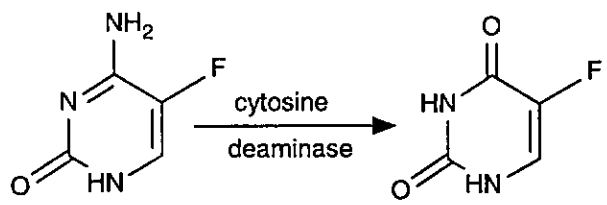


Figure 2

One such class of compounds under development in the Cancer Research Laboratory, the nitrobenzyl quaternary mustards, is exemplified by SN 25246 (**4**) (Tercel *et al.*, 1993; Denny *et al.*, 1994) (Figure 2). In this compound, the cationic charge on the nitrogen completely deactivates the mustard, while also conferring excellent water solubility and ensuring that the reduction potential of the nitro group is in the correct range for efficient cellular reduction (ca. -350 mV). In hypoxic cells, with no oxygen present to back-oxidise the initially-formed nitro radical anion, the molecule fragments, generating a benzyl radical and releasing a reactive nitrogen mustard (the clinical drug mechlorethamine). In cell culture, SN 25246 is several thousand-fold more toxic towards tumour cells under hypoxic compared with normal (oxygenated) conditions following a 4 hr exposure (Denny *et al.*, 1994). Against tumour cells grown as multicellular assemblages called spheroids, where the cells in the centre are hypoxic, SN 25246 achieves substantially higher cell killing than against single cell suspensions obtained from the spheroids by dissociation prior to drug treatment (Denny *et al.*, 1994). This is consistent with the drug undergoing bioreductive activation in the hypoxic core of the spheroid, thus releasing the activated effector to also kill surrounding oxygenated cells.

Gene-Directed Enzyme-Prodrug Therapy (GDEPT)

A concept of broader potential application is to use prodrugs which can be activated specifically by a foreign (usually non-human) enzyme. In this concept, selectivity resides in the ability to generate the activating enzyme specifically in the target (cancer) cells. This is achieved by engineering a gene construct consisting of the coding region for the enzyme in question, plus necessary control elements, and integrating this construct into the genome of the target cancer cells. There are several ways of doing this; a widely used strategy is to package the gene construct into an engineered retrovirus, which is capable of efficiently integrating genes into dividing cells. While this only provides a specificity similar to that shown by antiproliferative drugs, a major attraction of GDEPT technologies is their ability to impose a further level of tumour cell specificity by virtue of the control elements (transcriptional regulatory sequences) in the construct. These ensure that transcription of the foreign gene occurs only in cells which possess the relevant transcriptional activating proteins. An example is a potential therapy for colon cancer, where the coding domain for a bacterial cytosine deaminase gene is linked to carcinoembryonic antigen control elements, ensuring transcription of the gene occurs only in cells over-expressing the antigen (which many colon tumour cells do) (Huber *et al.*, 1994). The generated enzyme then converts the prodrug 5-fluorocytidine (**5**) to the cytotoxin 5-fluorouracil (**6**), which is widely used as a colon cancer drug (Figure 3). Many such concepts are now under study, with several close to clinical trial (Gordon and Anderson, 1994).



5 : 5-fluorocytidine **6** : 5-fluorouracil

Figure 3

If the foreign enzyme can be generated selectively in this way, subsequent administration of a non-toxic prodrug will result in activation to cytotoxic species only in the target cells. Because this activation is catalytic, with one enzyme molecule capable of activating many prodrug molecules, and the activated prodrug can diffuse from the site of release, it has been shown that only a few percent of the target cells need to express the enzyme in order to get complete tumour cell kill. Many combinations of enzymes and prodrugs are currently under study for GDEPT. A project in the Cancer Research Laboratory is concerned with the development of prodrugs which can be activated specifically by a bacterial nitroreductase enzyme to generate activated nitrogen mustards, by converting an (electron-withdrawing) nitro group to an (electron-donating) hydroxylamine or amino group (Palmer *et al.*, 1990). We have shown that the dinitrophenylcarboxamide mustard (**7**) is a suitable prodrug, being essentially non-toxic due to three electron-withdrawing groups on the molecule, but capable of being activated by the bacterial nitroreductase, via reduction of the 2-nitro group to give **8** (Anlezark *et al.*, 1995) (Figure 4).

Inhibitors of signal transduction in cells

The second approach is to develop "non-cytotoxic" drugs which do not kill cells directly, but which selectively block replication of cancer cells by interaction with targets specific to those cells. Although such compounds are theoretically cytostatic and not cytotoxic, cancer cells normally suffer such high death rates that preventing their replication for a relatively short period is sufficient to cause tumour regression. The key to this approach is to find truly "cancer cell specific" targets. There is now widespread belief that such targets lie in the components of the signal transduction pathways by which growth signals (instructing a cell to divide) are transmitted from the outside of a cell to the nucleus. This process begins when polypeptide growth factors bind on the outside of the cell to receptor proteins which protrude through the cell membrane. Binding of the growth factor to the outside portion of the receptor induces a tyrosine phosphorylating (tyrosine kinase) activity situated in the internal portion. This phosphorylates a substrate protein, which is also activated by this event to phosphorylate other substrates, passing on the growth signal.

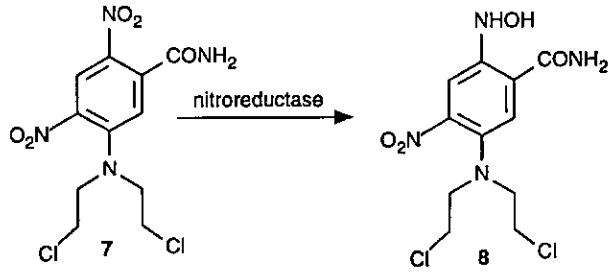
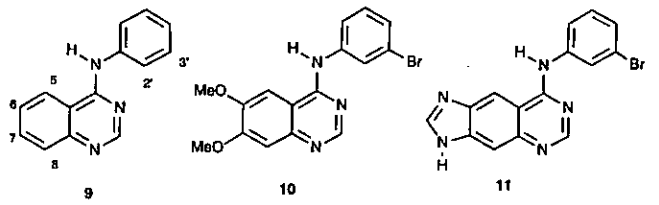


Figure 4

Many of the enzymes in these signal transduction pathways are the products of oncogenes, and are over-expressed or mutated in cancer cells. One of the most important is the epidermal growth factor receptor (EGFR), which does not usually occur in normal cells, but is over-expressed in a large proportion of human lung, ovarian and breast tumours. EGFR has a binding site for the ligand which is phosphorylated (to pass on the signal) and one for the cofactor ATP which donates the phosphate. There is a great deal of interest in small molecules which can selectively block the tyrosine kinase function of EGFR. Most work to date has been done with compounds which bind competitively to the ligand site. These generally have moderate potencies for inhibition of purified enzyme (IC50 values in the low μM range).

Less work has been done on compounds which bind at the ATP site, for fear these would not be selective for EGFR. The ATP site is highly conserved among many kinase enzymes, some of which must not be inhibited (e.g., insulin receptor kinase). However, recent work in the Cancer Research Laboratory (in conjunction with the Parke-Davis Company) has discovered a novel class of drugs, the anilinoquinazolines, which inhibit EGFR by binding competitively at the ATP site (Fry *et al.*, 1994; Rewcastle *et al.*, 1995). The lead compound, 4-anilinoquinazoline (**9**) already had good potency compared with most ligand site inhibitors (IC50 0.35 μM). Detailed structure-activity relationships revealed that, while changes in the 4-anilinoquinazoline skeleton were not useful, small lipophilic electron-donating groups at the 3'- position increased potency, as did small electron-donating groups at the 6- and 7-positions. When these two features were combined, compounds

of spectacular activity resulted; thus **10** has an IC50 of 25 pM (0.000025 μM) for inhibition of the isolated enzyme. The related tricyclic analogue **11** is even more potent, with an IC50 of 8 pM (0.000008 μM). More detailed studies with **10** show that, contrary to previous concerns about the lack of selectivity of inhibitors of the ATP binding site, this compound shows very high selectivity for inhibition of EGFR over related tyrosine kinase enzymes. Of a series of six enzymes studied only erbB-2, a member of the EGF family, was appreciably inhibited (Fry *et al.*, 1994). This work has demonstrated that extremely potent and selective small-molecule inhibitors of the EGFR can be developed.



9 10 11

Summary

The projects discussed here, as representative of much work now going on, illustrate that progress is being made in both targeting of classical antiproliferative drugs by selective activation of prodrug forms, and in seeking "non-cytotoxic" drugs designed to selectively block replication of cancer cells by interaction with targets specific to those cells. They reflect the increasing knowledge available concerning the mechanisms of cell growth and cancer progression, and how these can potentially be exploited to advantage. It is a fascinating time in anticancer drug development.

Acknowledgement

The projects in the Cancer Research Laboratory described here are supported by the Auckland Division of the Cancer Society of New Zealand, the Health Research Council of New Zealand, and the US National Cancer Institute.

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The Royal Society of Chemistry
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Confocal Microscopy, 3D Measurement and Stereology Course
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7-11 August 1995
4th International Congress on Amino Acids
Venue: Vienna, Austria
Contact: Professor Gert Lubec
University of Vienna
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Email: loper@ucbeh.san.uc.edu

9-11 August 1995
36th International Conference on the Biochemistry of Lipids
Venue: Washington DC, USA
Contact: Ms Hattie Johnson
Office of Continuing Medical Education
Georgetown University Medical Centre
2233 Wisconsin Ave, NW-Suite 333
Washington, DC 20007, USA

11 August 1995
"Advances in Polymers II - Polymers in Communications and Electronics"
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14-19 August 1995
35th IUPAC Congress
Venue: Istanbul, Turkey
Contact: Professor A R Berkem
35th IUPAC Congress
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80230 Harbiye, Istanbul, Turkey
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Fax +90-212-2317037

17 August - 1 September 1995
10th International Congress on Radiation Research
Venue: Würzburg, Germany
Contact: Professor Dr C Steffer
Institut für Med Strahlenbiologie
Universitätsklinikum Essen
D-45122 Essen, Germany

27 August-1 September 1995
10th International Conference on Fourier Transform Spectroscopy
Venue: Budapest, Hungary
Contact: Mrs Klára Láng *or*
Mr Attila Varga
Conference Office
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H-1371 Budapest, P O Box 433
Hungary
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'Molecular Design Down Under.' 14th Annual Conference of the Molecular Graphics and Modelling Society in conjunction with the 12th Conference of the Medicinal & Agricultural Chemistry Division of the Royal Australian Chemical Institute (RACI)
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North Queensland, Australia
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Tel: +61 7 3697866
Fax: +61 7 3671471
or Dr Michael L West
Centre for Drug Design and Development
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Best-Best Engineering Science Technology Exposition
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3-5 September 1995
New Zealand Geochemical Group Conference
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Chemistry Department
University of Otago
P O Box 56
Dunedin
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or Dr Graeme Lyon
Institute of Geological & Nuclear Sciences
Lower Hutt
Fax +64-4-5704657
Email G.LYON@GNS.CRI.NZ

3-5 September 1995
NSW Southern Highlands Conference on Heterocyclic Chemistry
Venue: Milton Park, Bowral, NSW, Australia
Contact: Professor David St. C. Black
School of Chemistry, University of NSW
Sydney, NSW 2052, Australia
Fax +61-2-6622835
e-mail D.Black@unsw.edu.au.

3-8 September 1995
6th European Conference on the Spectroscopy of Biological Molecules
Venue: Universite de Sciences et Technologies de Lille
Villeneuve d'Ascq
France
Contact: Professor J C Martin (Chairman)
ECSBM '95, LASIR, UST Lille
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59655 Villeneuve d'Ascq, Cedex, France
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International Meeting on Design of Bioactive Compounds: Possibilities for Industrial Applications
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Contact: SCI Conference Office
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London, SW1 8PS, UK

5-8 September 1995
WATER SOLUTIONS - AT WHAT COST?: The 1995 Annual Conference and Trade Display of the New Zealand Water & Wastes Association
Venue: Auckland, New Zealand
Contact: David Ogilvie
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6-10 September 1995
International Congress on Free Radicals in Health and Disease
Venue: Istanbul, Turkey
Contact: MEDI Organisation and Tourism
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MBE P K 150,
Dolapdere Cad No: 283-287
80260 Pagnalti, Istanbul, Turkey

10-11 September 1995
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Venue: Aberdeen, Scotland, UK
Contact: The Society for General Microbiology
Marlborough House
Basingstoke Rd
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10-15 September 1995
45th RACI Cereal Chemistry Conference
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Contact: Geoffrey Palmer
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8th International Symposium on Marine Natural Products
Venue: Santa Cruz de Tenerife, Canary Islands, Spain
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Spain

11-15 September 1995
Cryotechniques Course
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E-mail: rms@uk.ac.ox.vax

17-20 September 1995
International Conference on Agrobiotechnology - 95
Venue: Poznan, Poland
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61-704 Poznan, Poland

17-23 September 1995
International Union of Pure and Applied Chemistry Third International Symposium on Bioorganic Chemistry
Venue: Dagomys, Russia
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Dr Victor V Demin
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20-24 September 1995
Drug Resistance in Cancer
Venue: Dublin, Ireland
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Bioresearch Ireland
Dublin City University, Dublin 9, Ireland
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27 September-1 October 1995
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16-18 October 1995
Anticancer Targets and Strategies for the 21st Century
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Contact: Marian Cabailh
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IUPAC 6th International Symposium on Macromolecule-Metal Complexes
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7-10 November 1995
High Performance Liquid Chromatography Course
Venue: Auckland Institute of Technology, Auckland
Contact: Neil Edmonds
Department of Applied Science
Auckland Institute of Technology
Private Bag 92006, Auckland
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19-22 November 1995
15th International Symposium on Protein, Peptide and Polynucleotide Analysis (ISPPP '95).
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4th Pacific Polymer Conference
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17-22 December 1995
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Location

Brisbane is the capital of the state of Queensland, the Sunshine State, and as the name implies, it has a balmy subtropical climate with warm summers (29 °C) and winters (21 °C), the conference being in winter. In the 100-kilometer region surrounding the city, you can travel to lush tropical rain forests, the famous Gold Coast and not so famous but equally beautiful Sunshine Coast. The Great Barrier Reef and its many tropical islands and cays lie along the Queensland Coast and are only 1-2 hours flight from Brisbane.

