

Chemistry

in new zealand

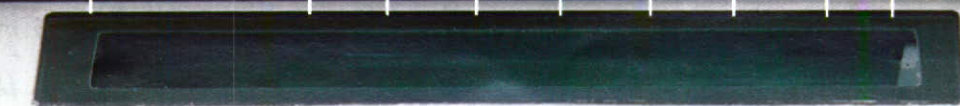
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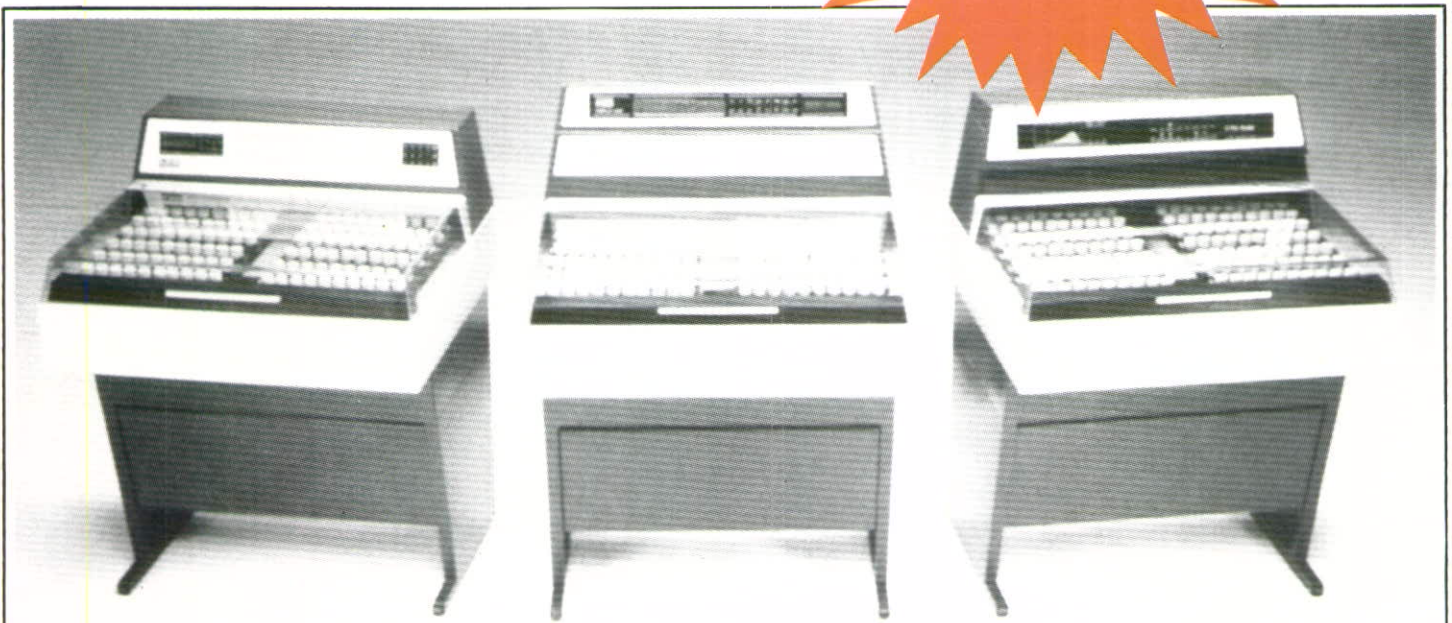


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FRONT COVER STORY P28



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Zealand dealers KMS Ltd, or by circling
32 on the reader reply card. See also p. 28.

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CHEMISTRY IN NEW ZEALAND YEARBOOK 1985

Compilation of the 1985 Yearbook with its listings of chemical suppliers, scientific instrument agents, consultants etc will soon get underway. If your company was listed in the 1984 Yearbook you need do nothing at the moment, we will be contacting you. However, if your company was not listed in 1984 but would like to appear in the 1985 Yearbook please send the name of your firm, postal address, telephone number and name of contact person to

1985 Yearbook
P.O. Box 9072
Newmarket
Auckland

and we will forward you a questionnaire.

EDITORIAL

Mexico City, Bhopal, Karlskoga, Auckland (?)

The public image of chemicals and the chemical industry must be at its lowest level for some time following the events of recent months. A gas explosion in Mexico City with a death toll of nearly 500, followed closely by the disaster at Bhopal with five times that number of fatalities, doesn't really support the image of an industry which can bring so many benefits to mankind. With these two events still fresh in the public memory, and coupled with the media "silly season", the scene was set for the fire in ICI's Mt Wellington farce. Suddenly New Zealand had its very own chemical disaster and there was no way the media were going to let that go! (Well at least not until the start of the first Test against Pakistan).

Given all this excitement, the accident at Karlskoga in Sweden, in which thirty tonnes of sulphur trioxide were released over the

town, seemed almost an anticlimax. Well you see, nobody died or broke out in a rash — where's the story in that? Perhaps the story was that the local authorities were prepared for just such an emergency, and took the appropriate steps to prevent it turning into a disaster? I note also that the company involved immediately admitted responsibility. How refreshingly different from the attitudes that normally prevail in the sort of incident.

It is easy to believe that a chemical disaster of the magnitude of those at Bhopal and Mexico City could not happen in New Zealand. Certainly we do not have the high population densities that must have been significant factors in both these incidents. But this is no reason for complacency — the Mt Wellington fire did cause significant environmental damage and, at the time of writing, one workman is still in a critical condition from burns suffered in the fire. Furthermore large quantities of chlorine were stored on the site, and if the fire had reached these, and caused them to rupture, significant areas of

Auckland would have been seriously affected by the gas.

A number of questions need to be answered if we are to learn from the events at Mt Wellington. Apart from the obvious one of how the fire started, there is the matter of whether such a wide variety of chemicals should have been stored on the one site, and whether the storage was adequate? Had the site been a chemical manufacturing one it would probably have been banded to contain spillages and the like — should this be required for storage facilities also? The speed with which information on the chemicals in the store was available could obviously be improved. Finally it would appear that we have some way to go in clearly establishing the responsibilities of central and local government agencies in dealing with incidents of this kind.

So far the initiative in investigating these matters seems to have come from the fire services and unions. One hopes that the chemical industry will not be long in also showing its hand?

Bruce Graham

COMMENT

The Bhopal Disaster

The disaster in Bhopal last December originated from a gas release from a pesticide plant operated by the Indian subsidiary of Union Carbide. The chemical involved was methyl isocyanate, which was used primarily in the manufacture of the common insecticide, carbaryl ($C_{11}H_{17}O_2CO.NHMe$). This is formed by the direct reaction of methyl isocyanate with 1-naphthol.

Methyl isocyanate is a highly flammable, volatile liquid that boils at 39°C. Its vapour has twice the density of air, and is therefore not easily dispersed. The vapour is an intense lachrymator and irritates the eyes, mucous membranes, lungs, and skin. In rats exposed for 4 hours the LC50 was 5 ppm; the effects being injury to the lungs and subsequent pulmonary edema. Experimental exposure to humans for 1 to 5 minutes is reported to have caused the following effects: 0.4 ppm, none; 2 ppm, lachrymation, irritation of the nose and throat; 21 ppm, unendurable irritation of eyes, nose, and throat. Not surprisingly the TLV has been set at a very low 0.02 ppm.

The accident in the plant occurred as the result of the build up of excessive pressure in a 30 tonne tank in which the methyl isocyanate was stored. In such an event the tank was designed to vent into a secondary tank equipped with a caustic scrubber. This should have neutralised the vapour, but was obviously ineffective. It has been suggested that the system had not been adequately designed to cope with the massive surge of vapour that occurred. The cause of the pressure build up in the tank is not known. The material was stored under pressure and refrigerated, and this system may have failed. Alternatively, a "runaway" reaction with some unknown impurity is suspected. Methyl isocyanate is extremely reactive. Contact with water causes formation of carbon dioxide and methylamine gases, and the reaction is much more rapid in the presence of acid or alkali. In the presence of metals such as iron, tin, or copper (or their salts), or certain other catalysts, it can undergo violent polymerisation.

Ed.



LETTER TO THE EDITOR

PRINCE AND PRINCESS OF WALES TRAVEL AWARDS

Sir,

In the "Council News" section of the October issue of "Chemistry in New Zealand" there was the information of your Council's intention not to make a contribution to the Royal Society of New Zealand's Science Awards Scheme this year. I would like to comment briefly on the role played by Member Bodies of the Royal Society, such as the Institute of Chemistry, in building up the funds necessary to operate such a scheme.

When the Royal Society was urged to inaugurate such a scheme the problems faced by the Society mainly related to acquiring the necessary funds. Before undertaking the task of approaching industry for financial support the Society felt it needed the support of both the government and of scientists themselves. Government responded well and now contributes \$25,000 annually to the Scheme. Our proposal to Member Bodies was that they might consider a \$2 levy on their normal subscriptions. This could provide the Society with about \$18,000 per year towards the Scheme, while requiring less than a dollar per person (after allowing for tax).

Individual member bodies were able, of course, to respond how they wished. Some responded by applying our suggested levy but others, like the Institute of Chemistry, responded by donating a lump sum to the Society. These were particularly ap-

preciated — they gave us a prompt and firm base to work on.

The Society has been reasonably successful in obtaining donations from private industry. Guided by a most helpful liaison committee chaired by Mr L.W. Gandar, former Minister of Science, and including a number of prominent industrialists, senior Fellows of the Society including the President embarked on a door-knocking campaign — a task none of them relished. The donations made by industry to the Scheme were unquestionably facilitated by the support already provided by government and the scientists themselves.

The scheme has been going for just over a year and already some 22 scientists and technicians (including 7 chemists) have received awards. But it is clear that it will be a continuing and arduous task obtaining funds from industry. It is for this reason that the Royal Society feels particularly disappointed at the inability of the Institute of Chemistry to contribute for the second year. Any contribution from the Institute is doubly welcome — for its own value and for the assistance it gives those senior members of the Society who undertake the difficult task of soliciting funds. The Royal Society looks forward to the time when the Institute of Chemistry can resume its very welcome contribution.

A.W.F. Thynne,
Executive Officer,
Royal Society of New Zealand.

ERRATA

WHOOPS!

We must apologise for inadvertently transposing the photos and biographies of the authors of one of the papers in the December '84 issue. Brian Robinson points out that while he has always admired the luxuriance of Jim Simpson's facial growth, he personally prefers to remain clean shaven. Clearly then, on p 155, he is the distinguished looking gentleman on the left, and Jim Simpson is the one on the right.

A further error appeared in the October '84 issue. In the council news on p 131, M.S. Greig is listed as having resigned. This information is not correct.

PEOPLE

Dr C.D. (Craig) Stevenson has been appointed Dominion Analyst. In this position, he will have statutory responsibility for much of the Chemistry Division DSIR work for other Government departments including Police, Health, Transport and Customs.

Dr Stevenson joined Chemistry Division in 1971 and has worked in the fields of water and environmental chemistry, including natural and drinking water quality, water and wastewater treatment, analytical methodology and land disposal of effluents. He has published 31 papers and reports on his research and has undertaken a range of advisory work including environmental aspects of thermal and geothermal power station development, waste treatment, corrosion problems in water supplies, and the presentation of water quality training courses for World Health Organisation in Manila, Beijing and Seoul.

More recently he has been increasingly involved in management in Chemistry Division, becoming Group Leader for the Water, Geothermal and Geochemistry Sections, and assuming responsibility for scientific staffing.

Mr Malcolm Robins, formerly General Manager of Analytical and Technical Consultants Ltd, has become General Manager of Swift New Zealand, a division of Burns, Philp (New Zealand) Ltd.

DSIR DIRECTOR-GENERAL

Dr A.J. Ellis has been appointed Director-General of the Department of Scientific and Industrial Research.



Dr Ellis

Dr Ellis was educated at Southland Boys High School and Otago University, graduating with 1st Class Hons in 1953, and PhD in 1958. Dr Ellis commenced his career in the DSIR as a Technical Trainee in 1948, and in 1951 was appointed a Chemist at Chemistry Division in the Food, Paints and Analytical Section.

In 1958 Dr Ellis was appointed head of the Geothermal Chemistry Section at

Chemistry Division, and in 1971 became Director of Chemistry Division, a position he held until 1979 when he was appointed Assistant Director General of the DSIR. During 1984 Dr Ellis was acting Director General until his appointment was confirmed.

Dr Ellis has published about 100 scientific papers, one book and contributed several chapters in scientific texts. He is also on the editorial panel of three international scientific journals. While he was at Chemistry Division Dr Ellis was awarded the Research Medal of the NZ Association of Scientists, in 1961; the ICI medal in 1962, the same year he became a Fellow of the NZIC; a Nuffield travelling Fellowship during 1963-64; was elected J.C. young man of the year in 1968, and Fellow of the Royal Society of NZ in 1969.

Dr Ellis has been active in the NZ Institute of Chemistry serving as Wellington Branch Chairman during the 1960's, and Chairman of the Conference Committee in 1972. Dr Ellis was President of the Institute of Chemistry during the Jubilee year.

AUSTRALASIAN CORROSION ASSOCIATION INC CORROSION MEDAL 1984



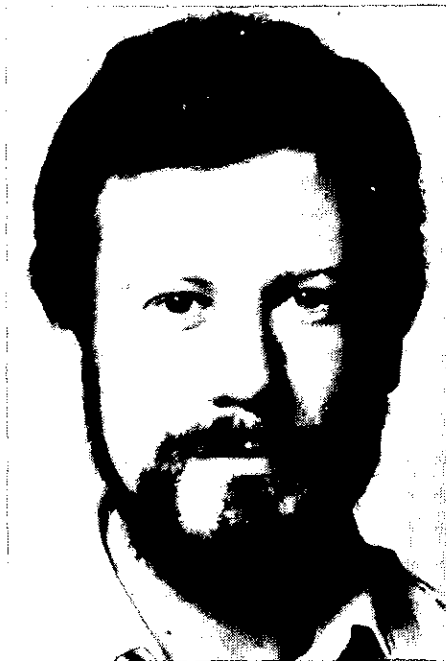
Assoc. Professor Graham Wright about to receive the Corrosion medal from Assoc. Professor Greig Wallwork (Sydney).

The prestigious "Corrosion Medal", awarded annually for outstanding work in the field of corrosion science and engineering throughout Australasia, has been presented to **Associate-Professor Graham A. Wright** for 1984. Graham, who is well known to NZIC members as a Past-President of the Institute, is Dean of Science at the University of Auckland. He received the Medal at the Annual Dinner of the Association, held at the Aorangi Peak

Restaurant in Rotorua, during the 24th Annual Conference of the ACA. Earlier on the same day, Graham had presented the "P F Thompson Memorial Lecture" on a subject he entitled, "Reactivity and Passivity of Metal Surfaces". This lecture is to commemorate the work of Percival F. Thompson (1884-1951) who is generally regarded as the founding father of corrosion science and technology in Australia and New Zealand. Graham now joins only three other New Zealanders who have received this award since the ACA was founded in 1959.

EASTERFIELD MEDAL

The Institute's Easterfield Medal has been awarded to **Dr. Tom Brittain**, Senior Lecturer in the Department of Biochemistry of the University of Auckland.



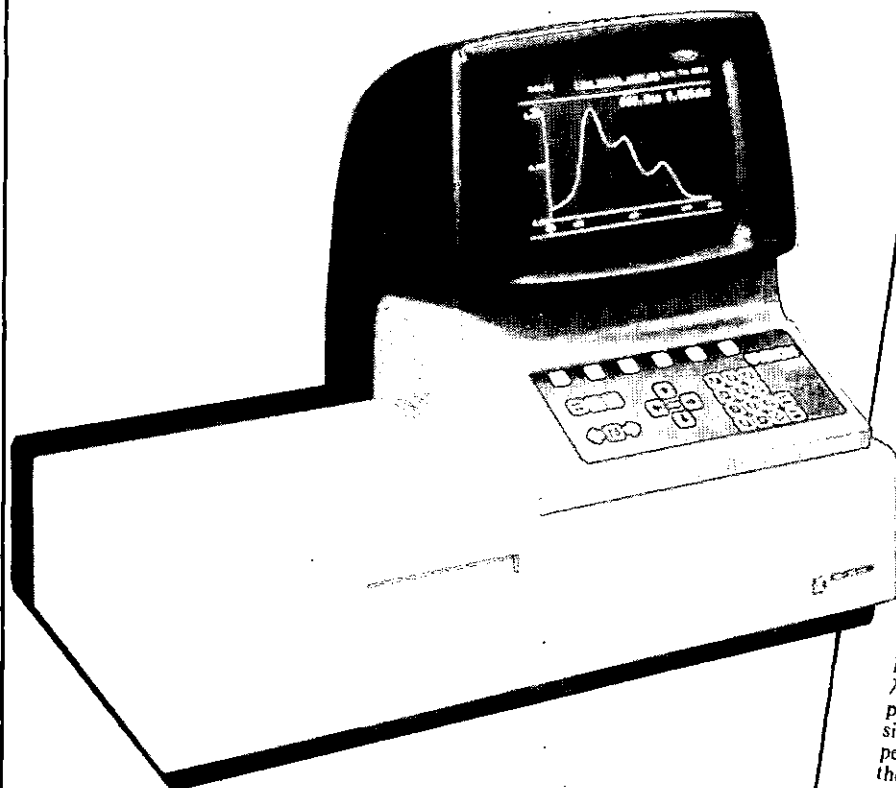
Dr Brittain

Dr. Brittain was born in Birmingham in the U.K. in 1951, and graduated with Honours in Chemistry from the University of East Anglia in 1972. He returned to U.E.A. as a post-graduate student, working on chemically-modified cytochrome C with Dr. Colin Greenwood in the Department of Biochemistry. After gaining his Ph.D. in 1975, he continued at U.E.A. as a post-doctoral fellow, working on the relationship between structure and function in cytochrome oxidase.