Brisbane also boasts three universities, and has been host to the 1982 Commonwealth Games, 1988 Expo and 1994 World Gymnasties and World Masters Games. Golf, horse-racing, tennis, river cruising, art galleries and theatre and just some of the activities available for the visitor.

Social Program

A program of social events including a Welcoming Reception on the Sunday, a Civic Reception, and the Conference Banquet on the Thursday will be organised for all delegates. Organised excursions will be held on the Wednesday afternoon.

Trade Exhibition

A trade Exhibition is planned to be held at the Brisbane Convention and Exhibition Centre during the week on the Conference. The exhibition will offer an excellent opportunity for companies to display their products and services to a large international audience.

Scientific Program

The Conference will feature plenary and section invited lectures, oral presentations and poster contributions. It is planned to run three concurrent sessions dealing broadly with:

A. Transition metal and 4f-metal organometallic compounds
B. Main group organometallic compounds
C. Metal compounds in organic synthesis and catalysis

Those who have already agreed to speak at the meeting include:

Plenary Lecturers

R G Bergman - *University of California (Berkeley), USA*
E Drent - *Shell Research BV, Amsterdam*
P Knochel - *Philipps-Universität, Germany*
R Noyori - *Nagoya University, Japan*
K B Sharpless - *The Scripps Research Institute, USA*

Invited Speakers

D Astruc - *University of Bordeaux, France*
Y Chi - *National Tsing Hua University, China*
O Eisenstein - *University of Paris-Sud, France*
J E Ellis - *University of Minnesota, USA*
L Field - *University of Sydney, Australia*
E Hey-Hawkins - *University of Leipzig, Germany*
T Mitsudo - *Kyoto University, Japan*
A Pfaltz - *University of Basel, Germany*
P Power - *University of California, USA*
R J Puddephatt - *University of Western Ontario, Canada*
M T Reetz - *Max-Planck-Institute, Germany*
H W Roesky - *University of Göttingen, Germany*
W R Roper - *University of Auckland, New Zealand*
H Schnöckel - *University of Karlsruhe, Germany*
H Suzuki - *Tokyo Institute of Technology, Japan*
J H Teuben - *University of Groningen, The Netherlands*
B Wild - *Australian National University, Australia*
C H Winter - *Wayne State University, USA*

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DIETARY HAZARDS, REAL AND IMAGINED

Jay D Mann, Consultant (Food Safety)
21 Hurunui Street, Hoonhay, Christchurch 2

"Are there any side effects when taking nutritional supplements? Because ingredients are natural products side effects are negligible or mild in a very few people." (Advertising feature, *Christchurch Star*, 30 April 1994, pg 4)

Are natural products automatically harmless? Does the expression "a low concentration of a poison" have any meaning? There are numerous compounds that are poisonous when ingested in sufficient concentrations. Are these compounds always "poisons"? Should we say that a liquid "contains a poisonous chemical" when the chemical is present only in a trivially low concentration? Consider a 10-20 mol/L solution of methylene blue. Does the solution contain a blue chemical?

This mini-review is restricted only to a few of the natural chemicals that may occur in amounts sufficient to damage human health in plants normally consumed. That eliminates a very large number of natural organic chemicals that are potentially dangerous to health but which appear only in tiny concentrations in ordinary diets. For instance, parsley contains dozens of materials, including thujone, high doses of which can cause convulsions. (Thujone, derived from wormwood, was a major ingredient in absinthe, a notorious drink of the last century.). Although parsley is one of the most common causes of skin problems in grocery workers and vegetable growers, thujone is not the cause. It is important to concentrate our attention on dangerous chemicals that can and have caused harm, rather than to fantasise about possible chemical hazards from minute traces.

Plants contain large numbers of unusual organic chemicals, once called "secondary metabolites" because they are not present in all plants. The role of these "secondary" chemicals was obscure until recently. Twenty or thirty years ago, some believed they represented accidents of uncontrolled plant metabolism. Privately, I believed their primary function was to provide employment for young biochemists. Now the so-called secondary metabolites are generally thought to act as plant protection compounds, that is, as natural pesticides.

Plants are attacked by animals (nematodes, mites, insects, reptiles, birds, mammals), by bacteria, by fungi, and by viruses. Resistance against these attacks can be through non-chemical means, such as rapid regrowth; tough tissues; surface hairs or spines; vulnerable organs placed in less accessible locations. Chemical resistance is the first order of the day, however, with ancient plant groups such as ferns and cycads showing how many ingenious toxicants can be developed given enough evolutionary time and pressure.

Chemical resistance can be divided into two broad categories. In the first category are broad-spectrum antagonists such as tannins and oxalic acid. Tannins bind to proteins, making them less available to phytophagous animals. Few animals are able to overcome the deleterious effects of plant tannins, except by the grasshopper approach ("eat a little bit of everything"). On the other hand, tannins are also detrimental to the metabolism of plant cells, hence plant tannins are normally found in separate organelles. Few plants rely solely on a high-tannin resistance, although walnut leaves have so much tannin that proteins in leaf homogenates coagulate instantly, settling with an almost audible clunk. Nevertheless, certain insects manage to make holes in walnut leaves.

Metabolic poisons, especially if they affect biochemical processes limited to animals and microorganisms, are energetically and chemically more efficient. Certain specialised plant-eaters can develop metabolic counterattacks against specific toxins. One can assume the damage done by such specialised plant-eaters is tolerable, since those plant species that once relied on inadequate natural pesticides are no longer in existence except as human-selected and human-maintained types.

The problem with parsley

Grocery employees and vegetable growers who raise parsley, celery and parsnips sometimes develop irritating rashes of the forearms. Those people who spend time outdoors are more likely to develop skin problems, as are light-skinned persons. The chemicals responsible are furanocoumarins, trivially known as psoralens (Figure 1), found as several related chemical structures. These agents are potent photosensitisers. They catalyse the cross-linking of protein and nucleic acid under the action of ultraviolet light. Army worms raised on artificial diets containing 0.1% xanthotoxin were all killed by the third or fourth instar stages if the cages were in daylight conditions, but 40% of insects raised in the absence of ultraviolet light reached normal adulthood. (M. Berenbaum, (1978) *Science* **201**: 532-533.)

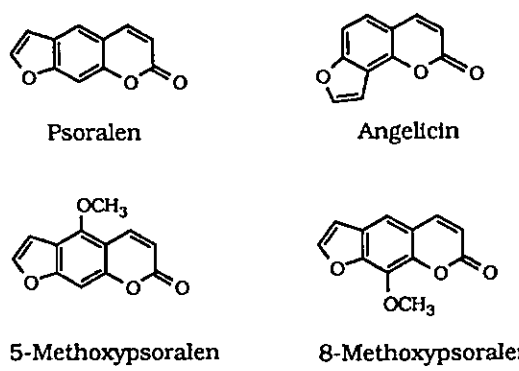

Figure 1: ***Structural formulae of furocoumarins***

In humans, furanocoumarin levels just below 20 ppm can cause skin lesions. Healthy parsnip can contain 40 ppm of these chemicals, and they are not eliminated by cooking. Sclerotinia (pink rot), rather than Fusarium, is the usual cause of high furanocoumarin levels in celery. Growers soon learn that pink

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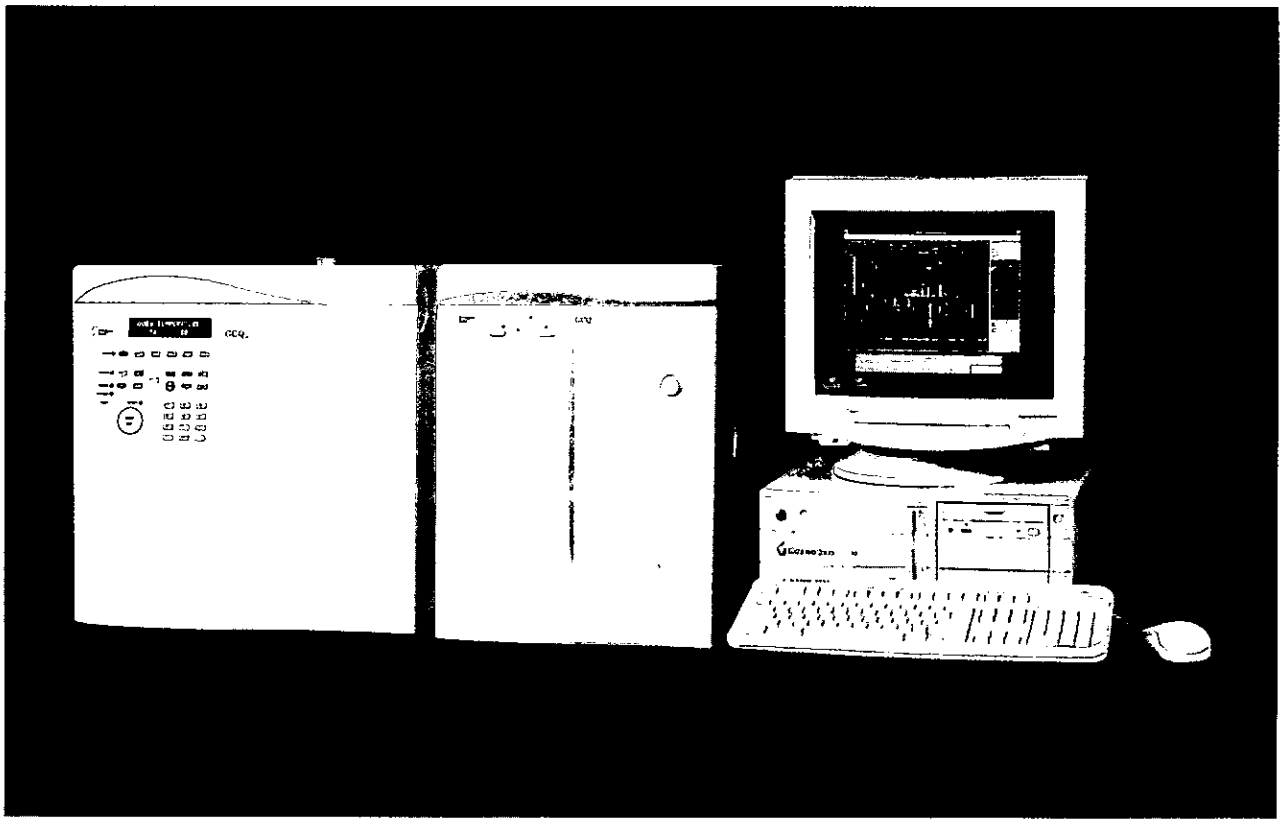

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rot-infected celery is particularly potent. Root and crown tissues of healthy celery had less than 2 ppm, but after inoculation with one race of Fusarium, concentrations of 9-50 ppm furanocoumarins were found (Heath-Pagliuso, 1992). Carrots, too, respond. Healthy carrots had about 0.01-0.02 ppm furanocoumarin, with over 2 ppm in "diseased" carrots (pathogen unspecified). These natural pesticides produced in response to disease or other injury are known as phytoalexins. The terminology is flawed because these same pesticides can often be found in healthy plant tissue as well.

In mammals, these materials cause a persistent blistering ("vesicular dermatitis"), often called "celery rash" or "parsnip rash". After the blisters heal, the skin below becomes darker, and this effect can last a year or two. In fact, some European suntan lotions used to contain oil of bergamot, which contained 5-methoxypsoralen, also known as bergaptene (Ashwood-Smith *et al*, 1980). These suntan lotions no longer contain oil of bergamot. The oil of bergamot that provides the unique taste of Earl Grey tea has been distilled and is therefore free of photosensitising agents. (Certain furanocoumarins, combined with ultraviolet irradiation, are used successfully as a medical treatment for psoriasis. Clearly the risks are counterbalanced by the benefits, but use of furanocoumarins by healthy individuals is pointless.)

Psoralen poisoning can be exceedingly annoying or even dangerous. An article by B C Aston in the 1924 issue of the *NZ Journal of Science and Technology*, dealing with the problems encountered by a local parsnip seed grower whose employees sometimes experienced water-blisters, quoted an episode occurring about 1900 in Ithaca, New York. Dr Henry Van Dresser, a poultry lecturer, had been mowing a large patch of wild parsnip which was in blossom. He carried bunches of plants in his arms, even though it was a hot day and he was perspiring. Subsequently "his face became badly swollen, and his eyes were in a terrible condition... The sight was not lost, although it was considerably impaired... Another gentleman... told me that some years previously he had lost a little girl with poisoning of a somewhat similar character, and it was attributed to the parsnip blossoms among which the little girl had been playing immediately before the attack." In soldiers, parsnip-induced lesions have been confused with mustard-gas damage.