Dr. Brittain was appointed to a lectureship in Biochemistry in Auckland in 1977. His main field of research has continued to be the physical biochemistry of haem proteins, but now also includes the haemoglobins. In particular, he is studying the development and properties of mouse embryonic haemoglobins, a research topic of considerable medical relevance. He continues to have particular interests in magnetic circular dichroism spectroscopy, and in kinetic studies using stopped-flow spectroscopy and flash photolysis.

Tom Brittain may be better known to readers and contributors to "Chemistry in New Zealand" as the "biochemical" member of the editorial board. He is married to Dr. Judy Brittain, herself an accomplished chemist and a tutor in the Department of Chemistry in Auckland. He has also recently been awarded a Prince and Princess of Wales Travel Fellowship, for a study leave visit to the U.K., by the Royal Society of New Zealand.

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- After the world-wide success of Kontron Uvikon 810/820 Spectrophotometers the engineering development team at Zurich have now produced the Kontron Uvikon 860 Spectrophotometer which was introduced in Europe earlier this year.
- Rather than list all specifications we would urge those interested in spectrophotometers to read the following press release.

PRESS RELEASE

The KONTRON UVIKON 860 was launched at the Analytica exhibition in April under the heading "UVIKON 860 — the end of the compromise!" this claim based upon the unique combination of intelligent electronics and proven optics.

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In addition to the normal measurement modes, λ Fix and λ scan, the UVIKON 860 has special programs for enzyme kinetics, endpoint analysis and absorbance vs time. Also, by using an internal computer the operator has access to and can easily write programs to suit his own application.

All the spectral data is put into the large curve memory which means that decisions about how to handle it can be made after the measurement. Curve expansion, multi curve overlay, curve addition and subtraction, peak determination, derivatization, and area calculation can all be carried out on the stored data. High quality hard copy of the results is provided by the P800 Printer/Plotter.

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"Protein Sciences at Massey University"

(From the Presidential Address to the NZ Institute of Chemistry at Victoria University, Wellington on August 29th, 1984).

by Professor R.D. Batt

Professor R.D. Batt MBE is immediate Past President of the New Zealand Institute of Chemistry. At Massey University he is Professor of Biochemistry and heads the Department of Chemistry, Biochemistry and Biophysics. Professor Batt was instrumental in establishing the NZ Biochemical Society and held the position of Chairman at the same time as his presidency of the NZIC. His research interest in the relationship between alcohol intake and blood alcohol levels is reflected in his article "The Gizmo" published in Chemistry in New Zealand 48, 33-34 (1984).



When the Faculty of Science was established at Massey University in 1964, the Council of the University agreed that science programmes

"should not necessarily develop along the lines of other New Zealand universities. In fact, it would be preferable to specialise in aspects of science training which are inadequately covered elsewhere".

From discussions at that time, the need was recognised for the introduction of science courses with special emphasis on macromolecules and particularly proteins. Over 90% of New Zealand's overseas earnings are derived from biological macromolecules and over 50% of these earnings come from proteins. The output from New Zealand universities of people trained in protein chemistry was negligible although it had been recognised that extensive diversification of industries based on biological materials in the country could require a large number of scientists with special skills in protein fields.

It was decided that the Massey Department of Chemistry and Biochemistry (subsequently enlarged to include a physics group with interests in biophysics) should specialise in undergraduate and graduate courses which placed particular emphasis on proteins. To provide such courses, it was clear that academic chemists, biochemists and biophysicists would be required to work closely together and that a modern comprehensive range of equipment for protein research should be available.

Now, 20 years later, protein chemistry is a major area of teaching and research in the University. In the expanded Department of Chemistry, Biochemistry and Biophysics, of the total academic staff of 39, over half have protein research interests.

An important step in developing protein work at Massey University was the development of facilities for the isolation and purification of proteins on a scale which would ensure that

the availability of purified material would not be a limited factor in carrying out research programmes.

With the establishment of a protein isolation and purification unit attention was given to the development of new technology for the separation of proteins from complex mixtures. It was claimed that if new fine protein industries were to be established in New Zealand it would be an advantage if the separation technology used was New Zealand in origin and hopefully a marked improvement on existing procedures.

Proteins can be separated from complex mixtures from plant and animal sources by a variety of techniques and of these probably the most important and widely used would be those based on ion exchangers. The Massey group already had access to the viscose-based Grant resins through an association with Tasman Vaccine Laboratories and it was logical to consider that viscose-based ion-exchange resins might be a source of the improved separation technology on which the Protein Unit could operate.

The Grant viscose resins had some important properties. The resins were chemically stable, they could be repeatedly regenerated and, most important of all, they gave very high flow rates for effluents when used in packed columns.

In July 1969, world-wide patent rights were obtained for the production and some uses of the DEAE- and CM-Grant resins. An early industrial application of the Grant resins was in vaccine purification in the TVL production plant and later they were adopted by the NZ Rennet Co. for purification of rennin. The application of the resins for rennin purification was a spectacular demonstration of the value of viscose-based resins in protein purifications.

At that time not all applications for the resins looked promising although it was clear that the modification of the viscose properties and group addition reactions held the potential for

tailor-making resins to meet individual protein separation requirements.

In 1972, a research programme was introduced to explore fully this potential of the viscose resins, keeping in mind the need to retain the highly desirable properties of high flow rate and stability for repeated regenerations. The work on the resins has continued through the intervening years.

Typical of the improvements to the resins which have come from this research have been ten-fold and greater increases in the capacities of the resins and the means to select high as well as low molecular weight molecules. As the chemistry for working with these resins has unfolded, a firmly established conviction concerning their value in protein research and for fine protein industrial developments has formed the basis for expanding the viscose resin research programmes.

Designing viscose resins for particular separation requirements is now the main thrust of the viscose resin work and separation science has become a major feature of the Massey protein research activities.

New resins continue to be made by the Massey group and through the involvement of the Development Finance Corporation some of these have been patented worldwide for both production and applications.

The industrial potential for this new approach to protein separation technology is clear. As examples, there are the original proposed uses for the Grant resins in removing proteins from industrial effluents and also the processing of animal organs to produce high value purified proteins such as insulin and enzymes.

Functional protein including whey protein is a major commodity on international markets and its annual total value for 1980 was about \$800,000,000. To give some perspective to this figure, the total value for all exports from New Zealand in 1980 was approximately \$5,000,000,000. New Zealand produces a small percentage of this world requirement using mainly ultrafiltration — a technique requiring a very high capital investment for plant and equipment.

It was thought that the viscose resins might be suitable for separating the protein from whey because of their inherent properties of high flow rate and stability during regeneration. No facilities could be obtained in New Zealand to test the viscose resins but fortunately a Welsh company was prepared to adapt its plant to scale-up this new isolation technique.

From tests on original Grant-type resins, the specifications for better resins could be defined as the new SP-viscose resin was developed by the Massey group.

The Welsh company has now built a large plant in Ireland to handle 250,000 l of whey per day. The resin to charge the Irish plant was produced by Phoenix Chemicals Ltd. in Nelson. A second plant is now being built in the U.S.A.

An account of the protein work in the Department was published in "Food Technology in New Zealand" in May, 1983. It was noted then that the work

"could have far-reaching commercial significance but so far New Zealand industry has been slow to accept the challenge of taking the findings from the laboratory to commercial application. While the country seems unprepared to accept greater scientific input into diversified industries, there is growing overseas interest in utilising the technology coming from the protein separation developments at Massey University".

Attempts to go out from the University protein teaching and research programmes to promote the development and expansion of science-based industries have identified some of the problems which will need to be resolved if the original proposals for fine-protein industries in New Zealand are to be implemented.

Undoubtedly the main problem is the tax situation for research and development (R & D) activities in New Zealand at the present time. It had been hoped that the 1984 budget of the National Government would have presented a realistic assessment of the R & D problem with appropriate incentives for New Zealand companies to move towards science-based industrial developments. The most discussed incentive was the introduction of tax deductions for expenditures on research and

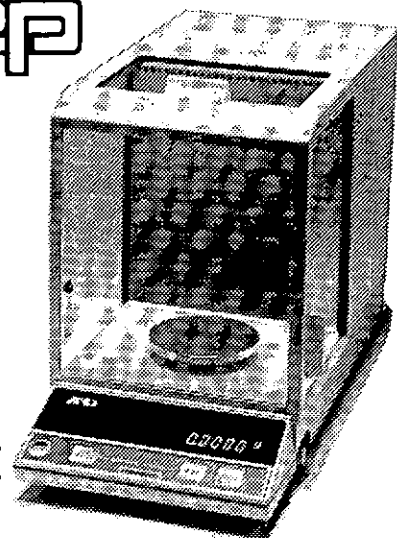
development work. In Australia, it seems that R & D costs will qualify as tax deductible at a level of 150%. The attitude of the new Labour Government towards incentives for companies to spend money on research and development activities is not yet clear but there are certainly indications that support will be forthcoming for moves to add value to primary products. Adding value to products will, in many instances, involve inputs from scientists with commitments of industrial finance for R & D work.

Despite the absence of significant moves by New Zealand industries and investors into science-based developments, there is a great deal of discussion and interest in so-called high technology. While there are problems for direct industrial moves into high technology, the situation for New Zealand is not completely dormant. It has been fortunate that the Development Finance Corporation has been empowered and prepared to promote R & D activities in applied technology without commitment. Much of the protein work at Massey University, is, in fact, funded by the DFC. The patents which have been taken out were all arranged by the DFC and the negotiations for licences in protein technology, some to overseas companies, have all been handled by the DFC. The development of technology for licensing on a world-wide basis is financially attractive and has been clearly successful.

It could be claimed that there is no need for immediate action in promoting science-based industries here, if high technology can earn overseas funds through licensing agreements. The missing benefits in operating mainly through licensing overseas, are the employment opportunities for scientists and others who would be required for science-based industries set up in New Zealand. An original aim in the Massey developments was to generate positions in New Zealand industry for the special type of graduate produced at the University. To meet this aim, the University will continue to encourage in any way it can, the investment of capital in New Zealand industries which are adding value to products — and, in particular, proteins.

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The Use of Magnesium Porphyrins in Modelling Chlorophyll

Ong Chin Choon and G.A. Rodley
Department of Chemistry, University of Canterbury, Christchurch



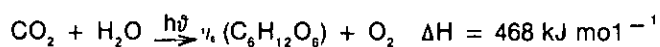
Dr Ong graduated Ph.D. in Chemistry from the University of Canterbury in 1984. He is now an executive officer with the Singapore branch of the American disc drive manufacturing firm, Seagate. Dr Ong was the most recent in a succession of students from Malaysia who have made significant contributions to research in Chemistry at Canterbury, at the Ph.D. level, over the past decade.



Dr Rodley gained his Ph.D. at University College, London, in 1963 in the area of transition metal chemistry. Since then he has been on the staff of the Chemistry Department at the University of Canterbury. His current research interests are in the areas of Bioinorganic Chemistry and Origin of Life Chemistry.

There has been an increasing need for new sources of energy especially since the energy crisis in the early 1970's. The potential, large-scale energy sources considered suitable for the future are nuclear, solar, wind, waves, geothermal and tides.¹ Recent studies have suggested that the most feasible source of energy for the future is solar energy and several experiments have been performed to trap this energy.² Solar heating devices, photogalvanic cells and solar biomass are some of the direct methods for collecting this energy. However, storage of this energy can be a major problem if steady energy is required.

In nature, the most common and inexpensive process for collecting and storing solar energy efficiently, is the photosynthetic one. The overall photosynthetic process can be represented as

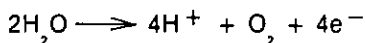


where $\text{C}_6\text{H}_{12}\text{O}_6$ is a monomeric unit of carbohydrate. The scale on which this process proceeds on Earth is vast, and the quantity of carbon converted to carbohydrate is 2×10^{11} tonnes per annum, which is equivalent to ten times mankind's energy consumption.²

Natural photosynthetic systems

In the plant kingdom, photosynthesis requires the interaction of two kinds of photosystems called photosystem I and II, to overcome an electrochemical gradient of 1.23 V for the oxidation of water³ (Figure 1). The bulk of the pigments in these two photosystems are the antenna chlorophyll entities which harvest light. Only about 1% of the total pigments are the photoreactive chlorophyll molecules which constitute the reaction centre.

Light energy absorbed by antenna chlorophyll in photosystem II, is transferred very rapidly to the reaction centre, P_{680} , which absorbs at 680 nm. This energy creates a very strong oxidant P_{680}^+ , and a weak reductant called Q^- . The electronically excited Q^- then reduces a molecule of plastoquinone and the electron is transferred through a series of pigments (including cytochromes b, cytochromes f and plastocyanin) until it reaches P_{700}^+ in photosystem I to regenerate P_{700} . P_{680}^+ can extract an electron from an unknown donor, Z, to regenerate P_{680} and produce Z^+ . Z^+ then extracts an electron from a manganese compound, M. The accumulation of four positive charges on M can then oxidise water to oxygen molecules and the overall reaction is



Similarly in photosystem I, the energy trapped by the antenna chlorophyll is used to excite the reaction centre, P_{700} , which absorbs at 700 nm. This excitation results in a weak oxidant, P_{700}^+ and a strong reductant. The excited electron at P_{700} is captured by "bound" ferredoxin (an iron-sulphur protein) which then reduces "free" ferredoxin. The reduced ferredoxin can react with either (1) NADP^+ and H^+ to give NADPH in the presence of ferredoxin NADP reductase, or (2) cytochrome b_6 , and the electron then flows back to P_{700}^+ through cytochrome f and plastocyanin to generate ATP .

ATP is also produced during the flow of electrons through the two photosystems. By utilising ATP (an energy carrier) and NADPH (a reducing agent), carbon dioxide can be reduced to yield carbohydrates in the Calvin cycle.

Although an understanding of these chemical processes has led to the development of several artificial photosynthetic systems the arrangement and environment of chlorophyll molecules *in vivo* are still not well understood. Direct studies of chlorophyll molecules are difficult because of their complex nature. Consequently, model studies of *in vivo* chlorophyll molecules are essential.

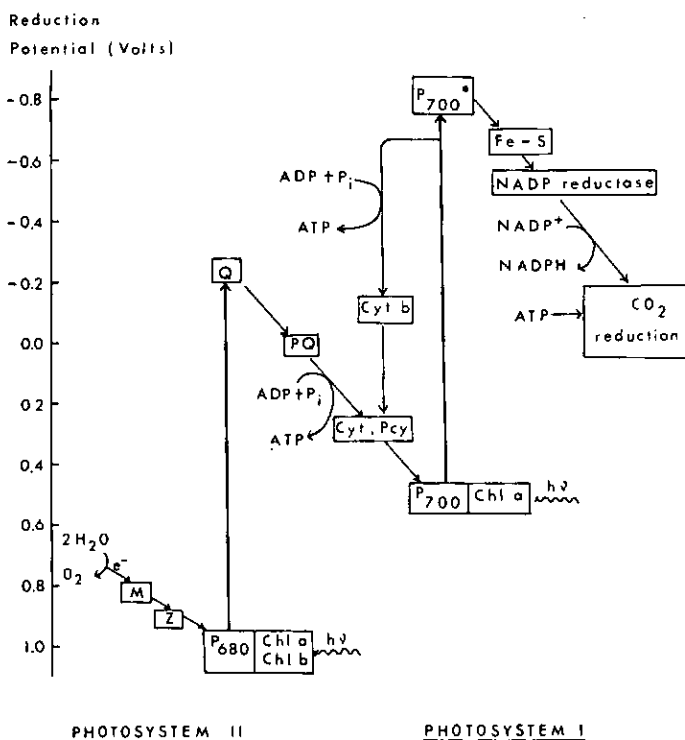


Figure 1 Photosynthetic electron transfer scheme.