Dermatitis amongst vegetable-handlers is a job-related hazard. In the early 1980s up to 24% of all grocery store workers in California and Texas suffered from this vesicular dermatitis; this was an exceptionally high figure. Several public health teams discovered that a new brand of celery had been introduced. This celery, "naturally resistant" to diseases, had about 2-3 ppm psoralen in stalks and 7 ppm in leaves of healthy samples. In contrast, other celery brands had 0.1-0.4 ppm psoralens in stalks and 2.6-.45 ppm in leaves. (Berkley *et al* 1986). Another group found 22-24 ppm in celery samples from stores whose employees suffered these rashes (Seligman *et al* 1987). The development of a naturally resistant celery line, which would not need as much spraying with man-made chemicals, resulted in the shifting of risk downstream to the grocery workers. Whereas the concentration of man-made chemicals will be highest shortly after spraying, and will decrease thereafter, the concentrations of natural pesticides may well increase post-harvest if the plant tissue responds to stress by increasing its production of phytoalexins.

From 75 to 100 different phototoxic molecules have been isolated from higher plant families. This includes 20 furanocoumarin and 25 acetylenic derivatives. Plants causing contact vesicular dermatitis include: angelica (roots and leaf stalks), cow parsley, carrot leaves and roots (a recognised industrial problem but also involved in "housewife's eczema"), caraway oil (carvone), poison hemlock, fennel, *Heracleum* spp, lovage, parsnip (both wild and cultivated), parsley, aniseed oil, *Peucedanum galbanum* (South African blister bush). Another serious source of photosensitiser is St Johnswort, *Hypericum*, which kills many sheep annually. (Incredibly, a New Zealand newspaper recently recommended St Johnswort as a medicinal tea in a feature article!)

Another lethal effect of psoralens involved pigs rather than humans, and death was indirect. In 1981, a mysterious outbreak of possible "foot and mouth disease" occurred in Temuka. Pigs in a certain farm had blistering on their snouts and feet. The symptoms were very similar to those of foot and mouth disease, although there was no evidence for a transmissible disease. The pigs were killed and their bodies burned, because the presence of foot and mouth disease in New Zealand would devastate our agricultural exports. Later, diagnostic results from an overseas laboratory confirmed that the disease had not been present. These pigs had been fed on waste vegetables, and the weather had been unusually sunny just before the outbreak. Furanocoumarins survive cooking, so the usual heat sterilisation would not have prevented the problem. It was not possible to determined how much parsnip and celery had been included in the pigs' diet. At least ten more episodes of vegetable-induced photosensitisation were later reported to veterinarians, but the lesson had been learnt, and no more animals were sacrificed (Montgomery *et al*, 1987).

I cannot leave the subject of psoralens without mentioning the elegant case of the parsnip webworm (Zangeri, cited in Moore 1991). The female webworm lays her eggs on the fruits of the wild parsnip only after carefully "tasting" the plant tissue. She selects fruit with the lowest psoralen concentrations. The plant produces two kinds of fruit: normal fertile ovules with high furanocoumarin, and sterile ovules with half as much psoralen. The psoralen gradient directs the wasps to the sterile fruits, decoys that can be eaten without affecting seed production. In this blackmail-bribery, the webworm larvae are perhaps short-changed, because experiments show that they would have grown better on the fertile ovaries. On the other hand, it is clearly advantageous to the wasp to allow production of another generation of parsnips.

Do you want salt on your nerve-gas?

In the case of celery, the risk from "natural resistance" was confined mainly to grocery workers. Future cases might not be as restricted. For instance, a newly released potato cultivar was withdrawn, when it was found to produce more than 10 mg solanine per 100 g tissue under certain growing conditions. (Solanine is a cholinesterase inhibitor, just like many man-made insecticides.) Potatoes with 20 mg solanine per 100 g have a bitterness sensed in the back of the mouth. Potatoes at this level of solanine won't normally be eaten except in exceptional circumstances such as starvation, in institutional food, or if masked with hot spices. Normally the main symptoms are stomach upset and headaches, yet some people

have died from eating potatoes in the 25 mg/100 g range (Morgan and Coxon, 1987). The secondary causes that make some individuals more sensitive to solanine are unknown. (Certain people are firmly convinced that their arthritis or other disease is aggravated by consumption of any solanaceous food, such as potatoes, tomatoes, and eggplants.) The traditional approach to setting limits to food additives was established long before the potato episode (and long before the extreme model-credulous extrapolations now popular): Assume that humans are tenfold more sensitive than the most sensitive test animal, and assume that some people are ten-fold more sensitive than others. Thus the maximum permissible level of added chemicals can be no more than one-hundredth of that causing any detectable effect in animals. (In fact, agricultural chemical boards won't permit these levels if lower levels can be obtained using good agricultural practices.) According to the "100-fold" criterion, potatoes should not be allowed with more than, say, 0.1 mg solanine per 100 g. It seems to be impossible to breed potatoes with that low level, yet they are sold and consumed by millions.

Because solanine alkaloids are concentrated in the surface tissues of potato tubers, consumers who eat commercial fried potato-skin products are subjecting themselves to even higher levels of cholinesterase inhibitor than other potato consumers. Why do some people eat fried potato-skins while scrupulously avoiding milk from cartons containing less than 0.00000001 mg per kg of "dioxin"? This tolerant attitude towards a natural nerve-gas-like chemical with a 5-10 safety margin should be contrasted with the far higher safety factors demanded for certain man-made chemicals.

Looking a gift horse in the mouth

When the Persian army under Xerxes invaded Greece in 481 BC, their cavalry came mostly from the tribe of Medes. After the invasion was repulsed, the Greeks found a new pasture plant that had been raised by the Persian equivalent of the quartermaster corps. Sarcastically, the Greeks called it "gift of the Medes", or Medicago. Eventually that plant, carried into Spain by the Moors, acquired the name of "al fasa fasa" ("the best fodder"). *Medicago sativum* re-entered North American agriculture with a Castilian lisp, as "alfalfa". Nowadays, alfalfa sprouts are routinely sold in supermarkets, perhaps inspired by the use of sprouted mung beans in Chinese cuisine.

However, the trouble with alfalfa seeds and sprouts is that they contain about 1.5% canavanine. Canavanine, H_2N-C(=NH)=NH-O-CH_2-CH_2-CH(NH_2)COOH, is an analog of arginine and is toxic to many organisms including mammals. This is an excellent strategy by the alfalfa plant to protect its seeds against consumption. Most people seem to tolerate modest amounts of canavanine. On the other hand, victims of systemic lupus erythematosus are advised to avoid alfalfa sprouts completely. In an experimental situation, rhesus monkeys with lupus in remission had the disease reactivated on a diet of 40% alfalfa sprouts (Malinow *et al*, 1982). There are apparently clinical studies suggesting that alfalfa sprouts can aggravate lupus erythmatosus symptoms in humans as well.

Other hazards

Space is too short to cover all of the life-threatening chemicals in commonly consumed foods. Black beans from tropical areas, especially where the varieties are adapted to "chemical-free" agriculture, can contain enough cyanide-generating (cyanogenic) compounds to poison whole villages. Other crops, such as taro, contain lower levels of cyanogenic chemicals, so that chronic rather than acute poisoning occurs. In the absence of sufficient dietary iodide, chronic cyanide poisoning results in goitre and idiocy. The swollen belly of kwashiorkor is possibly caused by a combination of protein shortage and cyanide poisoning. Cabbage crops also have goitre-inducing thiocyanates, the same chemicals responsible for the taste of cabbage, broccoli and mustard. This is no reason for well-fed people who use iodised salt to avoid cabbage, for both experimental rodent studies and hospital epidemiology investigations have shown that diets high in cabbage and other crucifers are associated with lower risk of cancer.

Uncooked dried beans (but not peas) have lectins (also known as phytohaemagglutinins) that cause almost instant stomach upsets, with diarrhoea and cramps. As little as two uncooked beans can result in illness. At least an hour of boiling is needed to destroy these lectins. A well publicised episode in England generated letters that showed hundreds of other people had similarly suffered. A large outbreak of food poisoning arose during the Berlin airlift, when flaked beans were distributed. This flaked product could be softened by a short period of cooking that was not long enough to destroy lectins.

Other hazards are found, as might be expected, in foods that are normally used only in emergencies. This includes, for instance, narcissus bulbs and fern fronds. Our ancestors spent a great deal of time and effort investigating the narrow range of plants that humans can eat with minimal chance of harm.

Some natural pesticides are useful to us

Catnip is a good example of protective chemicals that are beneficial in ways totally unrelated to their function in plants. The volatile terpenoids from both catnip and kiwi fruit vines are well known to attract felines of all descriptions, from domestic cats to lions and tigers. Although these chemicals are not stable, their structures have been characterised (Figure 2). It is unlikely that the catnip and kiwi fruit terpenoids evolved primarily for the indecent stimulation of cats. (This contrasts with the volatiles of truffles that are "meant" to attract wild pigs as agents of truffle spores distribution.) The catnip terpenoids are remarkably similar to insect-synthesised insect-repellents, such as irodidial made by the walking-stick insect. Many but not all insect species are repelled by the smell of nepetalactone. A freshly killed cockroach that had one droplet of nepetalactone on its abdomen was ignored by an ant colony, whereas an untreated roach was "overwhelmed by a swarm of ants" (Eisner 1964). Another example of botanical mimicry is that citronellal, well known as a plant-derived insect repellent, is a product of ant mandibulary glands.

Plant pesticides that work against insects and fungi (moulds) are often useful for human purposes too. Extracts of New Zealand Seven-Finger (*Schefflera*) are extremely effective against fungi causing skin disease, but unfortunately the active principal is unstable. Another New Zealand plant, horopito or pepper-leaf (*Pseudowintera colorata*) contains polygodial, a dialdehyde active against *Candida*, the yeast causing thrush infections. Polygodial is a potent anti-feeding compound, which can be confirmed by a cautious taste of a leaf. Turmeric, the ground-up root of Curcuma, is a common ingredient in Indian

remedies against scabies of both animals and humans. Fresh exudates (but most definitely not the commercial preserved extracts) of Aloe leaves promote wound healing, enhancing cell growth and attachment. Other "medicinal herbs" are effective for external application. On the other hand, many books on herbal medicines recommend internal consumption of hazardous materials. Risks from taking semi-random mixtures of unknown drugs in unknown quantities are not merely hypothetical. The world is filled with graves of people who have suffered fatal or permanent liver damage from consumption of "remedies" made from comfrey, coltsfoot, and skullcap. The most tragic instances are of mothers who conscientiously took herbal medications "to improve the health of their foetus", and whose infants were born with fatal liver disease. Natural is not automatically safe. Impure natural mixtures are unlikely to be as efficacious and free of side-effects as blends of purified drugs. Modern drugs were developed in response to the uncertainties of traditional herbal treatments.

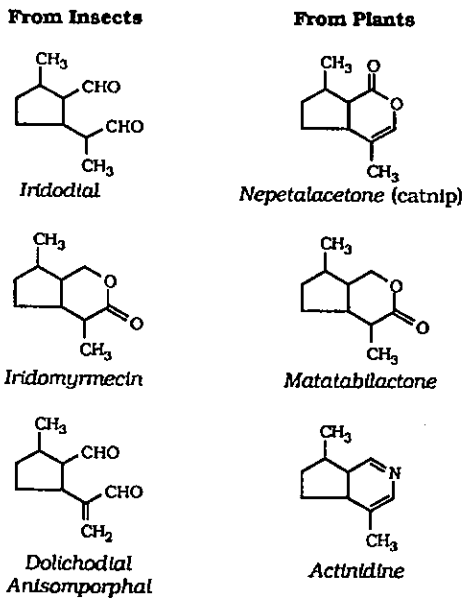

Figure 2: ***Closely similar cyclopentaniod monoterpenes from insects and plants***

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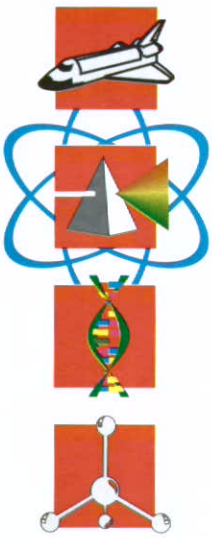

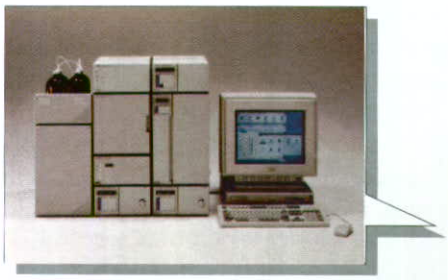

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The German patent database PATDPA on STN International is now available with integrated patent graphs. As a result of the merging of the former PATGRAPH image file into PATDPA, approximately 250,000 images of technical patent drawings and diagrams, construction drawings, or chemical structures now complement the over 2.4 million patent records contained in PATDPA. About 450 graphs are added weekly with the regular updates. PATDPA is accessible via the STN mainframe computer at FAZ Karlsruhe, STN's European Service Centre.

The merging of PATGRAPH in PATDPA, the largest German patent database, is an important enhancement in the provision of German patent information. Users who want to know the state-of-the-art or competitors' activities in their field now have the possibility to access patent drawings directly in PATDPA and have them displayed on-line or printed off-line together with the text information. All of the STN graphics functionalities and tools developed for Derwent's World Patents Index (WPI), also available on STN, apply for PATDPA too.

In order to display the drawings, your PC software should be able to interpret TIFF 6.0 (Tag Image File Format) images with CCITT group 4 compression. The drawings can be downloaded using communication software such as PROCOMM (DOS or WINDOWS) or, in particular, STN Express. The new STN Express version 3.2 for Windows and Macintosh offers users unique capabilities to handle PATDPA's patent drawings on their own PC. The standard display of a graph is with 150 dpi. Additionally, a high resolution format with 300 dpi is available. Off-line prints are always delivered with 300 dpi.

The PATDPA database is produced by the German Patent Office and supplied by FIZ Karlsruhe via STN International. The database contains citations of scientific and technological patents, patent applications, and utility models, published in the patent gazette ("Patentblatt") of the German Patent Office, including applications filed at the European Patent Office and the World Intellectual Property Organization (WIPO) designated for Germany. Citations contain the application and publication data as well as specific data on the legal status of patents and utility models, updated, in the case of patents, from the first publication (Offenlegungsschrift) to the granted patent publication (Patenschrift). Citations of patent and non-patent literature of the search report are included. Dating back to 1981, the German patent documents also contain abstracts.

Patent records are updated in PATDPA, with text and images, two days after publication in the patent gazette, updates of selected legal status data are available in PATDPA four weeks before publication in the gazette. Records are in German language.

CAplus

STN International has extended the chemistry cluster of its wide range of scientific and technical databases to include CAplus - the most comprehensive and most timely bibliographic database from Chemical Abstracts Service (CAS). Containing more than 12 million records, the database covers worldwide literature from all areas of chemistry, biochemistry, and chemical engineering including applied, macromolecular, organic, physical, inorganic, and analytical chemistry from 1967 to the present. CAplus is updated daily with approximately 2,000 new items.

CAS is the producer of the CA (Chemical Abstracts) database. With its 12 million records, CA is the central database for chemists. The new CAplus file contains all the records included in CA. These are drawn from journal articles, patent documents, conference proceedings, technical reports, books, dissertations, and reviews selected from over 12,000 scientific publications from more than 150 nations. In addition, CAplus provides early access to the bibliographic information (and sometimes abstracts and CAS Registry Numbers) for documents in the process of being indexed by the producer. In CAplus, the user will find the complete coverage of over 1,300 key chemistry and chemistry-related journals with information added to the database within one week of journal receipt. Further citations may be document types not included in the CA file, e.g. scientific articles, biographical items, book reviews, editorials, errata, letters to the editor, news announcements, product reviews, and miscellaneous items.

The CAplus file is designed to serve the customer's needs for timely and current information. Why should the user search CAplus instead of CA and CApreviews? Besides sooner coverage, CAplus has the advantage of containing the contents of two files in one, thus allowing for more convenient and faster searching. CAplus has variable SDI run frequencies not offered in CA or CApreviews.

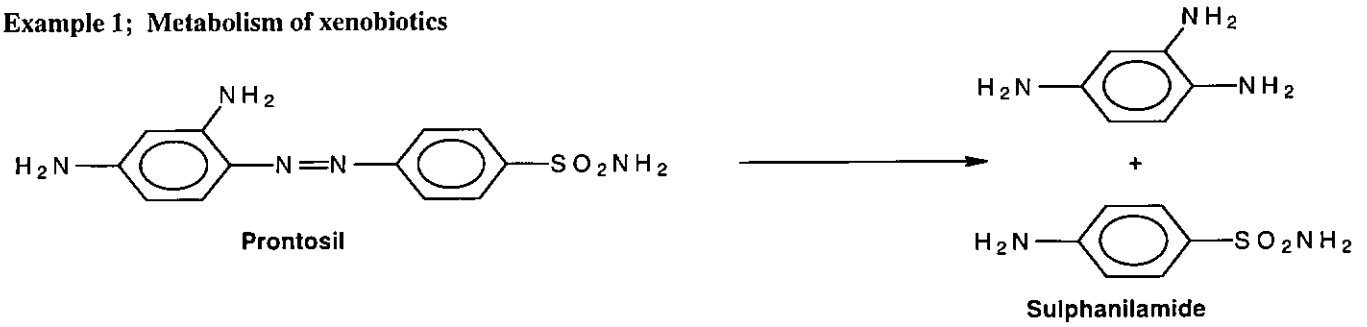
For further information, please contact STN International, c/o FIZ Karlsruhe, P O Box 2465, D-76012 Karlsruhe, Germany; tel.: (+49) 7247-808-555; fax: (+49) 7247-808-259; electronic mailbox STNmail: HLPDESKK; Internet: hlpdeskk@fix-karlsruhe.de.

Drawing Organic Structures Made Easy: Software Review; ChemWindows

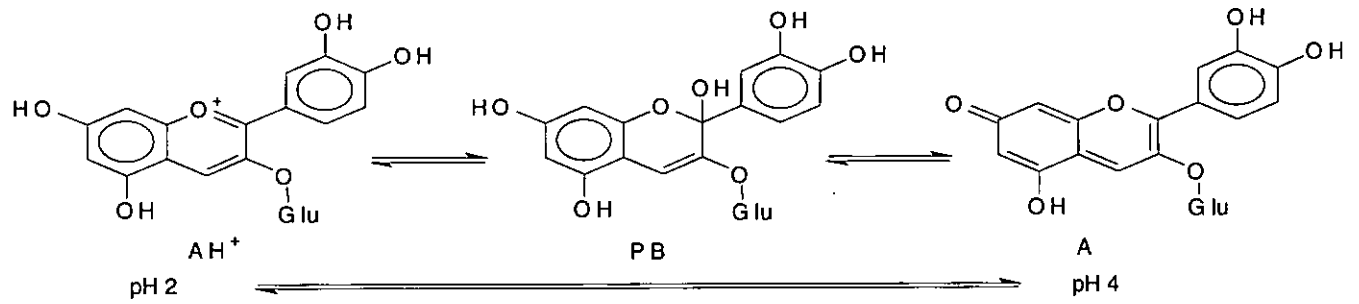
John R L Walker, Dept. of Plant and Microbial Sciences, University of Canterbury, Christchurch

In the past, drawing complicated organic structures, like the examples shown below, was a daunting task involving stencils, indian ink, etc. and a lot of frustration. However, once personal computers and word processors became popular it was not long before specialist chemical drawing programs became available. Nowadays, chemical drawing is both easy and fun thanks to modern software.

Example 1; Metabolism of xenobiotics



Example 2; Effect of pH upon anthocyanins.

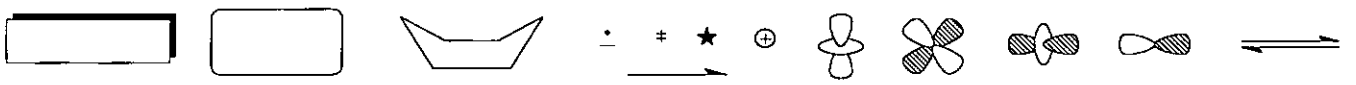


In my search for simple, cost-effective drawing software I evaluated a wide range of programs, both Windows and non-Windows based. These included PSIGEN, C-Design, ChemWord, WIMP, ChemDraw and ChemWindows; the latter three all use the Windows format. I would rank C-Design (Springer-Verlag, FoBasoft GmbH) as the best of the non-Windows programs but I finally opted for the PC version of ChemWindows.

The examples shown above were drawn with ChemWindows v3.1 which, as its name implies, is a Windows (v3.1)-based program and is very user-friendly. When you open the screen you are presented with an array of drawing tools for bonds, arrows, etc. plus a selection of structure icons that provide a range of cyclic structures and aromatic rings. From these you can readily build up the required structure and then add other atoms, substituent groups and captions. Drawing chains of carbon atoms is simply a matter of starting the 'chain' tool and stopping when it indicates enough C atoms; clicking the cursor on a bond then changes it to a double or triple bond or vice-versa. To make things even easier you can simply type in a formula like C_6H_5OH, go to "Make Stick Structure" and you will get an aromatic ring structure.

Having once drawn the parent structure it is very easy to then move, copy or modify it using typical Windows commands. Once drawn, structures can be added to the existing library and/or used as templates for future molecules. You can also preview the appearance on the final page layout before saving in a variety of formats (e.g. for Word or Word Perfect, MOlfiles, etc.).

Example 3; samples of some of the illustration tools.



ChemWindows also provides a set of drawing/illustration tools that enable you to draw shapes like brackets and braces, atomic associations, molecular orbitals and so on. The tools also allow you to draw boxes, circles and ovals which I have found to be ideal for preparing chemical flow charts since its easy to change the size and shape of these with the cursor.

ChemWindows, and its Macintosh cousin ChemIntosh, are products of SoftShell who provide a top rate backup service by fascimile or Internet. They also offer several other useful items of chemical software such as a library of pre-drawn structures, ^{13}C-NMR module, chemical picture and glassware libraries and a scientific spell-checker. If you want more information please write or Email (Walker@BOTN.Canterbury.AC.NZ), I'll be happy to try to help. I do have a limited number of demo copies of ChemWindow and ChemIntosh available but please supply an A4 size s.a.e. or write direct to SoftShell International Ltd, 715 Horizon Drive Ste. 390, Grand Junction, CO81506, USA, their Email address is CompuServe: 70702,3024.

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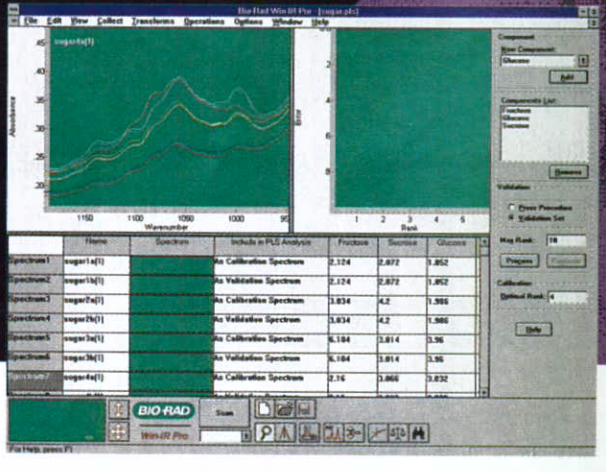

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    Vibrational Circular Dichroism
    Spectroelectrochemistry
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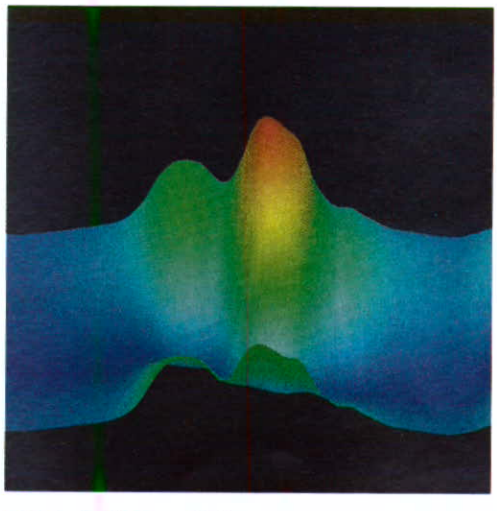
  - Far-IR to UV-Vis Spectroscopy
  - High Speed Kinetics



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International Congress of Pacific Basin Chemical Societies Honolulu, Hawaii, Dec 17-22

The Congress is divided into ten broad areas:

01	Agrochemistry
02	Analytical Chemistry
03	Biosciences and Technology
04	Chemical Economics and Business
05	Chemical Education
06	Environmental Science and Technology
07	Inorganic Chemistry
08	Macromolecular Chemistry
09	Organic Chemistry
10	Physical Chemistry

THE PRINTED REGISTRATION AND ACCOMODATION FORMS FOLLOWING SHOULD BE PHOTOCOPIED

FULL DETAILS OF THE TECHNICAL PROGRAM AND THE CONGRESS TOURS CAN BE OBTAINED BY USING THE ACS FAX-BACK SERVICE. SIMPLY PHONE THE NUMBER GIVEN BELOW, KEY IN THE RELEVANT EXTENSION AND ENTER 011 AND THEN YOUR NZ FAX NUMBER WHEN ASKED (REMEMBER TO START WITH 64 AND OMIT THE 0 BEFORE YOUR AREA CODE):
00-1-610-666-5525 Ext. 660 (technical programme) Ext. 770 (registration/hotel/tours and forms)

The deadline for registration is **November 10 in Washington DC.** The registration fee includes the Opening Ceremony and Reception, the plenary lectures, and attendance at technical sessions. Use of the hospitality center and participation in tours prearranged by the Congress are open only to registrants. Members of sponsoring and official participating societies receive discounts on registration. The list of societies appears below.

The Canadian Society for Chemistry, the American Chemical Society, the Chemical Society of Japan, the New Zealand Institute of Chemistry and the Royal Australian Chemical Institute are sponsoring societies.