Key features of chlorophyll

For a successful model of chlorophyll molecules *in vivo*, an understanding of the key features in this system is essential. In plants, the chlorophyll molecules absorb light between 680 nm and 700 nm. However, in polar solvents, the absorption maximum of the chlorophyll molecules is blue-shifted to 662-665 nm.⁴ Thus, there is a significant shift between the electronic spectra of chlorophyll molecules *in vivo* and *in vitro*. Similarly, bacteriochlorophyll *in vivo* has an absorption maximum at 865 nm but in diethyl ether this is blue-shifted to an even greater extent, to 770 nm. These differences are likely to be due to the different environments of chlorophyll molecules *in vivo* and *in vitro*. An insight into the molecular organisation of chlorophyll *in vivo* is therefore crucial for a thorough understanding of the way in which light energy is transferred among the light-harvesting components and photoinduced charge separation occurs in the reaction centre.

Various mechanisms have been suggested to account for the nature of the chlorophyll molecules *in vivo* which purport to explain the red-shifts of the absorption maxima. The two main mechanisms that have been proposed are:

(1) Interaction between chlorophyll molecules and protein residues

The most direct evidence for this mechanism is related to X-ray crystal structure analyses of the bacteriochlorophyll-protein complex from *Prosthecochloris aestuarii*.⁵ These studies show seven bacteriochlorophyll molecules contained within a protein matrix. Theoretical calculations based on the overall chlorophyll-chlorophyll interactions of the 7 bacteriochlorophyll molecules are unable to account for the red-shift of 770 nm to 809 nm. It was therefore concluded that the protein matrix can perturb the electronic transition of the bacteriochlorophyll either by providing a general hydrophobic environment or by specific protein-bacteriochlorophyll interaction.⁵

Reconstitution of pyrochlorophyllide with apomyoglobin produced a spectrum that was red-shifted by 9 nm in the solid state.⁶ Complementary results were obtained when chlorophyll-protein complexes from cauliflower were extracted.⁷ Separation of the chlorophyll from the protein resulted in a blue-shift of the absorption maximum of the chlorophyll to that found in organic solvents. When the chlorophyll was recombined with the apoprotein, a red-shift to the original absorption maximum was observed. Other studies like disc gel analysis and addition of mild detergents also indicate that chlorophyll molecules are closely associated with protein residues in natural systems.⁸

(2) Aggregation of chlorophyll molecules into dimers and oligomers

In vitro studies of model systems indicate that chlorophyll molecules tend to aggregate into dimers and oligomers.⁹ The absorption maxima of these complexes are similar to those observed for chlorophyll molecules *in vivo*. Theoretical calculations for such a complex, ethyl chlorophyllide $\cdot 2\text{H}_2\text{O}$ where the chlorophyll molecules are parallel and close together, indicate that chlorophyll-chlorophyll interactions can red-shift the electronic spectrum by as much as 30 nm¹⁰.

In oligomeric chlorophyll species, both five- and six-coordinated Mg are present.⁹ Equilibrium studies show that the absorption maxima of six-coordinated chlorophyll species are red-shifted.¹¹ Consequently, it is possible that the red-shift for chlorophyll *in vivo* is at least in part due to Mg being six-coordinated.

The question as to whether protein or ligand interactions with monomeric entities, or aggregation of chlorophyll units with each other, is the dominant factor producing the *in vivo* red shifts has not yet been settled. However recent X-ray results⁵ and physical studies^{12,13} indicate that monomeric chlorophyll species play an important role in photosynthesis. Consequently, it is assumed here that monomeric chlorophyll molecules are the dominant species in *in vivo* system.

Model compounds of chlorophyll in vivo

Porphyrins have been commonly used as model compounds for the chlorophyll molecule because chlorophyll and heme compounds share a common biosynthetic pathway (Figure 2). The last common member in this pathway is protoporphyrin. Insertion of iron leads to the prosthetic groups of cytochromes, myoglobin, hemoglobin and the heme enzymes, while insertion of Mg leads to the porphyrin ring being used for chlorophyll formation.¹⁴ Consequently, Mg porphyrin can be considered to be a suitable model for the chlorophyll molecule (and possibly an evolutionary precursor of it).

Most natural chlorophyll containing proteins are hydrophobic¹⁵ and globular in shape.¹⁶ X-ray studies on such a bacteriochlorophyll-protein from the green bacterium, *Prosthechloris aestuarii*, show that most of the bacteriochlorophyll molecules are coordinated to histidine groups.⁵ Consequently apomyoglobin and apohemoglobin have been considered to be useful protein models because

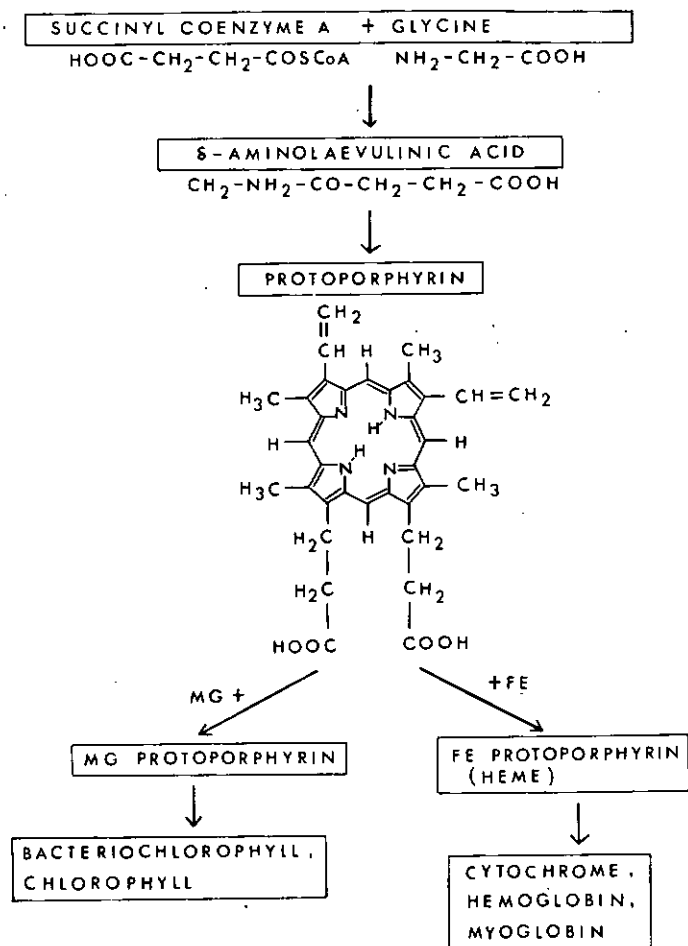
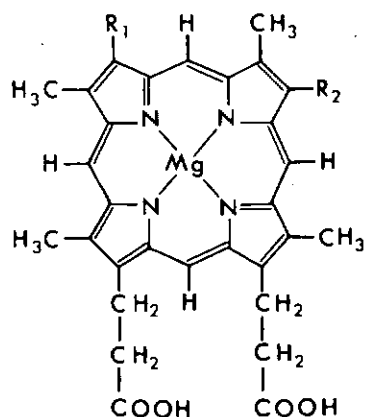


Figure 2 Common biosynthetic pathway between heme and chlorophyll compounds.

of their similar chemical properties to those of chlorophyll-containing proteins and the favourable positioning of an imidazole group for the same kind of coordination to Mg.¹³ Furthermore, a wide range of spectral and structural information is available for apomyoglobin and apohemoglobin, which can be of value in elucidating the influence of the protein environment on the spectral properties of chlorophyll molecules *in vivo*.



Compound	R ₁	R ₂
Mg Protoporphyrin	CH=CH ₂	CH=CH ₂
Mg Mesoporphyrin	CH ₂ -CH ₃	CH ₂ -CH ₃
Mg Deuteroporphyrin	H	H

Figure 3 Structure and Nomenclature for Mg porphyrins.

Magnesium porphyrin-protein complexes

Reconstitution of Mg protoporphyrin, Mg mesoporphyrin and Mg deuteroporphyrin (Figure 3) into apohemoglobin produces distinct Mg porphyrin-apohemoglobin complexes which show absorption maxima similar to those observed for corresponding Mg porphyrins in organic solvents.^{17,18} However, reconstitution of Mg porphyrins into apomyoglobin produces distinct red-shifts in the band positions for all the Mg porphyrin-apomyoglobin complexes, with respect to the corresponding Mg porphyrin in organic solvents. In the visible region, these red-shifted bands of Mg porphyrin-apomyoglobin are split into two components and in the lower energy band (commonly known as Q₀ band), the minor component appears as a shoulder (Figure 4).

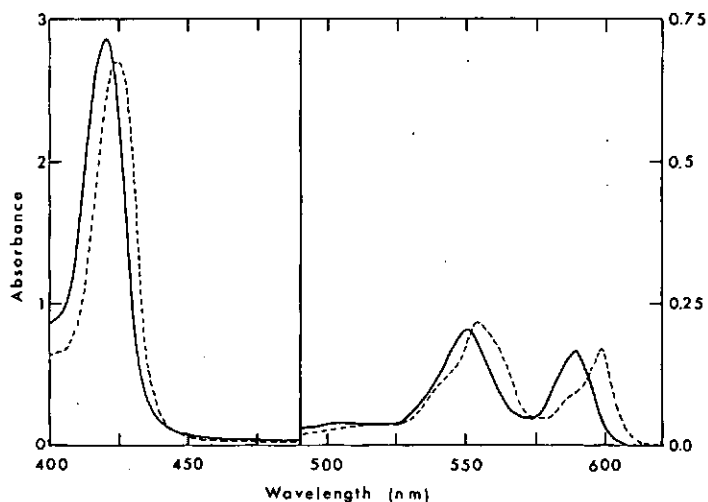


Figure 4 Electronic absorption spectra of MgPP-Hb[—] and MgPP-Mb[---] in 0.02 M phosphate buffer of pH = 7.0.

The magnitudes of the red-shift (which are measured as the differences between the positions of the major components of the Q₀ bands) for the myoglobin species with respect to the hemoglobin ones are 4, 4.5 and 9nm for MgDP, MgMP and MgPP respectively. This order is similar to but significantly greater in magnitude than that for Fe(II) analogues (the Mb and Hb oxy six co-ordinate forms) (Figure 5). These results indicate that a general additional feature enhances the red-shift for the Mg complexes, while for protoporphyrin there is some additional effect associated with the substituents of that porphyrin ring.

The general effect is likely to be related to a change in co-ordination state of Mg. Physical studies of Mg porphyrin have shown that the four-coordinated Mg centre is co-ordinatively unsaturated, and that five-co-ordination is the preferred co-ordination state.¹⁹ Thus when Mg porphyrin is introduced into the protein environment, it is expected to readily form five-co-ordinated Mg porphyrin, especially as a result of the co-ordination to a nitrogen donating residue like histidine. However, under suitable conditions, six-co-ordination can be obtained. The similarities between the electronic spectra of Mg porphyrin-apomyoglobin and nicotine-iron myoglobin²⁰ suggest that the Mg centres for all the Mg porphyrin-apomyoglobins are six-co-ordinated, while the shapes and band positions of Mg porphyrin-apohemoglobin complexes show that they are five-co-ordinated.¹⁷ The six-co-ordinated Mg centres for Mg porphyrin-apomyoglobin may arise from weak water co-ordination at the axial position. Favourable hydrogen bonding with the distal imidazole group (of the type outlined for

the bound oxygen of O₂ in β -subunit oxyhemoglobin²¹) may stabilise water co-ordination to the Mg centres.²² X-ray studies of Mg tetraphenyl-porphyrin with ligands such as 1-methylimidazole, 4-picoline and piperidine show that the Mg atoms in porphyrin systems can indeed be six-co-ordinated under suitable conditions.²³ Furthermore, equilibrium studies and observation of induced Cotton effects indicate that these six-co-ordinated Mg centres red-shift the electronic spectra^{19,24} in the same manner as also observed for chlorophyll molecules *in vivo*.

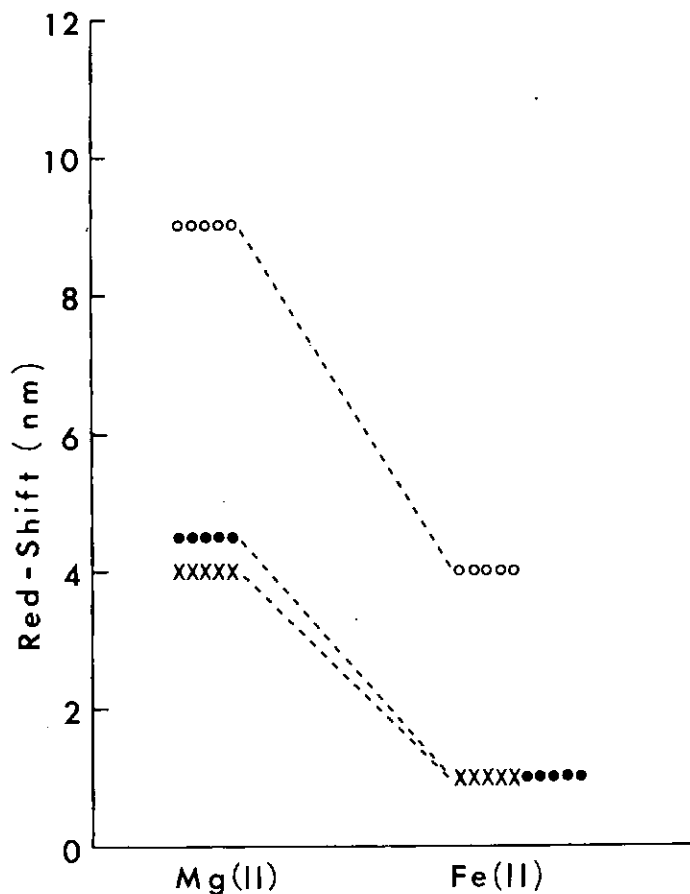


Figure 5 Comparison of red shifts for Mg(II) and Fe(II) porphyrin myoglobin species (with respect to hemoglobin analogues) for PP[ooo] MP[••••] and DP[xxxx].

The additional effect observed for Mg protoporphyrin-apomyoglobin is possibly due to different interactions between the side-chains of this Mg porphyrin and the protein environments of myoglobin and hemoglobin. X-ray studies have indicated that the side-chains of the heme are intimately involved in hydrophobic contacts with the protein^{25,26} and that the heme pocket of myoglobin is more rigid than in hemoglobin.²⁷ Consequently, the side-chains of Mg porphyrins are more likely to interact with the amino acid groups of myoglobin than those of hemoglobin. Such interactions may be associated with the larger observed red-shift for Mg protoporphyrin-apomyoglobin (compared with those for Mg deuteroporphyrin-apomyoglobin and Mg mesoporphyrin-apomyoglobin).

The magnitude of the red-shift observed for the Mg protoporphyrin apomyoglobin complex is small compared to that of the chlorophyll-protein complex, possibly because the porphyrin-protein interaction is a general effect and in the chlorophyll-protein complex this effect is amplified due to a more specific interaction. Direct X-ray studies of bacteriochlorophyll-protein *in vivo* appear to support this suggestion. They show that the oxygen atom of the cyclopentanone ring specifically interacts with the protein environment.⁵ This kind of behaviour has also been observed in other biological systems, particularly retinal

Schiff base-protein interactions in the visual pigments, rhodopsins.²⁸ In rhodopsins, the chromophore 11-cis-retinal interacts with the amino group of a lysine moiety of the protein opsin through a protonated Schiff base. This interaction has been found to red-shift the absorption maxima by as much as 140 nm.

Overall, model studies using Mg porphyrin-protein complexes indicate that the observed red shifts for *in vivo* photosynthetic systems may be associated with two particular boundary/interaction features of monomeric chlorophyll species. The magnesium centres could be six coordinate and the chlorophyll units could have specific side chain interactions with the protein environment. Although the magnitudes of the red-shifts observed for Mg porphyrin-protein complexes are small compared to those of photosynthetic systems, it is possible that during the evolution of photosynthesis, these effects became more specifically developed in the photosynthetic systems.

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Manipulations of Air and Moisture Sensitive Compounds

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1) Introduction

The advances achieved in inorganic and organometallic chemistry over the last 10 years owe much to the development of techniques for handling air and moisture sensitivity. By far the best example is perhaps shown by the increase in understanding of early transition metal chemistry¹. Previously it was quite common to read in the chemical literature that "the complex decomposed in the atmosphere so was not studied further" and for this reason extremely important and interesting chemistry was often left unstudied. For the main part, the thrust in transition metal research came from the metals to the right of the table and in particular those of group VIII, most of which formed complexes not showing sensitivity towards air. In general most researchers steered clear of involvement with air sensitivity due to the inherent handling difficulties. This is perhaps not surprising given the technology at the time. Large, somewhat intimidating, home-built glove boxes were used which were time-demanding in operation and consumed large quantities of inert gases. Even then, confidence was not high that the environment was suitably inert. (Commercial glove boxes are now available in which bare tungsten filaments will remain alight for several weeks. The systems still require large quantities of inert gases.)