Official participating organizations are: American Society for Testing and Materials, Canadian Society for Chemical Engineering, Chinese Chemical Society, Colegio Panameno De Quimicos, Colegio de Quimicos de Costa Rica, Hong Kong Chemical Society, Institut Kimia Malaysia, Integrated Chemists of the Phillipines, Korean Chemical Society, Papua New Guinea Institute of Chemistry, Russian Mendeleev Chemical Society, and Sociedad Chilena de Quimica.

Pacific Polymer Conference (PPC). The deadline for registration is **November 3 in Washington DC.** Registrants also planning to attend this conference, scheduled on the island of Kauai from December 12-16, before Pacifichem '95 may register for both meetings by using the single form. *Full* and *student* registration fees for the PPC includes a welcoming reception, continental breakfasts, coffee breaks, Thursday evening's luau, the book of abstracts, and attendance at technical sessions. *Spouse/guest* registration includes the above with exception of the abstract book and admission to the technical sessions.

Registration Policies. The registration form, containing information on fees and mailing instructions follows. You should photocopy the form. A separate form must be used for each registrant, as well as each guest. Payments or authorization to charge to a credit card must accompany the form. ALL payments must be in US dollars. Bank transfers must include bank charges in addition to the fee due. **Purchase orders cannot be honoured**. Registrations charged to a credit card may be faxed directly to 00-1-202-833-7711 or 00-1-202-872-6128, or 00-1-202-872-4081. If a copy is sent by mail, clearly mark it "confirming fax". Please allow at least four weeks to process your request. Your badge and receipt will be mailed directly to the address shown on the registration form. However, badge cases and programmes will be available on-site.

Abstracts. For Pacifichem '95, a book of abstracts is available for $US35 and may be purchased either in advance (using the registration form) or on-site. For the PPC, one abstract book is included in the full or student registration. Books for both meetings will be distributed on-site.

Refund Policies. All requests must be in writing. Deadlines for full and partial refunds vary for the two meetings. Please see the registration form for details.

Travel. New Zealand participants should make their own travel arrangements.

Car rentals. Budget and Hertz rent-a-cars are offering special rates for the duration of the conferences.

Pacifichem '95

Budget:	ID CODE:	V9MY	ISLAND	OAHU
	PHONE	Outside the US & Canada, call (800) 537-3600		
Hertz	ID CODE:	21055	ISLAND	OAHU

Pacific Polymer Federation

Budget	ID CODE:	V92PF	ISLAND	KAUAI
	PHONE	Outside the US & Canada, call (800) 537-3600		
Hertz	ID CODE:	21080	ISLAND	KAUAI

Visas: New Zealand passport holders may enter the US under the visa waiver programme. Others should check with their travel agent or the US embassy for requirements.

PACIFICHEM '95 HOTEL RESERVATIONS

ROOM RESERVATIONS: Mail the housing form for the official hotels that follows (you should photocopy it) to the

Advance Registration

1995 International Chemical Congress of Pacific Basin Societies
Honolulu, Hawaii
December 17–22, 1995
Deadline for receipt of Pacifichem registration: Nov. 10
Deadline for full refund: Nov. 17
Deadline for partial refund: Nov. 24

4th Pacific Polymer Conference
Koloa, Kauai, Hawaii
December 12–16, 1995
Deadline for receipt of PPC registration: Nov. 3
Deadline for full refund: Nov. 10
Deadline for partial refund: Nov. 17

Mail this form with payment to:
PACIFICHEM '95
c/o Meetings Department
American Chemical Society
P.O. Box 18598
20th St. Station
Washington, D.C. 20036-8598

or

Fax with credit card payment to:
(202) 833-7711 or
(202) 872-6128 or
(202) 872-4081

Make check or money order (U.S. dollars) payable to: **American Chemical Society or ACS**

☐ Dr. ☐ Mr. ☐ Miss ☐ Ms. ☐ Mrs. Surname First or Nickname M.I.

Name for badge

Affiliation

Street address

City, State ZIP

Country Fax

Telephone (office, home)

Pacifichem days at meeting: 1☐ Su 2☐ M 3☐ T 4☐ W 5☐ Th 6☐ Fri **Type of affiliation:** ☐ Academia ☐ Government ☐ Industry

PPC days at meeting: 1☐ T 2☐ W 3☐ Th 4☐ Fri 5☐ Sa

☐ **Please check here if you are disabled and require special services. We will contact you prior to the meeting.**

☐ **PLEASE CHECK HERE IF YOU DO NOT WISH TO RECEIVE EXHIBITOR PRODUCT OFFERINGS.**

1995 International Chemical Congress of Pacific Basin Societies

FEES: Registration (Check one only)

1 ☐ Member of sponsoring or participating society ..... @ $295
2 ☐ Nonmember: eligible for membership in a participating society ..... @ $365
3 ☐ Visitor: technical professional not eligible for membership in a participating society ..... @ $295
4 ☐ Family member ..... @ $50
5 ☐ Full-time student, less than postdoctoral status, member or nonmember ..... @ $50

Registration Fee $ _____

Fees: Tour Tickets

Event No.	No. Tickets	@ $	Total
_____	_____	_____	$_____
_____	_____	_____	$_____
_____	_____	_____	$_____
_____	_____	_____	$_____

Ticket Total $ _____

Abstract Book
_____ @ $35 each

Abstract Total $ _____

TOTAL REMITTED $ _____

4th Pacific Polymer Conference

FEES: Registration (Check one only)

	Advanced
1 ☐ Participant	@ $425
2 ☐ Student	@ $150
3 ☐ Spouse/Guest	@ $150

Registration Fee $ _____

Tour & Event Tickets

Event No.	No. Tickets	@	Total
1	_____	$43	_____
2	_____	$60	_____
3	_____	$37	_____

Ticket Total $ _____

Additional Abstract Book
_____ @ $25 each

Abstract Total $ _____

Airport Transfers
_____ One-way @ $17 per person
_____ Round trip @ $34 per person

Transfer Total $ _____

TOTAL REMITTED $ _____

Registrations paid by credit card ONLY may be faxed to either of the numbers listed above. However, do not mail and fax, otherwise duplicate charges will occur.

Paid by: ☐ Check ☐ American Express ☐ VISA ☐ MasterCard ☐ Diners Club Expiration Date

Credit card account No.

Cardholder: _____ Signature: _____

FOR OFFICE USE ONLY ☐ Pacifichem ☐ PPC ☐ Pacifichem & PPC

Congress Housing Bureau, c/o ACS, Meetings Department, P.O. Box 18598, 20th St. Station, Washington, DC. 20036-8598, USA. Reservations at the Congress rate **cannot** be made directly with the hotels and **cannot** be made by telephone. Requests may be faxed to 00-1-202-872-4081. If confirming by airmail mark the copy "confirming fax" otherwise a duplicate reservation will result (because of the large volume, we are unable to confirm receipt of faxes).

USE A SEPARATE FORM FOR EACH ROOM REQUESTED. Registrants sharing a room should use one form listing the names of all occupants. Reservations will be processed on a first-come, first-served basis only. **Please note at least three choices when making your selection.** If all the hotels you have requested are sold out, the next available hotel will be assigned according to your location and rate preference.

DEADLINE FOR RECEIPT OF ALL HOUSING TRANSACTIONS IS NOVEMBER 10. Reservations will be acknowledged directly to the individual listed on the reservation form, indicating the assigned hotel, rate, and room guarantee information. **Please allow at least 15 business days for processing a request.** Requests received after the deadline will be returned.

Occasionally, housing requests are sent but not received by us. You may confirm your reservation 2 weeks after sending it by calling the Congress Housing Bureau. Sometimes, acknowledgments are mailed but are never received by the guest. Please do not assume you were assigned any of your hotel choices. If you do not receive an acknowledgment in the mail approximately 3-4 weeks after sending your housing form, you should call the Congress Housing Bureau at 001-202-872-6008 before 08.00 NZ time and confirm your hotel assignment.

HOUSING DATES APPLY DEC 13-23 ONLY. If you wish to extend your stay beyond the time of the meeting (arriving before December 13 or departing after December 23) you must make reservations for the additional nights directly with your assigned hotel.

ACCOMMODATIONS ARE AVAILABLE FOR GUESTS WITH DISABILITIES. If you require special accommodations because of a disability, please mark the appropriate box on your housing form.

DO NOT SEND A CHEQUE TO THE CONGRESS HOUSING BUREAU. Cheques and money orders received by the Congress Housing Bureau will be returned to you. If you provided a credit card number, it will be forwarded to the hotel to guarantee your reservation.. If you do not provide a credit card number, a deposit for one night **must be sent directly to your assigned hotel within 10 days of the date on your Congress housing acknowledgment.** If you do not have a credit card, payment for your entire stay may be required upon check-in. **Failure to guarantee your reservation directly with your assigned hotel can result in cancellation of your room reservation.** Some hotels may elect to charge one-night's deposit on your credit card upon receipt rather than wait until you arrive.

DON'T BE A NO SHOW. Failure to cancel a guaranteed reservation can result in a charge for one-night to your credit card by the hotel. **CHANGES** in arrival/departure dates or cancellations by November 10 must be faxed or mailed to the Congress Housing Bureau. After November 10, all correspondence concerning housing matters, including cancellations and changes, must be made directly with the hotel. **Hotels will refund deposits only if cancellation notice is received by the hotel 7 days prior to arrival.**

A map indicating hotel locations is printed below and includes hotel codes, names, Congress guaranteed rates, and other hotel information. Be sure to provide all the information requested on the Congress housing form. Hotel space is limited, so do not be disappointed, submit your housing request as early as possible.

PPC HOTEL RESERVATIONS

The Hyatt Regency Kauai is the site for the 4th Pacific Polymer Conference. Reservations must be received by November 10, after which reservations are subject to availability at the prevailing rack rate. All reservations must be accompanied by a one (1) night deposit. The special rate for PPC attendees is $150 Single/Double and is available December 6-21. To receive a housing form fax the ACS Meetings Department at 00-1-202-872-6128. You may also call the Hyatt Regency Kauai Reservations Department directly at 00-1-808-742-6244 to make your reservation. In order to receive the special rate, you must advise them that you will be attending the Pacific Polymer Conference.

Ground Transportation in Honolulu.
Persons arriving from New Zealand need to clear U.S. Immigration & Customs. You will be transported by shuttle bus from the arrival gate to the main terminal where formalities are completed. Ground transportation is available at the exit from Immigration & Customs. The fare on buses to the Waikiki hotels is $US5.00, with no charge for baggage. Taxis are metered and the fare to Waikiki is about $US17 plus a charge for baggage. City buses stop at each end of the terminal, one level above the baggage claim area but no baggage may be taken on the bus; the fare to Waikiki is 60 cents.

Information for speakers. Each meeting room will be equipped a with 35 mm carousel slide projector, overhead projector, screen, lighted reading desk, lapel microphone, and projectionist to operate equipment.

Facilities for Persons with Disabilities. We are committed to making the Congress accessible to all people. We realize some may have special requirements, such as interpreters for the hearing impaired and shuttle vehicles with lifts. We will do our best to accommodate everyone. Most facilities used for meeting functions are readily accessible. Hotels having appropriately designed sleeping rooms are so identified. Registrants requiring sign language interpreting can submit their request by contacting us at 00-1-202-872-8069. When submitting a request for services, please provide the following information: your name, address, telephone number, fax number, the type of interpreting needed, and the day, date, time, and location of the sessions you will be attending (these are available from Prof. B. Halton, Chemistry Dept., Victoria University, PO Box 600, Wellington). Please call no less than four weeks before the meeting as the Congress cannot

Housing Reservation

International Chemical Congress of Pacific Basin Societies

Honolulu, Hawaii **Dec. 17–22, 1995**

Use this form for congress participating hotels only. Please read the information on reservations before completing this form. **Return this form by mail to:** *Pacifichem '95, c/o American Chemical Society, P.O. Box 18598, 20th St. Station, Washington, D.C. 20036-8598 U.S.A.* ***or by FAX to:*** *(202) 872-4081.* **DEADLINE FOR RESERVATIONS: Nov. 10, 1995.**

Mail Acknowledgment to:	Surname	First Name	M.I.
Name			
Organization/department			
Address			
City, State		ZIP	
Country		Fax	
Telephone Office		Home	

HOTELS: List your first, second, and third choice hotel accommodations below, including the hotel category (if applicable) and the type of accommodations.