Today it is simply inexcusable to pour samples exhibiting sensitivity down the sink. Most laboratories considered at the forefront of chemical research handle these compounds routinely and large overseas industrial concerns now seek people with experience in this field. For example, the continuing search for better integrated circuits relies heavily on main-group organometallics of gallium or indium, which are highly air sensitive.

While a certain sense of achievement is derived from any new compound be it organic or inorganic, the pleasure gained from complete characterisation of an air and moisture sensitive complex is certainly heightened by the realisation that a wrong move may require a restart from scratch. The work may be likened to an obstacle course with pitfalls all along the way and where the light is only seen towards the end or even at the finish. Certainly "Sods Law" is rampant, but the final result is well worth the effort. The researcher should be aware of dangers such as a fire, explosion and even implosion so that safety should always be paramount, especially the wearing of safety glasses.

The glove-box mentioned earlier is often still used for research^{2,3} but the newer techniques involving bench top

manipulations are to be preferred. Glassware to glassware techniques^{2,3} represent a considerable advance but may still restrict, as for example when a schlenck tube is used for filtering purposes, the glass sinters are prone to clogging. When construction, assembly and other factors are taken into account this method may not be the easiest nor the most practical.

In the following paragraphs are outlined methods for the preparation and handling of sensitive compounds conveniently and with speed at the bench top. The techniques are easily mastered after a certain amount of practice. It should be realised, however, that to achieve results, the researcher needs to be dedicated to a high degree of care and proficiency. As much of the final characterisation will depend on analytical data, all operations should be carried out meticulously to ensure purity. If these requirements are met, there is no reason to preclude research involving air and moisture sensitive operations.

2) The Vacuum and Nitrogen Line: Bench top manipulations are carried out using a vacuum line coupled with an inert gas line. Various designs are possible depending on requirements but the simplest apparatus for general use employs a vacuum line and inert gas manifold which may be utilised alternatively via a set of 3-way taps (see Fig. 1). Connected to the vacuum line are two traps (cooled with liquid nitrogen to protect the pump from solvent vapour) which should separate from each other and from the line to facilitate cleaning. With use the vacuum line will become progressively more coated with material as solvents and solids are sucked into it so that regular cleaning will be necessary to prevent contamination of samples. Thus the whole apparatus should be easily dismantled. It is convenient to include an attachment for a manometer or vacustat gauge at the end opposite to the traps (to prevent contamination) so an indication of the vacuum may be obtained.

The nitrogen manifold is attached to the 3-way tap system via neoprene tubing to allow easy removal. It is not necessary to provide cleaning outlets as the glassware seldom becomes contaminated. A gas vent should be provided with the outlet opening under sufficient mercury to provide a reasonable back-pressure. It is also helpful to include a tap so that the vent may be partially or completely isolated to provide a pressurised stream of gas if necessary.

Most industrial supplies of dry oxygen-free inert gases contain sufficient oxygen and moisture to render them

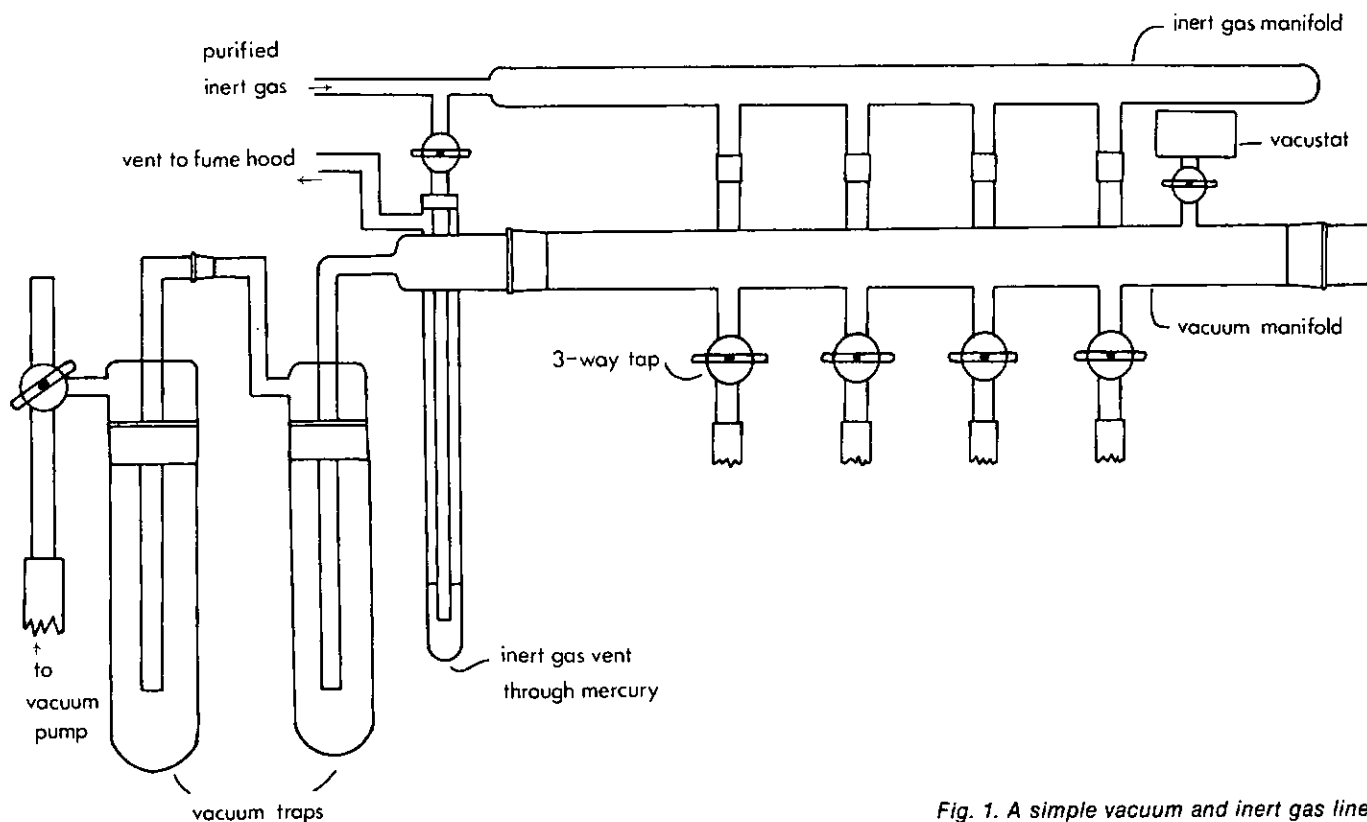


Fig. 1. A simple vacuum and inert gas line.

useless for preparations showing particular sensitivity to either. (The oxygen free nitrogen supplied by NZIG is the same as the ordinary nitrogen, the only difference being that oxygen levels may be analysed). Many inert gas purification systems have been devised, some of which are quite elaborate^{2,3}. However the air and moisture sensitive worker should be aware of the limitations. For example, the use of molecular sieves or silica gel as drying agents may actually put water back into a particularly dry gas and should thus be avoided. Perhaps the best method of purification is to pass the gas through a bulk sample of a highly air and moisture sensitive compound absorbed onto extremely dry chromatography grade silica gel. If the compound is contained in a column and changes colour on removal of the contaminant then it will be self indicating when exhausted. A simple and inexpensive preparation involves absorbing CrO_3 onto silica and heating the dried mixture to 350° under a stream of carbon monoxide. (Full preparative details are available from the author).

In operating the vacuum/inert gas line described, several points should be noted. At no time should the vacuum be left open to the atmosphere when the liquid nitrogen cooled traps are in place. Liquid oxygen collects rapidly at liquid nitrogen temperature and may well lead to an explosion if organic solvents are also present. If the coolant is removed, rapid expansion of the oxygen takes place and if sufficient venting has not been allowed for, the line is liable to explode or at least force rapid ejection of taps and joints. The vacuum pump should always be turned on and off with a vent made to the air so that pump oil does not suck back in-

to the line. The line should also be treated with care as it is very easy to break off taps or shatter the glassware.

Flasks and other apparatus are attached to the line via thick-walled rubber tubing leading from the 3-way taps. After evacuation, the flask is slowly filled with inert gas and the process repeated several times to ensure the absence of oxygen. Care should be taken not to admit the gas faster than the available flow otherwise the mercury in the vent will suck back and may end up in the flask itself. When removing a solvent, the bulk should be collected in a further trap placed between flask and vacuum line so that the traps attached to the line are used only to protect the pump. It will be necessary to replace the thick walled rubber tubing attached to the line from time to time as solids deposit inside and are easily carried back into the flask when admitting the inert gas. A point on drying glassware: after cleaning, the final wash should be made with absolute ethanol as this alcohol forms an azeotrope with water which gives a completely dry surface after oven-drying and flaming the apparatus under vacuum.

3) Bench Top Manipulations

a) Liquid Transfers

To transfer a solution from one flask to another a syringe may be used, but a more convenient method is to use a stainless steel transfer tube. Initially, the solvent is dispensed from a solvent reservoir and a serum cap added to the mouth of the flask, these operations being carried out under a strong inert gas flow. The receiving flask is attached to the vacuum line, a serum cap added and a bent transfer tube connected between the two. A vent needle is placed through the receiving flask septum and the gas supply to the flask turned off. In the other flask the transfer tube is placed below the level of liquid and with the inert gas supply turned up the contents are forced into the receiving flask (Fig 2). On no account should vacuum be applied to facilitate the transfer as this may cause air to leak through the seals made by the rubber septum. The septa should only be used while carrying out the transfer. As the seal cannot be guaranteed air will diffuse into the flask so that a greased glass stopper should always be replaced after the septum has fulfilled its task.

b) Filtrations

Perhaps the most important operation carried out by the air sensitive worker is filtering a solution either to obtain a solid or to further work up the solution. The clogging of

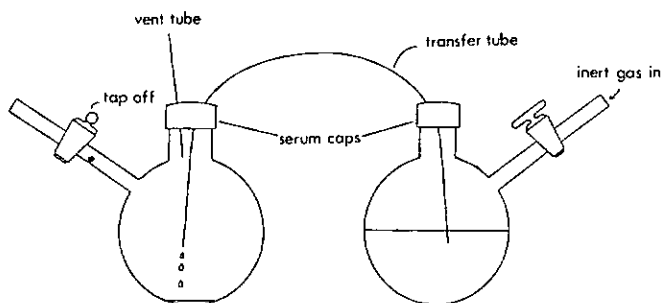


Fig. 2. Liquid transfer using stainless-steel tubes and serum caps.

Schlenckware glass sinters has been mentioned but an additional disadvantage when glassware to glassware connections are made is the vacuum grease sealant which often ends up in the solvent and can lead to a major source of sample contamination. To overcome this problem, a modification of the tube transfer is used. A filter stick is constructed by tying a filterpaper to a short length of glass tube, using stainless steel wire (Fig. 3a). A transfer tube is then attached using a small septum (Fig. 3b). A second example employs a short length of thickwalled glass onto which a transfer tube is glued and a filter paper wired onto the end (Fig. 3c). Filtersticks containing a sinter may also be used but in practice will easily clog. Although it is rare for the filterpaper to react with a water sensitive compound, to minimise the chance of this occurring, only the extremities of the filterpaper should be touched during the tie-on procedure. The paper contaminated with finger moisture is then cut away.

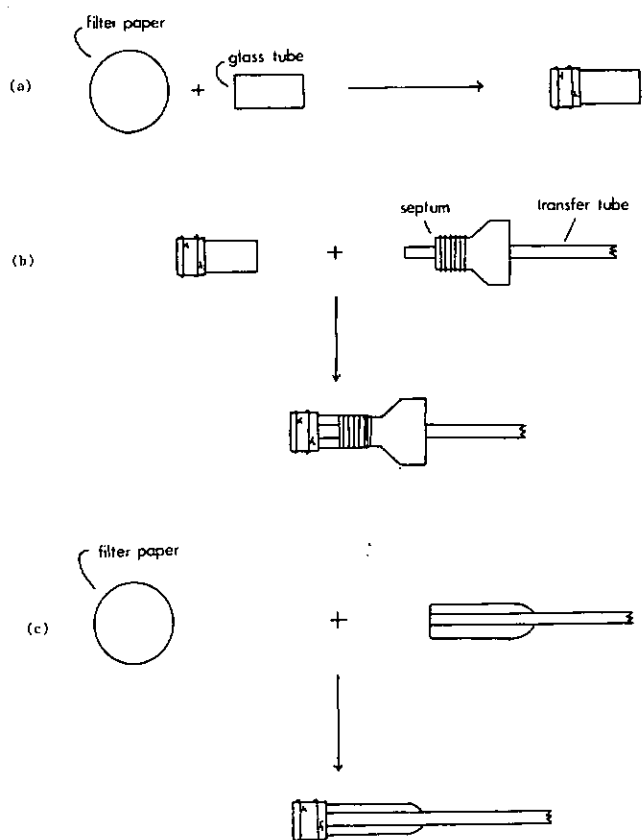


Fig. 3. Filter stick devices.

To use the filterstick, the transfer tube is passed through a septum which fits the flask mouth. After setting up as for the liquid transfer described before, the solid is allowed to sink to the bottom and the filterstick is placed into the liquid. Using a positive pressure of inert gas, the liquid will filter to the receiving flask. Depending on precipitate size and how well it settles, the filter paper may become clogged in which case the stick is removed and the filterpaper replaced. However, the filterpaper usually does not clog and the same filterstick may be used for the filtration as well as subsequent washings with solvent supplied *via* a syringe.

The filterstick and transfer tube techniques both have the advantage of being adaptable to a variety of glassware apparatus (e.g. nmr tubes, centrifuge tubes) and may even be used in large scale preparations. The greatest convenience lies in the short period of time needed to carry out successful operations. It is important to always wash the tubing out with solvent immediately after use as sample remaining inside will react with air and block the passage. In many cases the blockage may be impossible to remove, rendering the tube useless.

c) Solid Transfers

In general, solid transfers can be made under strong streams of inert gas provided the sample does not show extreme sensitivity to the air. The flasks are connected to the

vacuum line and the stoppers are removed. With the gas flow turned well up and the flask mouths held together, the transfer is made very quickly taking care that the sample does not blow away in the emerging gas streams.

Where extreme sensitivity is experienced, two transfer methods may be adopted. The first of these involves using a small glove bag in which all the items necessary to complete the transfer are contained. However unless the bag is kept in good condition with air excluded when not in use, moisture will coat the inside surface and affect samples. Perhaps the best method is to use glass connectors but a variety of different joints will be required (Fig 4). After joining, the whole system may be evacuated and refilled with inert gas before the transfer is made. Using this method, solids may be added to solvents but it is probably better to weigh the solid in a flask and then add solvent. Solids suspended in a solvent can be transferred using the stainless steel tubes already described provided the sample is ground to a suitable size. The suspension must be well swirled to ensure the tube does not clog during the transfer.

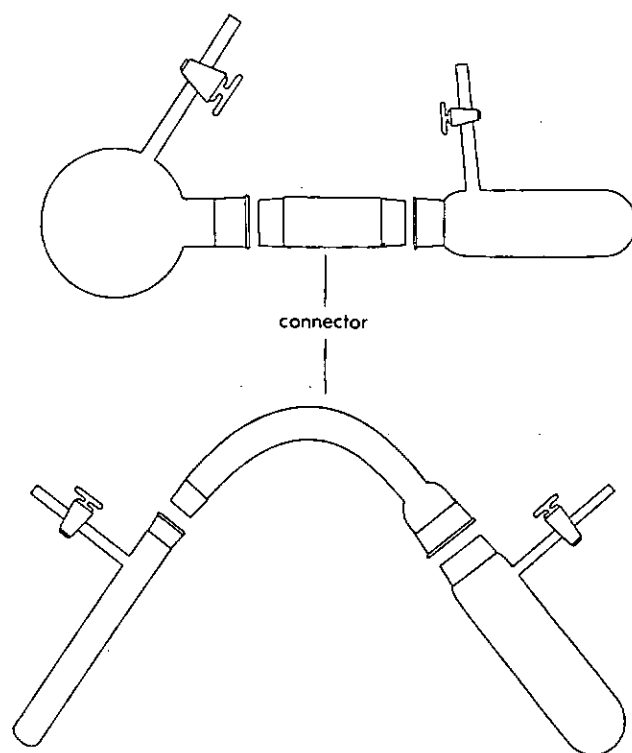


Fig. 4. Glass connectors with different joints.

d) Crystal Mounting Technique

Air sensitive crystals are usually mounted in glass capillaries and sealed off under an inert gas before mounting on a diffractometer. If air sensitivity is not great, the crystal may be mounted on a fibre in the usual manner and sprayed with polyurethane to seal it from the atmosphere but this method may still allow slow decomposition. Attempts to place crystals in a capillary using a glove-bag can be extremely frustrating mainly as vision is impaired through the plastic.

A simple method of mounting even the most air sensitive crystals uses the glass apparatus shown in Fig. 5. Argon is the preferred inert gas as it is heavier than air and provides an efficient blanket. After the crystalline material has been filtered and washed, the mounting apparatus is flushed with gas and fitted to the flask. A glass capillary is secured to the apparatus by melting piocene wax over the join at A and the sealed extremity broken to allow inert gas to flush through. When resealing, a very small flame is used with the stopper at B removed to reduce the gas pressure inside the glassware, which would otherwise cause the molten glass to blow out.

To mount the crystal in the capillary a length of stainless steel tubing is passed through the serum cap at C and the

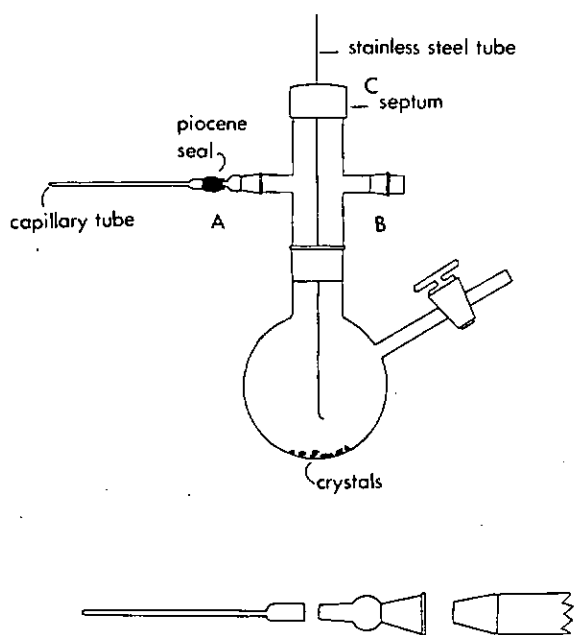


Fig. 5. Apparatus used for crystal mounting. Below is a breakdown of the capillary tube attachment.

sharpened tip, coated with silicone grease, is used to pick up the required crystal. With the tube retracted so that the tip lies between A and B, the crystal is transferred to the end of a finely drawn glass rod manipulated through B, and pushed into the capillary tube. With practice the manoeuvre is easily carried out and several crystals may be placed inside the same capillary. When sealing off, a very small flame is used once again and the gas flow vented to prevent the glass blowing out. As the seal may not be complete, a small piece of piocene wax is melted over it to prevent any air or moisture entering. The crystallinity of the samples is then checked under a microscope and if all appears well, the tube is mounted on the diffractometer.

For X-ray crystallography, the use of borosilicate capillary tubes is preferred as reflectance intensity can be lost using soda glass. However in practice it is better to use soda glass as it seals much more easily. To successfully seal borosilicate glass, an oxygen/gas flame will be needed and the heat generated often travels up the capillary decomposing the crystals and causing vacuum grease to char.

In quite a few cases it will be found that crystals will need to be mounted in a solvent atmosphere to ensure that crystallinity is not lost. The problem is often compounded with the apparatus described, where the inert gas stream blowing over the crystals can cause them to dry out. To maintain a solvent atmosphere during the mounting process a small amount of the liquid can be left in the flask bottom, out of contact with the crystals. However this method can often spell disaster if extreme care is not taken as the crystals may end up in the solvent and dissolve. A better method involves passing the inert gas through the appropriate solvent in a dreschel bottle so that the gas stream is saturated with solvent before reaching the flask. In this case it is important to realise that bringing a flame anywhere near the venting gas during sealing operations can lead to the gas stream catching fire which may blow back into the apparatus when the gas is turned off.

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COUNCIL NEWS

The Canadian Institute of Chemistry has elected Mr A.W. Mackney an Honorary Fellow during his term of office as President of the New Zealand Institute of Chemistry.

Council meetings in 1985 are planned on 7/8 February in Wellington and 25th August in Christchurch. Meetings of Standing Committee are proposed for 7th May and 5th November.

Prizes 1985. Members are reminded that entries and nominations close on 30th April with the Administrative Secretary, PO Box 29-183, Christchurch, for the ICI, Shell and Essay Prizes. Entries and nominations for the ACA-NZIC A.C. Kennett Memorial Award close 31st July, with New Zealand Branch, Australasian Corrosion Association, PO Box 5961, Wellesley Street, Auckland.

Overseas Invitations. The Organising Committee of the Asian Chemical Conference to be held in Singapore 8-11 April 1985 has extended an invitation to a representative of NZIC to participate in the Conference and to attend the 3rd Biennial General Assembly of the Federation of Asian Chemical Societies, of which NZIC is a member.

The Committee undertakes to cover the cost of local accommodation and per diem allowance for NZIC's representative Members who expect to be in Singapore at that time and who would be free to represent NZIC are asked to advise the Honorary General Secretary.

The recently formed Papua New Guinea Institute of Chemistry, 1st September 1984, is to hold its second PNG Chemical Congress at Lae 6-8 September 1985. The theme of the meeting is "Chemistry and Resources". The first issue of "Chemistry

in Papua New Guinea" was received before Christmas and the second issue is planned for March.

Recruitment. Council is concerned about the small number of students and chemists and biochemists who apply for membership of the Institute. For example the total number of student members listed in the 1983/84 report was 34 whereas a survey conducted by Branches in September 1984 showed 450 final year NZCS and B.Sc. students in Chemistry at the Technical Institute and Universities.

This is a matter for Branch initiative and action as the recruitment of new members appears to be a declining proportion of those qualifying.

The percentage of chemists and biochemists in New Zealand qualified for membership who are members of NZIC is not known. In Britain it is estimated at about 50% (see "Chemistry in Britain" September 1984, p. 793). President Cadogan in a RSC report of a working party reviewing RSC priorities for the next 5-10 years says: "Recruitment of a proportion of the practising chemists outside the RSC would not only improve our financial position but also add to the influence the Society has externally".

The RACI in its 1981 Green Paper discusses similar challenges to these facing Branches and Council.

J. Rogers
Honorary General Secretary

PAC CHEM '84
Alan Mackney reports

What can one say about a chemistry conference involving some 4000 registrants,

3000 technical papers, 75 symposia, 16 general sessions covering broad technical areas, and 3 plenary lectures? Even the choice of what session to attend from a 1 kg offering of abstracts in fine print on light-weight paper was quite a daunting task.

However, from a personal point of view attendance was worthwhile because of the opportunity to participate in the symposium dealing with management of R & D in Pacific Basin Countries. This produced an input from countries such as Korea, Taiwan, the Philippines, Malaysia, and China as well as Australia, USA, Canada, Japan and New Zealand. There is certainly a message to New Zealand in the dynamic support and encouragement by Governments in countries such as Taiwan and Korea for their emerging industries.

The conference provided a welcome opportunity for informal discussions with the Presidents of RACI and CIC and their executive officers concerning future contacts. Some discussions also took place concerning reciprocal visits with the American Chemical Society, and Doug Wright will be reporting separately on this aspect.

The overall result of the Conference must be regarded with a little scepticism if it was originally targeted to provide a basis for assistance to the industries of the emerging countries. This largely arises from the extreme complexity and range of the symposia with apparently little by way of attempts to pick out the real needs of these countries. This is not to say that no other Pac Chem would not be worthwhile in say 5 years time, but more careful and specific directions might be desirable.

Alan Mackney,
President

OBITUARY

JAMES MELVILLE, 1908-84

The death in Adelaide on October 8 of Jim Melville removes another notable figure in the history of New Zealand chemistry, even though nearly thirty years have passed since he joined the long list of the country's expatriates.

Melville was born at Lovell's Flat and educated in Milton, at Otago Boys' High School and the University of Otago. His first research (on azulene) was done under the supervision of Professor J.K.N. Inglis and he graduated M.Sc. with first class honours in 1930. After two years as a John Edmond Fellow, continuing work in the "essential oil" field, he gained a post-graduate scholarship which took him to A.C. Chibnall's laboratory at Imperial College, London. There being no biochemistry at that time available as a science course in New Zealand, Melville was one of the early New Zealand chemists to take up what was still a new discipline at the post-graduate level. His external examiner for Ph.D. was C.R. Harrington of thyroxin fame, who accepted the thesis (on peptides) as excellent and cross-examined him closely on general protein chemistry. Melville survived the ordeal, though he claimed that (in mastermind terminology) he "passed" half the questions. He was awarded a Commonwealth Fund Fellowship (now Harkness Fellowship), contemporaneously with M.M. Burns, another future N.Z.I.C. President. He took this up at



Yale and the Connecticut Experimental Station, working on proteins and plant metabolism, with Professors L.B. Mendell and H.B. Vickery.

On returning to New Zealand in 1936 he was appointed Assistant Chemist at the Wheat Research Institute, being associated there with E.W. Hullett and the geneticist who later (in Australia) became Sir Otto Frankel F.R.S. In 1938 he became

biochemist at the Plant Chemistry Laboratory, Palmerston North and in the next year Director. In 1951 the laboratory was amalgamated with the Grasslands Division, and Melville became Director of the latter.

In his years in charge of Plant Chemistry Melville laid the basis of the laboratory's current position (as the Applied Biochemistry Division of D.S.I.R.) among leaders in its fields of research. He created research groups and enabled young scientists of the quality of A.T. Johns, G.W. Butler and the late J.W. Lyttelton to obtain appropriate experience overseas before returning to contribute to the solution of New Zealand's problems. This was mainly a post-war development — Melville was on war service (1941-44) with the rank of captain. In 1956 he became director of the Waite Agricultural Research Institute from which he retired in 1973. He was a member of the Executive of C.S.I.R.O. (1958-66) and of the Council of Adelaide University. He was awarded a C.M.G. in 1969.

Melville was a foundation member of the Otago Branch of N.Z.I.C. and secretary of the Canterbury Branch (1937-38). He became a Fellow in 1943 and President in 1950. In his presidential address he claimed that "photosynthesis" is the most important chain of reactions in the world. This claim may be challenged — by astrophysicists and molecular biologists — but he made an impressive and exciting case for it.

H.N. Parton

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BRANCH NEWS

WAIKATO

Dr. Anne Dell, Department of Biochemistry, Imperial College, London, talked about "Applications of Fast Atom Bombardment Mass Spectrometry to High Molecular Weight Biopolymers" at the September branch meeting.

The October branch meeting was held at Mount Maunganui, where members from Hamilton and Rotorua visited the Pine Oil Fractionation Plant. Interesting descriptions were given of the distillation units and the laboratory where samples are analysed. Many members took the opportunity to meet socially over dinner after the meeting and guided tour.

In November, the AGM was once again held in an informal round-table format, following the success of the meeting last year in promoting active and useful discussion on a wide range of topics concerning Institute members. Refreshments of various kinds were available throughout the meeting, and the incoming committee were particularly interested in hearing suggestions for branch activities in 1985.

Prof. Roy Daniel, recently appointed to a new research chair in enzymology, took

members on a brief tour of the Thermophile Research facilities on the Waikato University campus after the AGM. Members enjoyed an inside view of this well publicised laboratory, which was specially built to study high temperature bacteria and their enzymes. This work is being supported by a New Zealand-United States development consortium that plans to establish a lucrative export industry.

MANAWATU

The Petralgas Chemicals N.Z. Ltd. methanol plant at Mamaku Road, Waitara, is a recent addition to the Taranaki energy industry. This plant started operating in late 1983 to produce 1200 tonnes of methanol per day using natural gas from the Maui field. Most of the product methanol is conveyed by pipeline to the port at New Plymouth for shipment overseas. Thus it was appropriate that the final meeting of the Branch for 1984 took the form of a visit, organised by the Taranaki section, to the methanol plant. After the manufacturing operations were described, the group was given an escorted tour around the perimeter of the plant and through the control room and laboratory. The Branch wishes to thank

Paul Kooy and Phil King of the Company for providing the visiting group of 50 chemists with an enjoyable and interesting description of the workings of the plant. The 11 participants from Palmerston North, and one from Wanganui, believe that their trip was well worth while and hope for a similar visit to the nearby synthetic petrol plant in the near future.

CANTERBURY

The Branch A.G.M. and Annual Dinner were held in the Ilam Homestead (University of Canterbury). Following the dinner, Professor C.J. Wilkins was presented with his Honorary Fellowship of the Institute and Professor Parton entertained us with anecdotes of earlier days in the University Chemistry Department.

OTAGO

Mark Milne, 7th form student at Bayfield High School, Dunedin, who won first place in the Experimental Section at the National Science Fair, has belatedly been awarded a special travel grant to enable him to be the second New Zealand representative at the San Diego Area Science Fair in the U.S.A. Mark's project was concerned with the release of Gibbs free energy as sound and kinetic energy in explosive gas reactions. The travel grant has been provided by Kiwanis International.

UNIVERSITIES, TRAINING COLLEGES & TECHNICAL INSTITUTES

AUCKLAND

J.E. Packer is going on sabbatical leave in January 1985. He will be spending some time with the Biochemistry Department at Brunel University at Uxbridge and then some time with Dr D.L.H. Williams of the Department of Chemistry, University of Durham. Finally he will be working with Professor K.D. Asmus, Bereich Strahlenchemie Hahn-Meitner-Institute für Kernforschung, Berlin. He will be arriving back shortly after Christmas 1985.

Professor R.C. Cambie has been appointed Head of the Chemistry Department at the University of Auckland until 5 October 1987.



Prof. Cambie

Professor Allan Odell has retired from the University of Auckland Chemistry Department. Allan enrolled at Auckland University College in 1938 and completed an M.Sc. under Professor L.H. Briggs in 1942.

In 1943 Allan was appointed Temporary Demonstrator. He then became Junior Lecturer (1946), Lecturer (1948), Senior Lecturer (1957) and Associate Professor in 1960. He was given a personal chair in 1970 and an established one in 1982.

When he became a Lecturer in 1948 Allan made a major contribution to the teaching of the Department particularly the stage I Inorganic and Physical Chemistry. He was also involved in the development of new laboratory courses based on structural and bonding concepts. At this stage Allan was studying para- and diamagnetism using these techniques to investigate Nickel(II) complexes and to detect free radicals.

In the period 1953-55 Allan was an Assistant Lecturer and Ph.D student at University College London working under D.R. Llewellyn and C.A. Brunton. In 1956 returned to New Zealand along with Professor Llewellyn and together they set up the first radiochemical teaching laboratory in the Choral Hall. The Urey Radiochemistry Laboratory in the present Chemistry Department building was opened in 1969. It is in the area of radiochemistry that most members of the Institute who studied at Auckland will have been taught by Allan.

Allan's present research interest is the use of tritium tracing techniques in a wide variety of biological and industrial applications. The most important of these at present is the study of the reaction mechanisms involving the Mobil catalyst ZSM-5.

Allan has always been widely involved in the University and the Chemistry Profession. He has been a member of the Universi-



Prof. Odell

ty and A.T.I. councils and on AAVA since 1958. He was Auckland Branch Chairman on three occasions, surely a unique record in the history of the NZIC!

In recognition of the service Allan has rendered to the University and to Chemistry the University of Auckland Council has appointed him Professor Emeritus.

WAIKATO

This month marks the retirement of Dr. D.R. Llewellyn as Vice-Chancellor of the University of Waikato. Dr. Llewellyn came to the fledgling foundation as its first Vice-Chancellor in 1964 from Auckland, where he was Professor and Head of Chemistry. He

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UNIVERSITIES, TRAINING COLLEGES, & TECHNICAL INSTITUTES

(Continued from Page 17)

has presided over Waikato's establishment and growth, to an active and exciting University of over three thousand students. A full appreciation of his contribution to the University and to Chemistry will appear in a future issue.

Mr. Geoff Mills, who is currently working with the DSIR Water Laboratory in Christchurch, has been offered an appointment as a Junior Lecturer starting in 1985. **Dr. H.R. Khan** has accepted a U.G.C. Postdoctoral Fellowship to start in 1985 and **Ms. Valdar Kirkwood** will take up a Teaching Fellowship in January 1985.

We congratulate **Alan Whitton** on his award of a Commonwealth Trust Prince of Wales Postgraduate Scholarship to Cambridge where he will work with **Dr. Brian Johnson** and **Professor Lewis. Christopher Adams** and **Alison Cuthbertson**, of the Chemistry Department, together with **Mark Patchett** (Biochemistry) are to be congratulated on gaining U.G.C. Postgraduate Scholarships. In addition, **Tony Sims** has taken up an N.Z.E.R.D.C. studentship, and **Richard Ede** a studentship from F.R.I., to work for their D.Phil.

Dr. Philip Watkinson has completed his Fellowship and is joining the Building Research Institute, Wellington.