Hotel choice	Category	Rate per night	Type accommodations
1st _____			_____Single (1 bed, 1 person)
2nd _____			_____Double (1 bed, 2 persons)
3rd _____			_____Double/Double (2 beds)

ARRIVAL DAY AND DATE: _____ **NUMBER OF NIGHTS:** _____ **NUMBER IN PARTY:** _____

If my preferred hotel or rate is not available, I am more concerned with: ☐ **Rate** ☐ **Location**

Please print ALL names (including your own) to occupy room below. Use a separate form for EACH room:

ADULTS:

	Surname	First Name	M.I.
Name(s)			

CHILDREN (must include age):

	First Name	Age	First Name	Age
Name(s)				

☐ Check here if you require any special accommodations due to a disability.
If so, please specify:_____

☐ Nonsmoking room (if available) Special request: _____

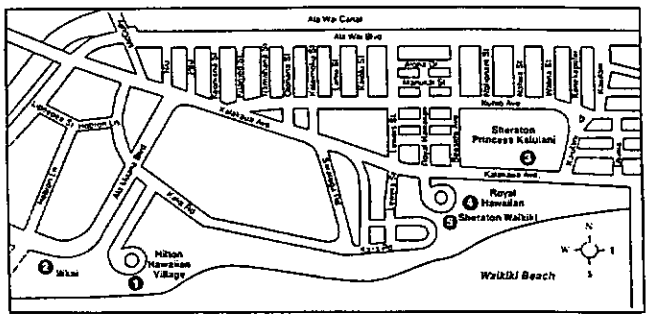
PAYMENT: DO NOT SEND A CHECK TO THE CONGRESS FOR THIS RESERVATION.
All hotels require either a credit card number or advance payment to hold your reservation. You must guarantee this reservation within 10 days of the date indicated on your congress housing acknowledgment directly to your assigned hotel. Failure to do so can result in its cancellation. If you wish to have the congress forward your credit card number directly to your assigned hotel to guarantee your reservation, please provide:

☐ MasterCard ☐ Visa ☐ American Express ☐ Diners Club ☐ Other_____ Expiration Date

CREDIT CARD NUMBER:

CARDHOLDER NAME (Please print): _____

accommodate last minute requests for interpreters. You will receive a confirmation of your request once it has been fulfilled. If you must cancel, please notify the Congress immediately. There is a box on the registration and housing forms to be checked if you require special arrangements. If you have special needs during the meeting, contact the nearest Congress Operations Office.



Pacifichem '95 Official Hotels in Honolulu, Hawaii

Hotel/Category	Single $US	Double[a] $US.	Additional Person $US.
1.Hilton Hawaiian Village[d]			
Rainbow Tower, ocean view	$180	$180	$30
Tapa Tower, ocean view	$163	$163	$30
Tapa Tower, partial ocean view	$149	$149	$30
Run of House, garden view	$139	$139	$30
2.Ilikai			
Ilikai Tower, ocean view w/kitchen[b]	$145	$145	$20
Yacht Harbor Tower, ocena view	$120	$120	$20
Ilikai Towre, city view w/kitchen[b]	$115	$115	$20
3.Princess Kaiulani[d]			
Run of Tower	$125	$125	$25
Run of Main Building	$95	$95	$25
4.Royal Hawaiian			
Main Building, garden view	$175	$175	$25
5.Sheraton Waikiki[d]			
Run of Ocean	$180	$180	$25
Run of Mountain/City	$145	$145	$25
Manor wing (no view)[c]	$99	$99	n/a

Note: The rates listed above are in U.S. dollars and do not include the current 10.17% room and occupancy tax per room, per night, which is subject to change. a. Double/double (2 bedded room) rates are calculated by adding the additional person charge to the double rate for each guest over two persons. b. Double/double rooms in the Ilikai Tower have two twin beds and a pull out queen sofa bed. c. Manor rooms are limited to 2 persons to a room. d. Accessible rooms for persons with disabilities are available. n/a = not applicable.

Nonparticipating Condominiums

Condominium	Dates Applicable	Studio	One Bedrm	Two Bedrm	Closest Intersection
Aston Island Colony 445 Seaside Avenue Honolulu, HI 96815 Ph: 00-808-9232345 Fax: 00-808-9217105	Dec. 10-22 Dec. 23-31	$68 $84	$86 $102	n/a n/a	Ala Wai Blvd & Seaside Ave.
Aston Waikiki Banyan 201 Ohua Ave Ste 406-2 Honolulu, HI 96815 Ph: 00-808-9220555 Fax: 00-808-9220906	Dec. 12-22 Dec. 23-30	n/a n/a	$88 $153-167	n/a n/a	Kuhio Ave. & Ohua Ave.
Aston Waikiki Sunset 229 Paoakalani St Honolulu, HI 96815 Ph: 00-808-9220511 Fax: 00-808-9247117	Dec. 10-26	n/a	$93	$180	Kuhio Ave. & Paoakalani St

Note: The hotels listed above are not part of the official Congress housing block. Reservations need to be made directly with these hotels, but you should ask for the Pacifichem Congress Group rate. These hotels **ARE NOT** on the Congress shuttle route, but are within walking distance of one of the official hotels. Please note that rooms prior to and after the Congress dates are very limited so early reservations are strongly recommended. Studios offer kitchenettes and 1-2 bedroom units offer fully equipped kitchens.

EXPOSITION

The Congress will include an exposition featuring over 30 companies displaying the latest instrumentation, lab equipment and supplies, software, publications, and other relevant products. Located in the Hilton Hawaiian Village, directly outside the Coral Ballroom, the exposition's hours will be:
Mon. Dec.18, 11AM-2PM and 4PM-7PM;
Tue. Dec.19 and Wed.20, 10AM-2PM only.

Official Congress Souvenir: Visit the exposition to pick up your official souvenir from Pacifichem '95 (stop by early-we have a limited supply).

Gift Booth: Also available within the exposition will be the gift booth (#133), where you can purchase Pacifichem T-shirts and other gifts.

CONGRESS EVENTS

Congress Opening Ceremony and Reception, Sunday evening. Opened by a traditional Hawaiian chant, the ceremony will include welcoming remarks from officers of the sponsoring societies, the governor of Hawaii, the mayor of Honolulu, and a prominent U.S. Senator from the state of Hawaii. A complimentary reception open to all registrants will follow.

Plenary Lectures. Four lectures have been scheduled for evenings during the week. The confirmed speakers are: Dr. Mary Goode (Presidential Advisor on Science and former ACS President) and Professor K. Nakanishi (Columbia University).

CONGRESS TOURS

Tour tickets for both Pacifichem '95 and the Pacific Polymer Conference can be purchased using the advance registration form. Tour participation is open to registered attendees only.

Tickets will also be sold on-site, but some tours may be sold out. Advance purchase is recommended. Tours may be cancelled if participation does not reach a required minimum. In that event, full refunds will be made. Prices are in $US and include transportation, taxes, and entrance fees. Children up to age 12 are eligible for the reduced prices marked "c" in the Pacifichem '95 tours. Refunds of tour tickets can made in advance if the tickets are received at the Congress Office by the deadline for full refund of registration. On-site, refunds may be obtained up to 48 hours before the scheduled tour. After that time, staff will attempt to re-sell your ticket.

PACIFIC POLYMER CONFERENCE TOURS

Wed. Dec.13: #1 Discover Kauai: 1:00 - 6:00 PM.

See the best that the Island of Kauai has to offer...visit the Waimea Canyon. Kauai remains a memorable secluded place that has been called "an island for the senses." In addition to enjoying what is known as the Little Grand Canyon of the Pacific, other stunning scenic attractions will be seen such as the Kalalau Lookout (weather permitting), Captain Cook's Landing - Waimea Bay, Hanapepe Valley, the Russian Fort, Spouting Horn, Old Koloa Sugar Mill, Queen Victoria's Profile, Nawiliwili Harbor and the Poipu Resort Area. Sail up the Wailua River to the Fern Grotto. A box lunch is included. $US43 per person.

Thur. Dec.14: #2 Luau: 7:30 - 10:00 PM.

The Luau is a traditional Hawaiian feast...you will experience an evening of Polynesian tradition including food and entertainment. A Luau ticket is included with the full conference participant, student, and spouse/guest registration fee. Additional tickets are available for $US60 per person.

Fri. Dec.15: #3 Alluring Hanalei: 1:00 - 6:00 PM.

Travel to the north side of the island and see spectacular Hanalei Valley Lookout and Lumahai Beach where blockbusters from South Pacific to Jurassic Park were filmed. A box lunch is included. $US37 per person.

PACIFICHEM '95 TOURS

Waimea Valley-The Ultimate Experience. Noon to 6 PM. Fri. Dec.15: CT-1/adult, CT-1c/child; Sun. Dec. 17: CT-11/ adult, CT-11c/child.

This fully narrated and guided exploration provides a unique opportunity for interaction with Hawaiian culture, people, dance, and song. Enjoy an approximately 3-hour visit to Waimea Valley. The tour highlights the ancient living site, Waimea Arboretum and Botanical Gardens, Hawaii crafts and games, Cliff Dives, Conservation Center and tropical rainforest. Cost: $US38 adult; $US20 child. Limit 100 persons per tour. Advance registration required.

Polynesian Cultural Center Tour. 12:15 PM to 10:30 PM. Fri. Dec.17: CT-2/adult, CT-2c/child; Sat. Dec.18: CT-8/ adult, CT-8c/child; Mon. Dec.18: CT-15/adult, CT-15c/ child; Tue. Dec.19: CT-21/adult, CT-21c/child; Wed. Dec.20: CT-26/adult, CT-26c/child. Thur. Dec. 21: CT-30/adult, CT-30c/child.

Afternoon drive to the center located at Laie on the windward side of Oahu. At the re-created villages of the six countries of Polynesia - New Zealand, Tonga, Fiji, Samoa, Tahiti, and Hawaii, visitors can observe or participate in the arts and crafts of Polynesia. A buffet dinner and show cap off the day. Price includes round-trip transfers, Hawaiimax theatre, admission, dinner, and show. Cost: $US59 adult; $US42 child. Limit 100 persons per tour.

Hawaii's Monarchy Revisited. 12:45 PM to 5 PM. Fri. Dec.15: CT-3; Tue. Dec.19: CT22.

Explore the kingdom of old Hawaii and its enlightened monarchy. This half-day excursion includes tours through two royal residences, a drive into Iush Nuuanu Valley and a look at the church of the royalty and their final resting place (Iolani Palace and Queen Emma's Summer Palace (admission included). Other points of interest are Kawaiahao Church, King Kamehameha's Statue, and the Royal Mausoleum. Cost: $US26. Minimum 20. Limit 50 persons per tour. Advance registration required.

Pearl Harbor Cruise. 7:40 AM to 11:45 AM. Sat. Dec.16: CT-4/adult, CT-4c/child.

Lengthy narrated cruise to Pearl Harbor passes Hickam Field, Ford Island, Battleship Row, and the USS Arizona monument. Roundtrip transfers from Waikiki are included. Cost: $US26.50 adult; $US13 child. Limit 100 persons per tour.

Arizona Memorial Excursion. 8:45 AM to 12:30 PM. Sat. Dec.16: CT-5/adult, CT-5c/child; Sun. Dec.17: CT-10/ adult, CT-10c/child; Tue. Dec.19: CT-19/adult, CT-19c/ child.

Tour the National Park Center and view a film of the Pearl Harbor attack of Dec. 7, 1941. Board the Arizona Memorial where history stands still for the crew members entombed there. Shirts and shoes are required; children must be at least 45 inches tall. Cost: $US15 adult: $US10 child. Limit 100 persons per tour.

Royal Circle Island Tour. 8:45 AM to 5:30 PM. Sat. Dec.16: CT-6/adult, CT-6c/child.

An all-day tour of Oahu. Sights include Diamond Head Crater, Hunauma Bay, and Sandy Beach. A visit to Nuuanu Pali Lookout provides a panoramic view. Other memorable sights include Kaneohe Bay, Byodo-In Temple, Waimea Bay, pineapple and sugarcane fields Waimea Falls Park's 1800 acres of tropical plants, waterfalls, and bird sanctuary. Cost (not including lunch): $US49 adult; $US30 child. Limit 100 persons per tour.

Deluxe Little Circle Island Tour. 9 AM to 1 PM. Sat. Dec.16: CT-7/adult, CT-7c/child; Mon. Dec.23: CT-14/ adult, CT-14c/child.

Half-day 60-mile tour shows Hawaii in many moods. See tranquil coves, rolling surf, breakers crashing against the rocky cliffs and lush tropical forests. Stops include inside Diamond Head Crater, Pali Lookout, and Makapuu Lookout. Cost $US23 adult; $US20 child. Limit 100 persons per tour.

One-Day Tour to Hawaii. 5:00 AM to 8:30 PM. Sun. Dec.17: CT-9/adult, CT-9c/child.

Experience the Hawaii Volcano National Park Adventure tour where we take you as close to the lava from the current eruptions

as Civil Defense will allow. Stops include an anthurium nursery in Hilo, Rainbow Falls, and a macadamia nut factory. Cost of lunch not included. Price does include roundtrip transfer in Honolulu, airfare, tour with admission into the Volcano National Park on Hawaii. Cost: $US169 adult; $US165 child. Limit 50 persons per tour. Advance registration required.

Scenic Honolulu City Tour. 1 PM to 5 PM.
Sun. Dec.17: CT-12/adult, CT-12c/child; Mon. Dec.18: CT-16/adult, CT-16c/child; Tue. Dec.19: CT-23/adult; CT-23c/child; Wed. Dec.20: CT-27/adult, CT-27c/child; Thur. Dec.21: CT-31 adult, CT-31c/child.

See Diamond Head, East West Center located on the University of Hawaii Campus, the National Cemetery of the Pacific, the herb shops, acupuncture clinics, open market, and noodle factories of Chinatown. Drive back to Waikiki via the historic waterfront, Iolani Palace, Kawaiahao Church, the Mission Houses, and the Hawaii State Capitol. Cost: $US23 adult; $US19 child. Limit 100 persons per tour.

Native Hawaiian Crafts. 9AM to 11 AM.
Mon. Dec.18: CT-13; Tue. Dec.19: CT-20; Wed. Dec.20: CT-25; Thur. Dec.21: CT-29

A workshop by Hawaiian crafts artisans features feather lei making, floral leis, Hawaiian musical instruments, Iauhala and Hawaiian quilt. Cost: $US10.