HAMILTON TEACHERS COLLEGE

Mark Cosgrove, Principal Lecturer in Science, recently presented two papers at a conference on Science Education in Ludwigsburg, FR Germany.

MASSEY UNIVERSITY

Dr. Sylvia Rumball of the Chemistry Department recently spent three weeks in the U.S.A. where she attended a Workshop on Methods on Human Lactation at Winter Park, Colorado and a Symposium on Human Milk at the A.C.S. Conference in Philadelphia. **Dr. Rumball** also visited Lactation Clinics in California.

Dr. John Ayers has been granted eight months leave from the University to allow him to continue his research in the development of new ion exchange cellulose resins. Funds for this work have been provided by the Development Finance Corporation and by Waitaki N.Z. Refrigerating.

VICTORIA

Professor J. Millar, from the University of Sao Paulo in Brazil recently visited the Organic Section at the Chemistry Department.

Professor R.J. Ferrier has returned from research leave at Heriot-Watt University. On his way home he attended a Pan Pacific Congress in Honolulu.

Mr. P. Osvath recently completed his PhD studies and has left New Zealand to take up a Post Doctoral position at the University of Notre Dame.

Recent visitors to the Chemistry Department have included **Professor W.R. Smith**, from the University of Guelph who gave a seminar on 'Statistical Mechanics of Molecular Fluids', and **Dr. D. McDonald**, from the Stamford Research Institute who gave a seminar on 'Problems of Corrosion in the Nuclear Energy industry'.

CENTRAL INSTITUTE OF TECHNOLOGY

Dr. B.J. Wilkins of the School of Pharmacy has returned from study leave at the University of Sydney where he examined the mode of action of nitroimidazoles.

Mr. G.R. Scott of the School of Pharmacy recently spent six weeks in Melbourne and Sydney studying the pharmaceutical industry.

CHRISTCHURCH POLYTECHNIC

Dr. Mel Bradshaw has returned to the U.K. after spending a one year exchange with Christchurch Polytechnic teaching Biochemistry and Biology.

CANTERBURY

Professor J. Vaughan has advised that he intends to retire from the Chemistry Department at the end of May 1985.

Dr. Kip Powell has been appointed to the Council of the New Zealand Society of Soil Science.

Dr. J.P. Matousek from the Department of Analytical Chemistry, University of New South Wales, will be on leave in the Chemistry Department from 17 February for 9 months.

OTAGO

From the beginning of 1985, the Department of Pharmacy ends its association with the Faculty of Science when it will be transferred to the Faculty of Medicine. The Pharmacy Department will open its doors in the Adams Building of the Medical School on 15th February, 1985.

In the Nutrition Department, **Prof. Marion Robinson** has become Chairman for two years following Professor Birkbeck's transfer to a part time position. Also, **Dr. Kazuo Suzuki**, from the National Institute of Environmental Studies in Japan, visited the Trace Element Group recently. The main topic of discussion during his visit was the effects of cadmium on human health.

Visitors to the Chemistry Department have included **Prof. David Natusch** from the Liquid Fuels Trust Board. He also visited Otago University's Science and Resource Centre. **Dr. Ian Shearer** came to talk to staff in the Chemistry and Biochemistry Departments in the course of a search for ideas which may lead ultimately to commercial development. **Dr. Graeme Searle**, from the University of Adelaide, will spend the first term working with **Prof. D.A. Buckingham**.

Also from the Chemistry Department, **Assoc. Prof. M.R. Grimmitt** will spend a sabbatical year writing and researching at Exeter University in England, and **Brian Robinson** and **Jim Simpson** have now been promoted to the ranks of Professor and Associate Professor respectively.

Dr. Ian Weatherall (Textiles Dept.) was Convenor/Secretary for the Annual Conference of the N.Z. Section of the Textiles Institute held in Dunedin in November. The conference was concerned primarily with the use of computers for automation and control in the textile industry. Several overseas speakers attended. **Dr. Peter Barber**, also of the Textiles Department, was also on the organising committee and chaired one of the sessions.

Dr. Paula Jameson will attend the Biennial Tissue Culture Conference at Massey University in February.

From the Pharmacology Department, **Emeritus Professor Fred Fastier**, who retired in 1980, has just completed a B.A.

degree in Philosophy, his particular interest being in the Philosophy of Science. He has suggested that Arts Professors in their retirement ought to follow his example and take a B.Sc. if they aspire to being educated. **Prof. R. Lavery** has received a 2 year grant from the Neurological Foundation to set up a liquid chromatography unit with electrochemical detection for the study of amines and their metabolites in the brain. **Assoc. Prof. Gary Blackman** has received a project grant for 3 years from the M.R.C. for studies on an animal model of asthma in which the respiratory tract is abnormally sensitive to bronchoconstrictor substances.

In October, **Assoc. Prof. I.R. Edwards** attended the 7th Annual Meeting of representatives of national centres participating in the W.H.O. Interactive Drug Monitoring Programme held in Bethesda, U.S.A. **Dr. Edwards** reported on the use of adverse drug reaction data for genetic polymorphism studies on the Intensive Medicine Monitoring Programme, and in particular on a new computer-based scheme in clinical information on serious adverse drug reactions, coupled with patient details, so that each time a patient is admitted to a hospital, warning of possible adverse drug reactions may be given. This N.Z. scheme appears to be unique.

Dr. Richard Mason of the M.R.C. Toxicology Unit, associated with the Department of Pharmacology, attended a meeting of the Australasian Society of Clinical and Experimental Pharmacologists in Melbourne in December, and contributed a paper to a symposium on toxicology training in Australasia.

A number of pilgrims have made their way to the Biochemistry Department during 1984 where **Prof. George Petersen** and his followers have been initiating them into the practical aspects of cloning, DNA sequencing and the computer analysis of sequence data. The pilgrims have included **Mark Anderson**, **Roger Booth** and **Ross Prestige** from Auckland, **Clive Ronson**, **William Lang**, **Betty Terzaghi**, **Barry Scott** and **Brian Shaw** from Palmerston North, **Bill Stewart** from Dundee and **Warren Simpson** from next door in Microbiology. The Department has enjoyed their company and has benefitted from a number of stimulating seminars.

Peter Stockwell has been seconded to the Imperial Cancer Research Fund in London for three months where he will continue his work of 1983 on the representation of biological sequences. This includes developing computer programmes which use broadly-based knowledge and can reveal unexpected relationships.

Tony Reeve is working on the molecular genetics of Wilms' tumour — in particular, the alterations which occur in the chromosome 11 region involving oncogene and growth factors. The Cancer Society funded his travel to the U.S.A. recently where he attended the Molecular Biology of Cancer Conference in Boston, and visited a number of laboratories engaged in oncogene work.

Dick Wilkins is working on the sequence specificities of the interactions between non-covalently binding drugs and DNA, and also on the mechanisms of mutation by such drugs. With **Mike Eccles** (Cancer Society of N.Z. Post-graduate Fellow), he is looking at mechanisms by which carcinogens transform cultured human fibroblasts — in particular the

(Continued on Page 19)

GOVT DEPTS & RESEARCH INSTITUTES

MAF; WALLACEVILLE ANIMAL RESEARCH CENTRE

Dr Karl Rogers, who has been working on cytochemical and morphological studies of residues found in the extra cellular matrix of atherosclerotic blood vessels at the Wellington Cancer and Medical Research Institute, has been appointed to a position at Wallaceville where he will be undertaking research into the nutritional and metabolic controls of fat and protein deposition in sheep.

MAF, RUAKURA AGRICULTURAL RESEARCH CENTRE

Dr Bert Quin, Chief Scientist (Soil Fertility), Ruakura Soil and Plant Research Station, was included in the latest batch of recipients of Prince and Princess of Wales Science Awards. Dr Quin is particularly interested in factors influencing the efficient use of phosphate fertiliser. He plans to visit organisations investigating alternative fertilizers in Australia and the U.K. and will present a paper at the British Sulphur Corporation's 1985 Fertiliser Conference. Dr Quin's grant is a Shell New Zealand Award.

Dr Pat Holland attended the 9th A&NZ Society for Mass Spectrometry Conference in Canberra, ACT, August 17-31 and presented two papers on technical and applied areas of mass spectrometry. He also visited a number of laboratories in Canberra and Sydney in order to view new instrumentation and discuss applications relevant to agriculture research.

Dr Michael Petz spoke about "Residues of Animal Remedies in Meat and Dairy Products" at a recent Ruakura Soil and Plant Research Station seminar. He is a lecturer from the Institute for Food Chemistry at the University of Munster, West Germany, and has worked under Professor H.P. Thier on the development of HPLC methods for the analysis of antibiotic residues in foods. For the last six months Dr. Petz has been Visiting Scientist at the Wallaceville Animal Research Station.

MAF, INVERMAY AGRICULTURAL RESEARCH CENTRE

Dr Peter Dratch, originally from the U.S.A., but who obtained his Ph.D. from the University of Edinburgh, has been working as an N.R.A.C. Fellow in the Animal Production Unit at Invermay. He has been concerned with aspects of the genetic makeup of Booroola sheep, using isoelectric focussing and agarose electrophoresis to identify the marker gene responsible for the high fecundity of this breed.

BUILDING RESEARCH ASSOCIATION

Dr Phillip Watkinson will be starting as a Materials Division Scientist on February 4th 1985. Dr Watkinson prior to coming to BRANZ was working on a postdoctoral fellowship in the Chemistry Department at the University of Waikato.

A three day conference with the theme of "Building Materials Durability in the Food Industry" is being organised by BRANZ. The Conference will be held in Lower Hutt from June 17 to June 19, 1985. Topics will include roof and wall claddings, and related jointing systems, ceiling and wall lining materials and related joints. Speakers will be drawn from the food industry, designers, material suppliers, Research Associations and Government Research Departments.

All initial inquiries should be directed to: Wayne Sharman or John Duncan, Building research Association of New Zealand, Private Bag, Porirua, Phone (04) 357-600.

WHEAT RESEARCH INSTITUTE

Dr Klaus Lorenz from Colorado State University has been offered a Senior National Research Fellowship at Wheat Research Institute. He is expected in 1985.

Mr Peter Cressey has recently returned from the Wheat Research Unit of the C.S.I.R.O. in Sydney.

Dr Adriana Grama of the Volcani Institute in Israel is spending 6 months with W.R.I. and Crop Research Division. She is working with new wheat cultivars that have been developed by back-crossing wild emmers with modern bread wheats. The resulting wheats have very high protein content. She has come to New Zealand because we have more sophisticated bread testing techniques than Israel.

D.S.I.R., APPLIED BIOCHEMISTRY DIVISION

A new area of research, the study of chemicals attractive to bumble bees, is being undertaken by Dr David Greenwood in co-operation with Dr Rod Macfarlane of Entomology Division, Lincoln. This research is part of a programme to improve the pollination of agricultural and horticultural crops and to aid in the future rearing of bumble bees. In March, Dr Greenwood, as a recipient of a Prince and Princess of Wales Science Ward will visit laboratories in the U.K. and in Europe that are actively working in this area of research.

Dr Jim Patel is currently undertaking research at the Microbiology Department, University of Helsinki, Finland, into bacteriophages that are parasitic on *Rhizobium*. This work is funded by a grant from the National Academy of Sciences, Finland, for Dr Patel to continue his collaborative work at Helsinki with Dr K. Lindstrom who visited here as an OECD Fellow in 1981-82. Dr Patel intends to extend his research interests into the isolation of active receptor molecules on the surface of *Rhizobium* that are involved in phage building.

Alan Craig, a member of the electron microscope laboratory, was recently awarded a PhD degree in Biophysics from Massey University.

CHEMISTRY DIVISION, CHRISTCHURCH

Dr Graeme Wright of the Chemistry Department, University of Canterbury, who is taking his leave in Chemistry Division, recently spent two weeks in England inspecting Mass Spectrometry equipment.

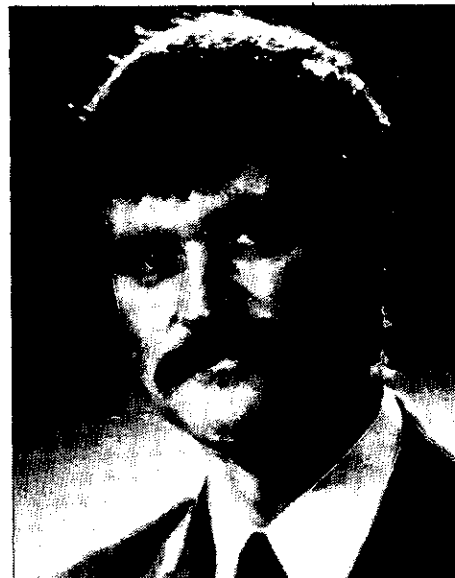
CHEMISTRY DIVISION, WELLINGTON

Dr L. Porter, head of the Organic Section has returned from a years leave in California, and Mr L. Sharman, head of the Forensic Section has returned from almost a years leave at the Metropolitan Police Science Laboratory in London.

Mr G. Dougherty has resigned from the Applied Chemistry Section at Chemistry Division and has moved to Australia.

Reorganization of Chemistry Division has resulted in Dr C.D. Stevenson being appointed Dominion Analyst, some of Dr Stevenson's responsibilities as Group Leader have been reallocated to other

Group Leaders at Chemistry Division.



Dr Stevenson

Dr C. Tennant has been appointed a new Group Leader, with responsibilities for the Instrument Section, and the Spectroscopy Section.

Three new section heads have been appointed at Chemistry Division.

Dr D. Hannah has replaced Mr H. Brewerton as head of the Food Section.

Dr G. Gainsford has been appointed head of the new Computing and Statistics section.

Mrs Helen Beaumont has been appointed head of a new Environmental Section.

OTAGO

(Continued from Page 18)

chromosomal and oncogenic changes which occur at different stages in the transformation. Mike has perfected the technique of in situ hybridisation, and has applied it to several cancer-related problems. He has been selected as the Sci-Med N.Z. Ltd. Speaker at the Adelaide meeting of the Australia and N.Z. Society for Cell Biology to be held in February at which he will present a paper titled, "Is Wilms' tumour a result of aberrant expression of insulin-like growth factor?"

OVERSEAS

Ken Gawne, lecturer in the School of Science, Deakin University, Australia, has been granted 3 years leave to take up a position as Associate Professor of Applied Technology at the University of Technology, Lae, Papua New Guinea.

The Department of Chemical Technology at UTECH is headed by Professor D.F. Stewart of Melbourne, has 19 academic staff, and is comprised of three sections — Food Technology, Mineral Technology, and Applied Chemistry. Ken Gawne will head the Applied Chemistry Section.

In addition to this academic appointment Ken will also become the first director of the PNG National Analysis Laboratory. This is a commercial laboratory, employing nine scientific and technical staff, which provides a wide range of analytical services to industry, national and provincial governments, and University Departments.



The new Mettler PE LabPac makes life in the lab easier.

The Mettler LabPac programmes Mettler PE balances to do the types of weighing you do in your lab each day. Turns the balances into lab specialists.

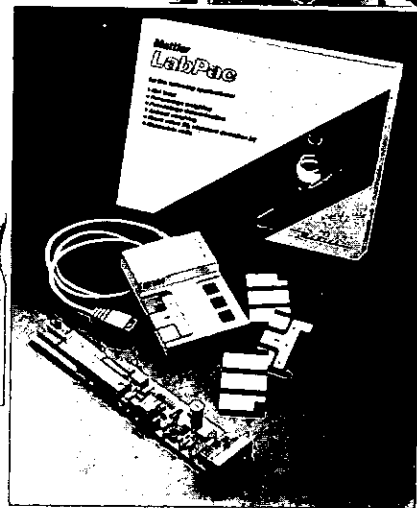
For example, if you need to do net total weighings, you simply plug in the LabPac's net total key, and away you go. The same is true for other laboratory weighing procedures. Want to do percentage weighing? Plug in the appropriate key. It's the same for statistical weighing (mean value/ standard deviation) and

animal weighing. It couldn't be easier.

The PE LabPac also incorporates a data output (RS232C and current loop) which allows you to interface with computers and other peripheral equipment.

LabPac interfaces with the new PE balances.

There are fourteen balances in Mettler's PE series. Readability ranges from 0.001g to 1.0g and capacities go up to 24 kg.



Mettler LabPac is the key to faster and easier weighing in the laboratory.

Each of the new PE balances features automatic calibration, a micro-processor controlled integration cycle, stability indicator in the read-out and DeltaDisplay, which allows you to hit target weights quickly and accurately.

Another aspect of the PE LabPac package you'll like very much is the price. You'll find the pricing of the PE balance you need and the comparison LabPac most attractive.

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CONFERENCES

THE NEW ZEALAND INSTITUTE OF CHEMISTRY, THE NEW ZEALAND BIOCHEMICAL SOCIETY AND THE NEW ZEALAND ASSOCIATION OF CLINICAL BIOCHEMISTS JOINT CONFERENCE TO BE HELD AT THE UNIVERSITY OF CANTERBURY, CHRISTCHURCH FROM 26-30 AUGUST 1985

The conference committee cordially invites all members of the three groups and other interested people to attend the joint conference. The general theme of the conference will be "Chemistry Becomes Computerized". Plenary lectures, which will include the application of computers to protein synthesis, new approaches in polymer chemistry and three-dimensional colour graphics in X-ray crystallography, will support the conference theme. Technical displays and a full day microcomputer workshop will provide delegates with the opportunity to inspect the latest products and to discuss the application of microcomputers in laboratory management, data processing, the instrument control, teaching and research areas with chemists and teachers who are familiar with the practical and conceptual difficulties which confront other chemists wishing to take advantage of the technology with little or no formal training. The application of microcomputers in chemical education will be well represented with an overseas plenary lecturer to open the education group session.

Specialist group sessions, including physical chemistry, mass spectrometry, biochemistry and analytical chemistry, will be available for the presentation of short papers and posters. The use of posters will be encouraged through the timetabling of sessions during which presenters will show a slide of the poster and give a brief (two minute) outline of the work involved. Another feature of the conference will be the Vaughan Symposium, honouring the retirement of Professor J. Vaughan.

The conference dinner will be held at the Christchurch Town Hall Restaurant. Delegates will have use of the University

Staff Club (DB Brown and DB Lager on tap) and the University Recreation Centre (which offers tennis, squash, badminton, trampolining etc.) The programme of social events will also include the usual mixers, visits to local industries and sightseeing. Skiing trips will be arranged to nearby Mount Hutt or Porter Heights following the conference.

For further information contact: — Dr P.W. Harland, Conference Secretary, C/Chemistry Department, University of Canterbury, Christchurch.

NOTICE: OIL AND FATS TEACH-IN

This one day seminar organised by the N.Z.I.C. Oils and Fats group will be held at the Waipuna Lodge on March 20th, 1985, from 8.30am to 5.30pm followed by a Dinner. The course is intended for people with a limited knowledge of oils and fats who may wish to obtain a deeper understanding of the field.

Aspects covered will include basic chemistry and biochemistry, analysis, physical properties, storage and preservation, and use in the baking trade. The after-dinner speaker will be Professor John Scott who will talk on "Fats in Health".

For further details phone L. Eyres, Auckland 548-145.

Fee \$50.00 to "NZIC Oils & Fats Group" to Mr G. Wynward, 163, Oaktree Ave, Browns Bay by March 1st, 1985.

WORKSHOP: ATMOSPHERIC CHEMISTRY IN NZ

The NZ Meteorological Service is organising a 2 day workshop in the above topic, to be held in Wellington in May. For further details contact Dr Tom Clarkson, NZMS, P.O. Box 722, Wellington.

AUSTRALASIAN CORROSION ASSOCIATION INC

24th Annual Conference
"Corrosion Technology — 1984 and Beyond"
Held at the Sheraton Rotorua Hotel
19-23 November 1984

Conference-24 was held in the Fenton Centre of the Sheraton Hotel in Rotorua and was attended by some 250 delegates from NZ, Australia, USA, UK and Asian countries. The Conference was opened by the Director-General of DSIR, Dr Jim Ellis, and the Technical Convenor, Mr Les Boulton, announced that the Proceedings of the conference contained over 50 pre-printed papers, which was the largest technical programme ever presented at an ACA Conference.

The Plenary Lecturers were Dr Digby Macdonald of SRI International (USA), Dr John Sketchley of CEGB (UK) and Dr Edmond Potter of CSIRO (Sydney). Mr Mathew Foo (Monash University, Melbourne) received the "PLE Award" for the best student paper, whilst Mr Tony Eaton (Chemistry Division, DSIR, Auckland) was awarded the first-ever "A C Kennett Award" for a paper on degradation of polyethylene. The Australasian President, Dr Greig Wallwork (University of NSW, Sydney), presented Assoc-Prof Graham Wright (Auckland University) with the "Corrosion Medal" for 1984, an honour that only comes to New Zealand every eight years.

Social events held during the Conference Week included a Maori Concert and Hangi, plant visits and a boat trip to Mokoia Island. At the Farewell Luncheon on the Friday, the New Zealand Branch of ACA was congratulated by representatives from each of the other seven branches of the Association, on organising the largest ever ACA Conference.

Copies of the pre-printed papers are available from the NZ Branch of ACA (\$45 per set) at Box 5961, Wellesley Street, Auckland.

THE SCEPTICAL CHEMIST

The recent moves by Otago Medical School to influence the prescription for Intermediate Chemistry brings to a head an increasing concern that the University training of scientists is being damaged by aspects of the Intermediate system. It would appear that, once the Otago changes are instituted, anything between 400 and 600 first year students will be reading those Intermediate courses (such as Medicine, Veterinary Science and Dentistry) which are substantially biased towards specialised programmes. These do not directly contribute to a classical major in Chemistry, Physics or Biological Science. Since only some 150 are likely to be admitted to the professional schools, and the vast majority of the "rejects" will proceed to a B.Sc., it would appear that here is a matter for concern for the National Associations of scientists. The problem is compounded since Medicine, Veterinary Science, and related professions are still seen by students as highly attractive, so that an undue proportion of the best science school-learners are affected.

An additional pressure may result from the recent report on Engineering education. This both suggests modifications affecting the Intermediate, and produces significant arguments for greatly increasing the out-

put of engineers. These factors would exert substantial pressure on the education and output of scientists.

These problems should particularly concern the N.Z.I.C. since there are a number of indications of a future shortage of chemists. First, we see no significant unemployment among new chemists at present be they N.Z.C.S., B.Sc., Honours, or Ph.D. graduates. There are still shortages in certain areas such as science teaching. Second, the "think big" and "value added" projects create new demand for chemists. Third, any move to replace direct export incentives by support for R. and D. will add to this demand. To cope with such increased demands, there seems to be little evidence of an increase in the production of N.Z.C.S. or B.Sc. graduates in chemistry. The last chemistry subject conference found that the supply of postgraduates has actually been dropping over the past few years.

What should be done?

(1) It is clear that a better prediction of professional manpower requirements is needed. The pool of potential scientists, doctors, veterinarians, engineers etc. is a limited one at present and school students should be given as much information as possible on which to base career decisions. The lead

time in training is far too great for the market mechanism to work. This is an area deserving much more attention from those concerned with science and technology planning.

(2) The specific Intermediate problem can be solved either

(a) by direct admission to the professional school at first year (reducing the redundancy of "mistrained" students to perhaps 10% rather than 200-300%) or,

(b) returning to the classical Intermediate where specialised courses are eliminated, the work done at First Year is determined only by the professional judgment of Chemists, Physicists, Biologists, Mathematicians and Computer Scientists, and the student may make an unhandicapped career choice at the end of his first year.

(3) It is important in the longer term to increase the pool of science-orientated students. Greater investment is needed in resources for science and mathematics teaching in schools and the utmost support is required for all areas of science education. The Institute should speak with the strongest possible professional voice and its recruitment and publicity programmes deserve all our support.

K.M. MACKAY

Traps for Young Balance Buyers

By Malcolm Bell, TELARC

Reprinted with permission from TELARC-talk, the Newsletter of the Testing Laboratory Registration Council of New Zealand.

The ubiquitous laboratory balance has undergone some startling changes in recent years. The old two-pan balance and box of weights has had its day and now the days of opto-mechanical, single pan balances with in-built weights also appear to be numbered. Today microprocessors rule the roost and many balances being sold are the digital electronic models with a whole host of accessories and peripherals available for them.

Whatever type of balance is finally purchased the specific model chosen will usually be dependent upon the requirements of the test methods in use in the laboratory. Equally, a laboratory considering the introduction of a new test method may be limited by the balances that it already possesses.

Most test methods that involve weighing attempt to give some guidance as to the accuracy of the balance to be used. It becomes confusing, however, when different approaches to the specification of accuracy are adopted. The following statements are all taken from Standard Test

Methods in use in registered laboratories:

- (i) 'Use a balance accurate to at least 1 mg'
- (ii) 'Weigh 5g(± 0.01 g) of sample...
- (iii) '...balance readable and accurate to 0.001g'

(iv) '...balance weighing to 4 decimal places'

(v) '...balance readable to 0.1% and accurate to $\pm 0.1\%$ of the sample mass'

Let's presume that we wish to purchase a balance meeting the requirements of statement (iii) above and that the largest object we will want to weigh will have a mass of about 150g. At this stage we can get out of the balance manufacturers' catalogues to see if we can find a suitable model.

Here are the relevant parts of the specifications for three balances taken from the catalogues of three different manufacturers:

Balance 1 (Opto-mechanical)	(g)
Weighing Range	160
Readability	0.001
Standard Deviation	± 0.0005
Linearity Deviation	± 0.001
Precision of built-in weights	± 0.0008

Balance 2 (Opto-mechanical)	(g)
Capacity	160
Readability	0.0001
Precision	± 0.0005
Accuracy in optical range	± 0.0001

Balance 3 (Electronic)	(g)
Capacity	200
Readability	0.001
Reproducibility	0.0005
Linearity	0.001

Three balances of basically similar performance. There are some slight differences in terminology used in the catalogues but each manufacturer gives roughly the same information about his product (except for the manufacturer of Balance 2 who seems to have forgotten to mention the in-built weights).

What do these specifications mean and will any of these balances meet our needs?

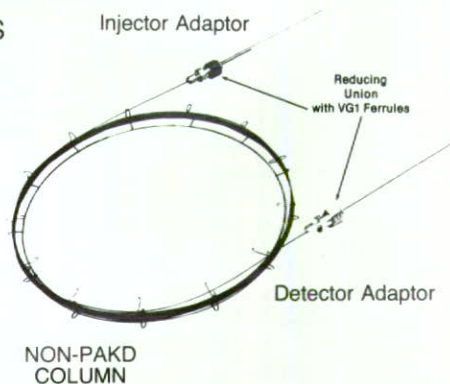
Standard Deviation

The laws of nature being what they are there is very little chance that if we make the same measurement twice we will get exactly the same answer. Minor random changes in the environment, random variations in operator technique and random performance of the instrument all conspire against us. The measuring process is said to exhibit a characteristic known as 'repeatability' (...or more precisely the lack thereof...)

The best that we can do is take several readings and calculate the average in the hope that these random errors will average close to zero. Most balance users do not have the time to do this however, they want

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to put the sample on the pan, take a reading and get on with the job.

The balance manufacturers acknowledge that their balances will exhibit repeatability errors by quoting the standard deviation of the readings that are typically obtained when the same object is weighed a number of times (usually 10). This figure is variously identified by the different manufacturers as the Standard Deviation, Repeatability, Reproducibility or Precision of the balance but they all mean the same thing. Confusing isn't it?

When just a single weighing of a sample is made the repeatability error in that single result may be as much as three times the quoted Standard Deviation.

Linearity

If you were to draw a graph of balance reading against the true mass of the object being weighed you might expect a straight line; ie a linear response from the balance. The balance has not yet been made, however, that exhibits a perfectly linear response and the manufacturers acknowledge this fact by indicating that linearity errors are present. The figure quoted in the catalogues is usually the worst-case departure of the balance's actual response from the theoretical straight line encountered at any point in the optical range of opto-mechanical balances or the full range of electronic balances.

In-built Weights

The in-built weights of opto-mechanical balances also contribute to the overall error in a weighing. The manufacturer of Balance 1 above has admitted that its weights have a precision of 0.8mg which we presume to mean that the worst-case error of the whole set of weights, in any combination, will not exceed 0.8mg.

The manufacturer of Balance 2 admits to the existence of in-built weights in his balance elsewhere in its catalogue but they seem to forget about them when providing information about accuracy. Perhaps the weights are so good that the errors they contribute are negligible compared with the readability of the balance?

In considering these various sources of error in a balance reading it is often overlooked that they are all there at the same time. You cannot pick and choose

which you will have today, like optional extras from the catalogue. This leads us, therefore, into considering how these errors might be combined into one figure that will be of use to a potential purchaser in evaluating overall performance of the balance.

The combination of errors is a subject all on its own and all we intend to do here is give a rough 'rule of thumb' which ignores the mathematical niceties. It is often advisable to make a pessimistic assessment of the readability error of a balance. This can be done by adding three times the quoted standard deviation to the arithmetic sum (ie ignoring the \pm signs) of the other quoted errors. In the case of Balance 1 above, this gives an overall error of $\pm 3.33\text{mg}$.

Similar calculations for the other two balances reveal that they also can exhibit worst-case overall errors in the region of $\pm 2.5\text{mg}$.

The answer, therefore, to the original question (as to whether these balances comply with a specification requiring readability and accuracy to 0.001g) is 'no'. It would appear that if you want a balance that is accurate to 0.001g then you may have to buy one that is readable to 0.0001g.

A further point that we have not considered up to now is the effect of the off-centre loading of samples, particularly on top-pan balances. If the centre of gravity of the item to be weighed is displaced from over the centre of the pan then further errors may be introduced which, as you move out to the edge of the pan, may be as high as two or three times the readability of the balance. If, therefore, you intend to weigh any large asymmetrical objects on your balance you should find out from the manufacturer's agent the potential magnitude of these pan position errors and take them into account when calculating any overall error figure.

You may only be using your balance, in a particular test, to measure the difference between two masses as, for example, when determining the moisture content of a material by oven drying. In these circumstances it is often suggested that you only need to take account of the repeatability of the balance and that other sources of

error should average out close to zero.

This, however, only applies as long as the balance exhibits a linear response and, as we have seen above, this is not the case. Indeed with opto-mechanical balances the overall response of the instrument can exhibit a series of steps as different combinations of in-built weights are brought into use with further non-linearities in the optical scale range between the steps due to other factors such as knife-edge wear etc. Weighing by difference is not, therefore, a justifiable excuse for ignoring everything other than the repeatability of the balance.

One final tip. If you are thinking of buying a new balance, why not talk to the technicians in the agency's service department about your choice. They will know how their company's balances perform in the field and in particular how the model chosen is likely to respond to your laboratory's environment (dust, fumes, vibration etc.)

ELECTRONIC BALANCES

The term "electronic balance" is something of a misnomer as it implies that the instrument balances, by some electronic means, one mass against another. In fact electronic balances could be more appropriately termed "mass meters".

Most electronic balances make use of a transducer, linked by a suitable mechanism to the balance's pan, which measures the force due to gravity acting on the object being weighed. Transducers are usually elastic load cells or electro-magnetic force compensation systems.

If a balance is calibrated at a location where $g = g_1$ then moved to a second location where $g = g_2$ the error (E) in balance reading at the point on the scale (M) at which the calibration was undertaken is given by:

$$E = M(g_1 - g_2)/g_1$$

If an electronic balance, readable to 1 mg with a capacity of 200g, is calibrated in Wellington ($g_1 = 9.803$) then moved to Hamilton ($g_2 = 9.800$) the error in the balance reading at the calibration point (usually the top of the scale i.e. 200g) is calculated as follows:
 $E = 0.2 \text{ kg } (9.803 - 9.800) / 9.803$
 $= 0.000061 \text{ kg}$
 $= 61 \text{ mg}$

The balance will be in error, at the top of its scale range, by 61 times its readability.

Balances — The Hardware

Compiled by A.C. Herd,
Auckland Technical Institute

Because of the very large number of balances currently on the New Zealand market it is impossible to do them justice within the space available. For more detailed information, contact the New Zealand agents listed below, or preferably use the reader reply card.

ALSEP

Alsep balances are manufactured by the A&D Company of Japan and are marketed in New Zealand by E.C. Gough Ltd. of Christchurch. Circle 8 on the reader reply card for further information.

E.C. Gough Ltd. will be promoting a complete range of precision laboratory electronic balances in 1985, spearheaded by the ER-180A model, see Fig 1. The Alsep range also includes portable battery operated "personal" balances, single and double range precision balances, multi-unit balances, counting balances, and one, the



Figure 1, The Alsep ER-180A

EX-2000B, designed for weighing live animals. Some of the features of Alsep balances include: Microprocessor control of the balance functions. Internal automatic calibration. Interface cards allowing remote operation, bulk data storage, and communication between other digital equipment. Top loading, and under the balance weighing capabilities. Portable battery operated balances for remote field work.