Sunset Dinner Dance Cruise. 5 PM to 8 PM.
Mon. Dec. 18: CT-17/adult, CT-17c/child; Tue. Dec.19. CT-24/adult, CT-24c/child.

Experience a warm tropical evening viewing the sunset and city lights from a smooth sailing yacht on the protected waters off Waikiki. Price includes round trip transportation, cruise, complimentary cocktail, grilled dinner and dessert, soft drinks and coffee, and music. Cost: $US41.50 adults; $US26 child. Limit 100 persons.

One-day Tour to Maui. 6 AM to 7:30 PM.
Tue. Dec.19: CT-18/adult, CT-18c/child.

Fly to Kahului and drive to the top of the Haleakala Crater, 10,000 feet above sea level. See rare silversword and the state bird Nene. Continue to Iao Valley and Old Lahaina Town, once the capital of Hawaii's kingdom. Stop for lunch (cost not included). Price includes round trip transfers in Honolulu, airfare, and admissions to Haleakala Park, and tour on Maui. Cost $US169 adult; $US164 child. Limit 50 persons. Advance registration required.

One-day; Tour to Kauai. 6AM to 7:30 PM.
Thur. Dec.21: CT-28/adult, CT-28c/child.

Kauai remains a memorable secluded place that has been called "an island for the senses." We'll see the incredible Waimea Canyon, take a cruise on the Wailua River to the romantic Fern Grotto (admission included) in addition to enjoying the many other stunning scenic attractions of this beautiful island. Cost: $US169 adult; $US164 child. Limit 50 persons. Advance registration required.

HAWAII VOLCANO FIELD TRIP

The tour will be held on December 15-17. Hotel accommodations have been secured at the Hilo Hawaiian Resort Hotel in Hilo on the island of Hawaii. Participants should plan to arrive by 6 pm on Friday, December 15, when the tour will commence with a lecture, reception, and dinner at the hotel. The hotel package includes two nights' lodging, reception and dinner Friday evening, and breakfast on Saturday.

This technical trip will explore dynamic processes associated with one of the world's most active volcanoes: Kilauea. While at the summit, we will tour the USGS Hawaiian Volcano Observatory and visit the Jaggar Museum. From the caldera overlook at the observatory we will review recent and historic activity at Kilauea's summit. Additional stops are planned in and around the caldera at Sulphur Bank, and Halemaumau and Keanakakoi pit craters. These stops will examine the geologic structure of Kilauea's summit and the principal sites of volcanic gas release. The trip will continue down the East Rift Zone on Chain of Craters Road with several stops along the way to the current eruption site, including a walk through the Thurston lava tube. We will proceed to the end of Chain of Craters Road which is being repeatedly cut off by lava issued from vents at Pu'u 'O'o. Activities at this stop will depend upon eruption conditions. Hopefully, things will be as spectacular as they have been for several months and we can experience active lava flows, and witness dynamic littoral processes where molten lava enters the ocean. No sample collecting is permitted. A box lunch will be provided during the trip.

Children under 18 years of age will not be allowed on the trip. Volcanic fumes encountered on this trip may be hazardous to anyone with respiratory conditions.

Short hikes over fresh lava and ash deposits predicate the need for sturdy shoes. Light-weight, long-sleeved cotton shirts, and long cotton pants are the best overall attire. The summit is at 4000 feet elevation, so expect it to be cool. At the other extreme, down at the coast, the lava is hot and the sun is intense. This side of the island receives over 100 inches of rain per year, so bring your raincoat along with your sunscreen.

Fees: Hotel: Single $210 $80 each additional person
Tour: $80 per person, includes lunch, bus transportation and entrance fee to the Volcano National Park (tour is limited to 96 persons).

Reservation form
HAWAII VOLCANO FIELD TRIP

Please print name(s): Tour: yes or no

1. _____ _____
2. _____ _____
3. _____ _____

Address: _____

City: _____ State: _____

Country: _____ ZIP: _____

Telephone (Office): _____

Fax: _____

Arrive day/date: _____ Depart day/date: _____

___ Hotel single @$210 $_____

___ Add'l person @ $80 (Max: 3 to a room) $_____

___ Tour @$80 per person $_____

Total enclosed $_____

Reservations and cancellations must arrive at the Congress Housing Bureau. c/o ACS, P.O. Box 18598, Washington D.C. 20036-8598, U.S.A. by Nov. 10. If payment is by credit card, you may fax to (202) 833-7711, (202) 872-6128, or (202) 872-4081 by Nov. 10.

Full payment in U.S. dollars must accompany your request. Deadline is Nov. 10.

☐ Check enclosed (Make payable to ACS or American Chemical Society)

☐ Visa ☐ Master Card ☐ AMEX ☐ Diners Club exp. date: _____

Credit Card # _____

Card holder: _____ Signature: _____

NZIC NEWS

COUNCIL NEWS

PACIFICHEM 1995

We are aware that there will be quite a lot of our Members attending PACIFICHEM '95 in Honolulu in December. Unfortunately our President will be unable to be present, and he would like one of our Members to deputise for him at the Congress.

It would be appreciated if members would advise the Executive Officer of their intention to attend Pacifichem '95 and their willingness to be the President's representative.

CHEMISTRY OLYMPIAD

Four students were selected during May to compete in this year's International Chemistry Olympiad being held in Beijing, China this month. The students will compete against students from about forty five other countries at the competition. The team was selected after a training and selection camp, attended by students from Pleasant Point to Auckland, held in Christchurch at the University of Canterbury and Rangi Ruru School.

The members of the team are: Andrew Baldwin (17), a student of Palmerston North Boys' High; Hayden Callow (17), a student of Pleasant Point High School; Ben Clark (16), a student of Wellington College and Irine Peng (17), a student of Epsom Girls' Grammar School. Irine is the first girl to be selected for a New Zealand Chemistry Olympiad team. The non-travelling reserve is Jeremy Harrison, a student of Christ's College. They will be accompanied by Dr Sheila Woodgate of the University of Auckland, and Mrs Barbara Duncan of the University of Otago.

This is the fourth time New Zealand has entered the competition. Last year two Silver medals were won by Andrew To, from Auckland, and Ben Wilkinson, from Palmerston North, and Bronze medals were won by Raghav Raman, from Wellington, and Duncan McGillivray from Auckland. Sponsorship funding for the travel costs of the team have come from the Science Promotion program of the Ministry of Research, Science and Technology, the New Zealand Institute of Chemistry, and industrial sponsors.

NZIC COUNCIL ELECTIONS

As more than one nomination has been received for the position of Honorary General Secretary a postal ballot is being conducted with ballot papers being sent to all corporate members (Rule 16.6). If you have not received your ballot papers please contact the Executive Secretary Mr Alan Turner on telephone (04) 473-9444 or fax (04) 473-2324.

NZIC COMMITTEES

One of our members has asked who the members are on (i) the NZIC Science Policy and Public Affairs Committee that made the SPiR submission and, (ii) the Environmental Committee that made the NZIC Submission on the Hazardous Substances and New Organisms Bill (both published in *Chemistry in New Zealand* Vol. 59 No.3 (May 1995)).

The Committees are as follows:

NZIC Science Policy and Public Affairs Committee
Mr W Freitag (convenor), Professor N Curtis, Professor W A Denny, Professor B Halton, Dr D Bibby, Dr R Whitney.

Environmental Committee
Mr N G Thom (Convenor) with NZIC members co-opted depending upon the subject and circumstances.

ANNUAL GENERAL MEETING

Notice is given that the NZIC Annual General Meeting will be held on Monday 4 September 1995 at 6 pm in the Chemistry Department Seminar Room, University of Auckland.

The AGM will be immediately prior to the Auckland Branch September Meeting.

A A Turner
Honorary General Secretary for NZIC Council

AGENDA

1. Welcome
2. Apologies
3. Minutes
4. Matters Arising
5. Annual Report
6. Finance
7. Officers for 1995/96
8. Prizes
9. General Business

Minutes of the Annual General Meeting of the New Zealand Institue of Chemistry, held in Christchurch on 17 August 1994 at Canterbury University at 7.00 pm.

1. Welcome: The President, Professor A G Williamson opened the meeting by welcoming the 25 members present.

2. Apologies: Apologies were received and accepted for Professor B Halton, Dr G Worth and Dr M Taylor.

3. Minutes of the 1993 AGM: The minutes of the 1993 Annual General Meeting held in Auckland on 6 December 1993 were taken as read and approved on a motion from the Chair.

4. Matters Arising: The President reiterated the vote of thanks to Denis Hogan for his services to the Institute especially "CHEM NZ".

There were no other matters arising.

5. Annual Report: The President presented and spoke to his report. Acceptance of the report was moved from the Chair.

6. Financial Report: The Treasurer presented his report for the 1993/94 financial year. It was accepted (Karl/Turner and carried).

7. Election of Officers: The President announced that the following officers had been elected for 1994/95 year.

President	Prof. W.A. Denny	(Auckland Branch)
1st Vice-President	Mr N.E. Pritchard	(Waikato Branch)
2nd Vice-President	Dr R.S. Whitney	(Wellington Branch)
General Treasurer	Mr D.P. Karl	(Auckland Branch)
General Secretary	Mr A.A. Turner	(Wellington Branch)

8. Prizes: The following Institute Prize winners were announced:-

Easterfield Prize	Dr A Abell
SGS Prize	Dr P Steel
Chemical Education Prize	Mrs L Metcalfe

The Shell Prize winner would be announced at a later date.

9. General Business:

9.1 Branch Meetings: Dr W. S. Simpson raised the problem of achieving good attendances at Branch Meetings. Getting prominent people who are not actually in a scientific field to address the Branches could assist in attracting members as well as the public.

9.2 Institute News: There is still a need to increase the amount of news about the Institute and its members in the Journal.

9.3 Increasing Membership: Like similar organisation who are member bodies of the Royal Society of New Zealand, membership of the Institute is not increasing. Perhaps teachers could be attracted to join at a lower rate is they are concurrently members of the Science Teachers Association.

The President closed the meeting at 7.50 pm.

Treasurers Report
Financial Year 1994/1995

The annual Financial Statement of accounts of the Institute for the financial year 1994/1995 is presented below.

The Financial Statement for this financial year has been prepared in line with that proposed in my report published for the previous year.

The proposal was that these accounts are prepared on an actual income/expenditure basis. That is, any subscriptions in arrears have not been accrued as an asset which would show up as income.

Subscriptions in arrears for the 1993/94 year were $22,125. This figure, when added to actual cash received, gave an apparent subscription income of $123,000 as opposed to an actual income of $101,000. This clearly can be misleading to those not familiar with financial statements. The change in accounting practice will, in future, give a much clearer picture to members of the actual income. However the effect of the change in this year's financial statements is to give an apparent, and alarming, drop in income collected.

Actual subscription income for this year is $99,000. This is slightly below the $101,000 collected last year and represents the non payment of subscriptions by the equivalent of 14 members at member level.

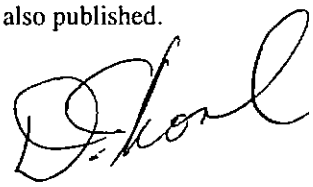
Other items under income which show major changes from the previous year are publication sales, conference surplus, ANC Quiz fees and return of capital from Equiticorp. The increase in sales is due largely to the Royal Society of Chemistry purchasing the successful NZIC education publication 'Chem NZ' for distribution to schools in Great Britain. The lack of a conference shows up as a lack of income, apart from residual distribution of income from the Auckland conference. The ANC quiz fees are on a net income basis rather than gross as previously reported. The Equiticorp capital repayment represents a further distribution from the Receivers of this group of companies. Further distributions are likely to be small in value only.

Of concern is the drop in donation income received for the Chemical Olympiad. Donation income has fallen from a 1993 high of $27,522 to $15,106 (including a MoRST donation of $5,000 not received in 1993). There was a deficit of $9,000 in this account which has been met by the Institute.

Expenditure items showing changes are detailed as follows. The item Sundry Publications for Resale also contains the costs of the new 'Careers in Chemistry' brochure produced by the Manawatu branch. These are not for resale. The cost of publication has been met by the Institute and by donation. GST shows as a net refund. Savings have been made in audit fees and travelling expenses.

The Institute shows an apparent net loss for the year of $30,000. Once the changes in accounting practice have been taken into consideration the true loss is $7,800.

The Financial Statements of the Chemical Education Trust are also published.



D.P. Karl.
Hon. Treasurer.

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30TH APRIL 1995

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.

... continued on page 59

NEW ZEALAND INSTITUTE OF CHEMISTRY (INC)
INCOME AND EXPENDITURE ACCOUNT
FOR THE YEAR ENDED 30TH APRIL 1995

			1994
INCOME			
Subscriptions from Members		76,566	123,114
Publication Sales		8,733	(1,797)
Conference Surplus		1,002	6,507
Chem 13 Exam Fees		3,434	4,553
Chem Education Subscriptions		1,125	-
I. U. P. A. C.		32	542
Chem 13 News		-	690
Interest - BNZ		3,084	3,942
Interest - Local Body Stock		31	31
Equiticorp Capital Repayment		7,048	1,059
ECNZ Lecture Tour		-	5,625
Fees ANC Quiz		272	3,951
		101,327	148,217
Chemical Olympiad Donations	15,106		20,633
Chemical Olympiad Expenses	24,007		20,439
		(8,901)	194
		92,426	148,411
EXPENDITURE			
Accountancy & Audit Fees	1,984		2,924
Accommodation Expenses	1,210		3,540
Branch Expenses - Capitation Fees	11,635		11,474
Branch Expenses - Student Travel	3,000		3,000
Chem NZ Expenses	10,534		7,467
Chem 13 Expenses	1,120		1,426
Conference Expenses	428		-
Donation	-		271
Depreciation	30		38
Goods & Services Tax	(2,910)		1,982
Interest & Bank Charges	545		1,577
Journal - Publisher	10,391		10,792
Journal - Editor	-		600
Sundry Publications for Resale	15,445		704
Overseas Visitors Expenses	703		-
Printing, Stationery, & Postage	7,303		7,744
Prizes	2,650		900
Rent to I.P.E.N.Z.	2,565		2,565
Secretarial Services	41,908		41,883
Subscriptions	3,150		5,835
Telephone & Fax Charges	1,189		1,244
Travelling Expenses	9,486		13,553
		122,366	119,519
NET LOSS(PROFIT)		29,940	(28,892)

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

NEW ZEALAND INSTITUTE OF CHEMISTRY (INC)
BALANCE SHEET
AS AT 30TH APRIL 1995

				1994
CAPITAL FUNDS				
Balance at the Beginning of the Year			35,634	6,742
Plus Net Income for Year			(29,940)	28,892
Development Fund			46,699	46,699
Easterfield Account			567	567
			52,960	82,900
REPRESENTED BY:				
CURRENT ASSETS				
Accounts Receivable		3,973		2,113
Prepaid Travel Account		1,936		221
Subscriptions in Arrears		-		22,125
B.N.Z. Current Account		-		6,498
B.N.Z. Autocall Account		21,256		26,621
B.N.Z. Term Deposits		28,684		27,234
			55,849	84,812
FIXED ASSETS				
Office Equipment	582			582
Less Accumulated Depreciation	460			430
		122		152
Presidential Chain		360		360
			482	512
INVESTMENTS				
Equiticorp $21,000 Debenture		1		1
Lyttleton H.B. Stk. 6.25% 1998		500		500
			501	501
TOTAL ASSETS			56,832	85,825
CURRENT LIABILITIES				
B.N.Z. Current Account	1,872			
Accounts Payable	2,000			2,925
			3,872	2,925
NET ASSETS			52,960	82,900

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

NEW ZEALAND INSTITUTE OF CHEMISTRY (INC)
CHEMICAL EDUCATION TRUST

INCOME AND EXPENDITURE ACCOUNT
FOR THE YEAR ENDED 30 APRIL 1995

		Last Year
INCOME		
Interest Received	2,778.00	2,723.00
EXPENDITURE		
Administrative Expenses	820.00	-
NET INCOME	1,958.00	2,723.00

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

NEW ZEALAND INSTITUTE OF CHEMISTRY (INC)
CHEMICAL EDUCATION TRUST

BALANCE SHEET
AS AT 30TH APRIL 1995

		Last Year
TRUST FUNDS		
Opeining Balance	50,696.00	46,973.00
Plus Donations refunded	100.00	1,000.00
Net Income for Year	1,958.00	2,723.00
Funds at 30/04/95	52,754.00	50,696.00
REPRESENTED BY:		
CURRENT ASSETS		
Interest Accrued	967.00	662.00
B.N.Z Current Account	12,067.00	9,435
B.N.Z Autocall Account	3,528.00	3,489.00
Withholding Tax on Interest	782.00	-
Owing to Institute	(800.00)	-
	16,544.00	13,586.00
INVESTMENTS		
Equiticorp Holdings Ltd (in receivership)	1.00	1.00
A.G.C. Ltd Debenture Cost	9,000.00	9,000.00
N.Z. Govt. Stock at Cost	27,209.00	28,109.00
	36,210.00	37,110.00
TOTAL ASSETS	52,754.00	50,696.00

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

... continued from page 59

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. inclusive basis.

: Investments are stated at cost or, where applicable, with the addition of interest compounded to date.

3. CHANGES IN ACCOUNTING POLICY.

The accounting policies have been changed to show subscription income on a cash basis, and to exclude subscriptions due as shown in previous years.

AUDITORS REPORT
NEW ZEALAND INSTITUE OF CHEMISTRY INC.

Audit Report:
To the members of New Zealand Institute of Chemistry Inc. We have audited the financial report attached. The financial report provides information about the past financial performance of the Institute and its financial posistion as at 30 April 1995. This information is set out in accordance with accounting policies attached.

Council Executive:
The Council Executive is reponsible for the preparation of a financial report which fairly reflects the financial position of the Institute as at 30 April 1995 and the results of its operations for the year ended on that date.

Auditor's Responsibilities:
It is our responsibility to express an independent opinion on the financial report presented by the board and present our opinion to you.

Basis of Opinion:
An audit includes examining, on a test basis, evidence relevant to the amounts and disclosures in the financial report. It also includes assessing:

- the significant estimates and judgement made by the Executive in preparation of the financial report; and

- whether the accounting policies are appropriate to the Institute's circumstances, consistently applied and adequately disclosed.

We conducted our audit in accordance with generally accepted auditing standards in New Zealand. We planned and performed our audit so as to obtain all the information and explanations which we considered necessary in order to provide us with sufficient evidence to give reasonable assurance that the financial report is free from material misstatements, whether caused by fraud or error. In forming our opinion we also evaluated the overall adequacy of the presentation of information in the financial report. 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, and our audit opinion below is subject to this comment. Our firm has no other interest in the Institute.

Unqualified Opinion:
We have obtained all the information and explanations we have required. In our opinion the Institute's financial report attached fairly reflects the financial position of the Institute as at 30 April 1995 and the results of its operation for the year ended on that date.

Our audit was completed on 10 July 1995 and unqualified opinion is expressed as at that date.

MARKHAMS AUCKLAND

ROYAL SOCIETY NEWS

ROYAL SOCIETY PREMIER AWARDS

Professor Philippa Black, President of The Royal Society of New Zealand, recently presented the 1994 Hector Memorial Medal (mathematical, physical and engineering sciences) to Professor Geoffrey E Stedman FRSNZ, Department of Physics and Astronomy, University of Canterbury, for his contributions to the field of atomic and radiation interactions. This medal is awarded annually in rotation for plant sciences, chemical sciences, human sciences, and animal sciences to the investigator who, working within New Zealand, has done most towards the advancement of that branch of science for which the medal and prize are allotted.

Professor Black also presented the 1994 Hamilton Memorial Prize for the encouragement of beginners in scientific research to Dr Michael Steel, Lecturer in Mathematics at the University of Canterbury, for his contribution to the mathematics of phylogenetic (evolutionary) trees.

1995 HAMILTON MEMORIAL PRIZE

This award was established in memory of Augustus Hamilton, President of the New Zealand Institute (1909-1910) and was awarded for the first time in 1923. The Royal Society is the successor to the New Zealand Institute. The Hamilton Memorial Prize is awarded annually for the encouragement of beginners in scientific research in New Zealand.

Nominations and applications for the above award should be sent to the Executive Office - Awards, The Royal Society of New Zealand, P O Box 598, Wellington, by 31 August 1995. At least two copies of the relevant publications and a supporting statement should accompany the nomination or application. Nominators or applicants must attest that their first substantive paper has been included and the date of publication.

Rule J 1116 reads:
This prize shall be awarded for scientific research carried out in New Zealand or in the islands of the South Pacific Ocean. The applicant or nominator shall submit one or more papers published within 7 years preceding the last day of January prior to the council meeting at which the award is made.* The papers shall include the first substantive paper published by the candidate; the applicant or nominator shall identify one paper that is considered to be the principal one on which the award is to be judged. In the circumstances that this paper has more than one author, the applicant or nominator shall supply a statement of what part or aspect of the work is primarily the work of the candidate.

* i.e. Within 7 years preceding 31 January 1995.

No award shall be made unless in the opinion of Council, there is evidence of scientific work of great merit.

The Hamilton Award for 1995 consists of a certificate and $1,000.

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1995 HUTTON MEMORIAL MEDAL

Captain F W Hutton FRS (1836-1905), the first President of the New Zealand Institute, (1904-05) was a leader in colonial science almost since his arrival in New Zealand in 1866.

The Hutton Memorial Medal was established in memory of F W Hutton and is awarded every three years for outstanding research.

Eligibility
Candidates must have received the greater part of their education in New Zealand or have resided in New Zealand for not less than ten years.

Selection Criteria
The prime purpose of the award is to recognise scientific work of great merit which must have a distinct bearing on New Zealand zoology, botany or geology.

Closing date for nominations
Nominations for the 1995 award must be received by the Executive Officer - Awards, The Royal Society of New Zealand, P O Box 598, Wellington no later that 31 August 1995.

Nomination Procedures
There is no prescribed nomination form; however, nominations must include the following information:

- Identification of Nominee: Include a person's name, professional or home mailing address, present occupational title and institutional affiliation. Enclose a full curriculum vitae and publication list.
- Summary of accomplishment: Provide a statement of the contributions in the field for which the award is proposed.
- Referees: Provide the names, addresses, fax and email numbers (if available) of two referees, one of whom should be from overseas.

In 1992 the Hutton Memorial Medal was awarded to George H Scott for research in palaeontology.

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1995 HECTOR MEMORIAL MEDAL AND PRIZE (Animal Sciences)

James Hector was Manager and Editor of the New Zealand Institute 1867-1907.

The Hector Memorial Medal and Prize was established in memory of Sir James Hector KCMG, FRS for the encouragement of scientific research in New Zealand. It is awarded annually in rotation for the following subjects: plant sciences; chemical sciences; human sciences; solid earth sciences; physical, mathematical and engineering sciences; animal sciences.

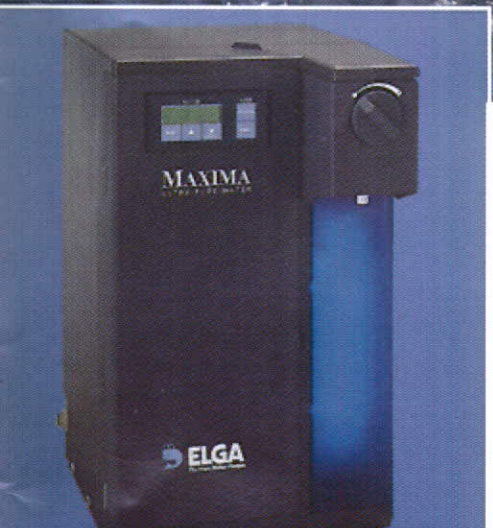
In 1995 the Medal and Prize shall be awarded to that investigator who, working within New Zealand, shall in the opinion of Council, have done most towards the advancement of Animal Sciences.

Closing date for nominations
Nominations for the 1995 award must be received by the Executive Officer - Awards, The Royal Society of New Zealand, P O Box 598, Wellington no later than 31 August 1995.

Nomination Procedures
There is no prescribed nomination form; however, nominations must include the following information:

- Identification of Nominee: Include a person's name, professional or home mailing address, present occupational title and institutional affiliation. Enclose a full curriculum vitae and publication list.
- Summary of accomplishment: Provide a statement of the contributions for which the award is proposed.
- Referees: Provide the names, address, fax and email number (if available) of two referees, one of whom should be from overseas.

In 1989 the Hector Memorial Medal (Animal Sciences) was awarded to Dame Patricia Bergquist FRSNZ for research on the biology, classification and chemistry of sponges.



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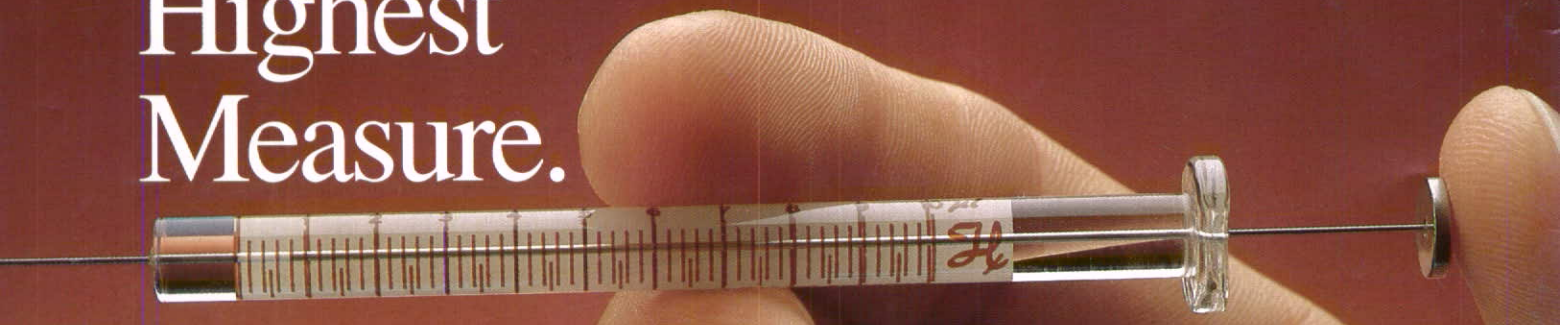

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