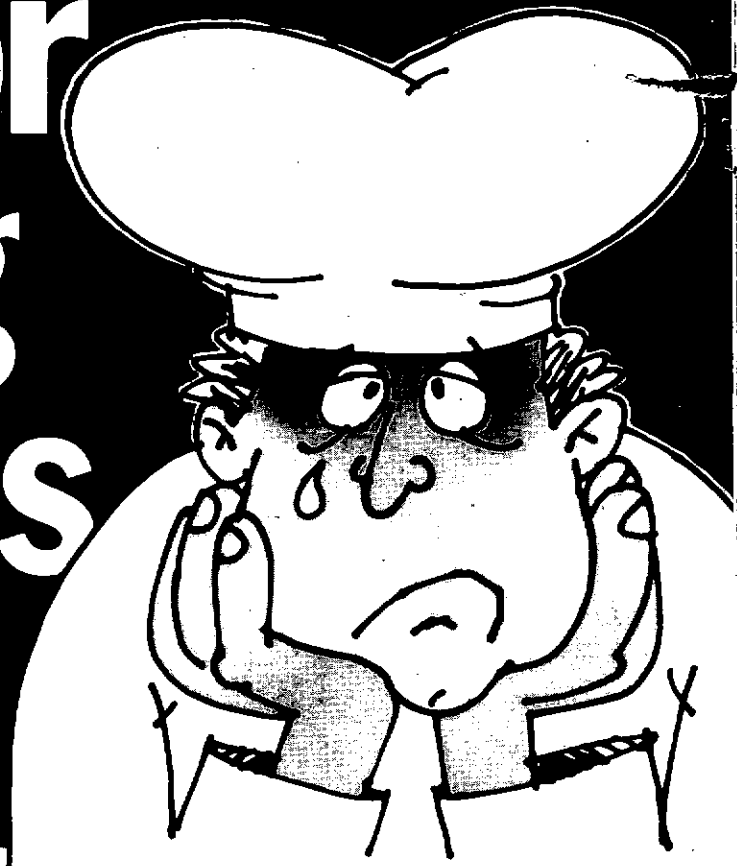
Peripherals available include printers, calibration weights and a foot switch.

CAHN

A range of Cahn balances are available through John Morris Scientific Ltd. For further information circle 9 on the reader reply card.

The series 20 micro and ultra-microbalances feature range selection and tare facilities, the C-29 for example allows the following ranges and sensitivities at a

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capacity of 3.5g, 1250mg/0.01mg, 250mg/1 μ g, 25mg/0.1 μ g.

Toploading analytical balances are claimed to require no special environmental conditions, the TA-4100, weighing 400g with a sensitivity of 0.1mg. The Cahn range also includes semimicrobalances, recording balances, and a full range of accessories.

METTLER

The Swiss manufactured Mettler balance range will need little introduction to most chemists. NZ agents are **Watson Victor Ltd.** and further information can be obtained by circling 10 on the reader reply card.

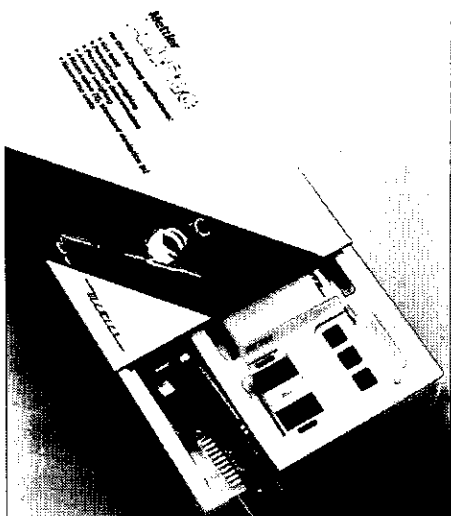


Figure 2, The Mettler LabPac

As well as the AE range of analytical balances, (the new AE166 has Delta Range, weighing either 0-162g readable to 1mg, or 0-60g readable to 0.1mg), Mettler also has the PE range of precision balances. The PE range can be used with a number of application packages to facilitate routine weighing jobs. The simplest package (see Figure 2) LabPac converts the "standard" balance into a multi-functional balance giving net total, percent determinations, animal weighings, means and standard deviations and results in non-metric units. The StatPac and DataPac allow further functions including the addressing of auxiliary instruments.

Mettler also produces two microbalances, the M3 with a total capacity of 3050mg, a reading range of 0-150mg and a readability of 1 microgram, and the UM3 (Figure 3), capacity 3005 μ g, reading range 0-15mg and readability of 0.1 microgram.



Figure 3, Mettler's UM3 ultra-microbalance

OERTLING

Oertling are British balances, marketed in New Zealand by **Avery N.Z. Ltd.** A number of new models will be released in 1985 and further information can be obtained by circling 11 on the reader reply card.

The analytical model, LA164, has a 160g weighing range, with a weight interval of 0.1mg and a fully subtractive tare of 160g. The LA164 can be supplied with an attachable self programme keyboard for additional data handling.

The dual range weighing and counting balances are shown in Figure 4, and there are many other models of electronic top-loaders.

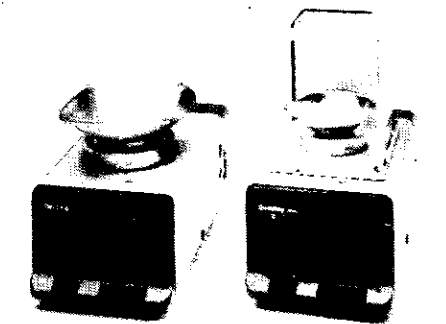


Figure 4, Oertling weighing and counting balances.

OHAUS

Ohaus Scale Corporation is represented in New Zealand by **Smith Biolab Ltd.** and further details on their products can be obtained by circling 12 on the reader reply card.

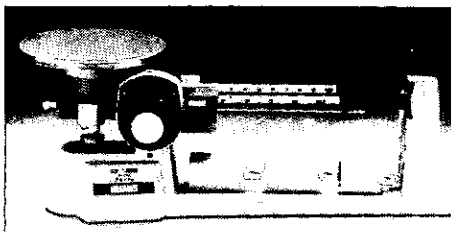


Figure 5, One of the Ohaus mechanical balance range.

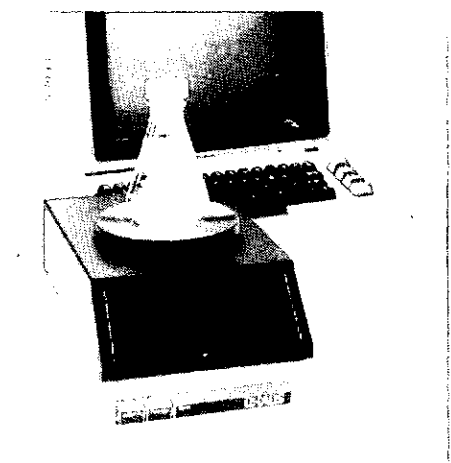


Figure 6, The Ohaus B300-D interfaced to a personal computer.

Ohaus is well known, especially in the educational field, for their mechanical balances (see Figure 5), but they also manufacture a range of top-loading electronic balances (see Figure 6). The Ohaus "Brainweigh" balances are interfaceable to most popular computers, printers and calculators. For example, one package connects an Ohaus balance to an Apple com-

puter with three self prompting weight and time domain interactive programs.

PERKIN-ELMER

Now represented in New Zealand by **John Morris Scientific Ltd.** Perkin-Elmer offer an ultramicro balance that is radically different in appearance. Information on the AD-6 autobalance can be obtained by circling 13 on the reader reply card.

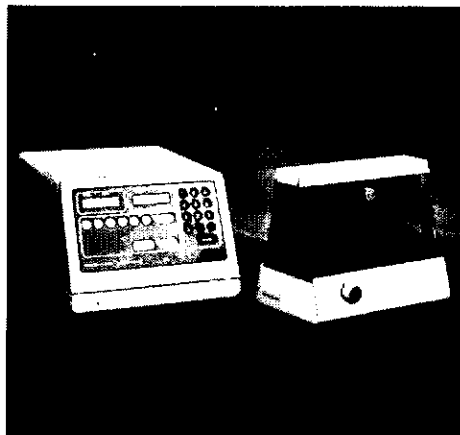


Figure 7, The Perkin-Elmer AD-6 ultramicrobalance.

The AD-6, shown in Figure 7, is an ultramicro balance consisting of a control unit and a weighing unit. The balance has a 5 gram capacity with 0.1 microgram sensitivity and is able to be connected to a computer for sophisticated data handling.

PRECISA

New Zealand agents **Kemphorne Medical Supplies** and further information can be obtained from them by circling 35 on the reader reply card.

Familiar to readers of Chemistry in New Zealand, the Precisa range includes more than 20 models. The "A" range includes the 80A with 80g capacity and 0.1mg readability. KMS are marketing three new models, the 120A, 160A and 200A all with 0.1mg readability and capacities given by the model number. A complete range of electronic top-pan models, including dual range models, runs up to the auto dual ranging 8000D - 24000 G (see Figure 8) with readability of 0.1g/1g. There is a single range balance with 30kg capacity and 1g readability. Available accessories include a remote display, a footswitch for tare or print command, and a multi-function unit for operations such as parts counting, net totalling etc.

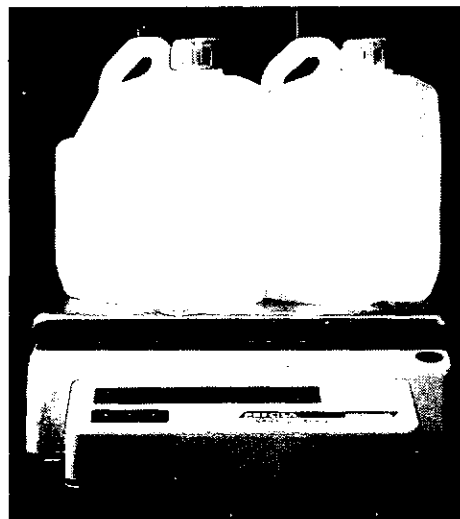


Figure 8, The dual range Precisa with maximum capacity of 24 kg.

SARTORIUS

Sartorius balances are marketed and serviced in New Zealand by Wiltons, a division of **Smith Biolab Ltd.** Further information can be obtained by circling 14 on the reader reply card.

The Sartorius range includes over 30 balances. Semi micro, micro and ultra micro balances are represented by 5 models, some of which have automatically opening doors with a pan that swings out and retracts. The analytical balance range includes the 1712 which is dual range selectable by softkey, either 30g capacity 10 microgram readability, or 160g capacity

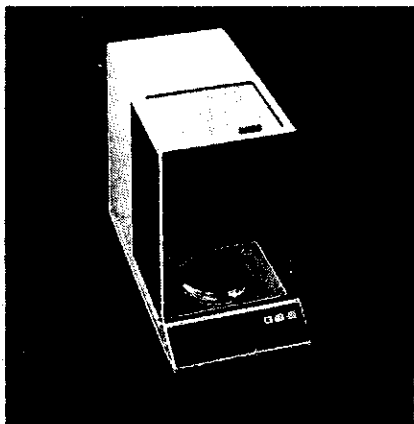


Figure 9, The Sartorius 1712

0.1mg readability (see Figure 9). Recent additions include the 1801 (111g/0.1mg) and the multirange 1872.

Many balances in the range are especially designed for use in routine processing and formulation work and there is a new line of portable precision electronic toploaders. Other speciality areas are catered for eg moisture analysis, education, explosion safety etc and sophisticated network systems, incorporating computers and printers, are available.

SHIMADZU

Shimadzu agents in New Zealand are **Sci-Med NZ Ltd** and further information on Shimadzu balances is available by circling 15 on the reader reply card.

The standard EB series of electronic balances have been on the market for about four years, only requiring minor upgradings such as touch-pad keys to keep them fully up-to-date. The range of over 20 balances is aimed at production and process control laboratories rather than the micro-analytical end of the market. Within this framework the EB series offers the full range of functions and accessories, dual range balances, piece counting, density measurement, moisture analysis, printer options and calculation functions.

The most recent additions to the range are the load cell type EB-L and EB-LS series (see Figure 10). These are very compact,

able to be held in the palm of the hand, robust, and with liquid crystal displays.

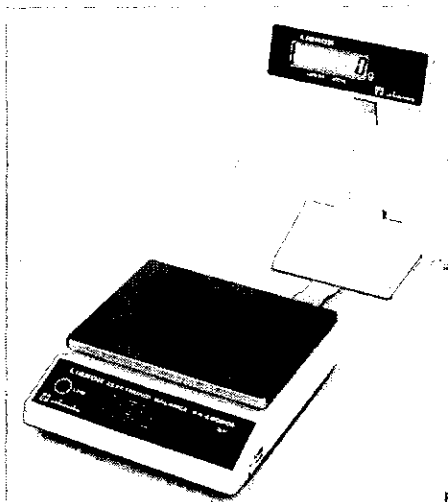


Figure 10, The separate display option for the EB-LS series. Either 600g/0.1g or 6000g/1g

In the above summary, I have tried to focus on particular points of interest for each manufacturer. Just because the particular feature you require in a balance has not been mentioned for a particular supplier, do not automatically assume it is not available, use the reader reply card.

PRODUCT NEWS

HPLC ACCESSORIES

Alltech/Applied Science introduce their new range of 'Direct Connect' Cartridge Columns for HPLC. As with all 'Direct Connect' products, ease of use is the criteria, and this, combined with more than 125 packing materials, three particle sizes and six lengths, gives, with over 2000 possible combinations, the most broad-based cartridge system yet developed.

This interchangeable family of cartridges, holders and connectors may be configured for conventional and high-speed chromatography. Options such as hand-tight, tubing free connections are part of the no-compromise approach to column performance. Each holder incorporates a built-in prefilter which eliminates column clogging.

For full details, contact Alltech NZ or circle 16 on the reader reply card.

A new 14-page brochure, dedicated to Rheodyne valves and accessories, including the new Alltech/Applied Science 'Knurl-Lok' (patent pending) sample loops, is available from Alltech NZ by circling 17 on the reader reply card.

MICROBORE COLUMNS FROM BROWNEE LABS

A new line of 1mm ID x 25 cm long microbore columns features a unique coaxial design that makes handling of the column easy and facilitates temperature control. The microbore column is isolated in a protective outer jacket surrounded by a liquid medium. It can be used with column ovens, water baths, heating coils or other temperature control devices.

Each Brownlee microbore column is individually packed and tested. A selection of 5 micron sorbents is available, including C8, C18, silica, cyano and a wide pore reverse phase, RP-300.

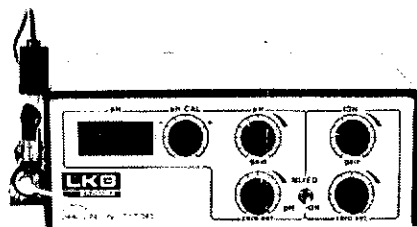
For more information, contact Advanced

Electronics Ltd, or circle 18 on the reader reply card.

NEW CHROMATOGRAPHY MONITOR

Sci-Med (NZ) Ltd announces the availability of a pH/Ion Monitor for liquid chromatography. This is the only combination flow-through detector available that can measure both pH and, via the conductivity, the ionic strength on-line simultaneously.

The monitor can be used to determine the precise elution conditions for a particular sample component and to determine when column re-equilibration is complete after ion-exchange separations. Greater control over desalting and rapid checks on column packing efficiency can also be rapidly achieved with this detector. The pH/Ion Monitor is designed for use in series with a UV detector.



Three modes of operation are available: direct on-line monitoring of pH or conductivity, or simultaneous monitoring of both parameters. To achieve acceptable flow rates for large-scale operations, a stream-splitting accessory can be used.

Ideal for coldroom operation, the pH/Ion Monitor has a working range of 4 - 40°C.

Further information about the 2195 pH/Ion Monitor may be obtained from the sole New Zealand agents: Sci-Med (NZ) Ltd or circle 19 on the reader reply card.

SEQUOIA TURNER INTRODUCES NEW LOW COST METER SPECTROPHOTOMETER

A new low cost, compact spectrophotometer that features 8nm bandwidth, solid state detector and electronics, and a diffraction grating monochromator has been introduced by SEQUOIA-TURNER Corporation.

The Model 320 Spectrophotometer has a continuous wavelength range of 330nm to 1000nm to cover all routine UV and colorimetric tests. This range can be extended to 210nm with an easily installed Far UV accessory. This wide range is achieved by a monochromator having a plane diffraction grating in an f7 Ebert mounting. The monochromator utilizes a single casting to maintain alignment of the optics, sample, and solid state detector.

Two controls simplify operation and a large analog meter provides easy readability in Absorbance and Percent Transmittance.

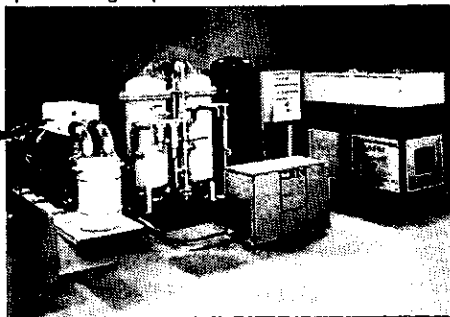
The Model 320 has exceptional photometric linearity of better than 1% as a result of the combined narrow bandwidth (8nm) and low (less than 0.5%) stray light. Performance is further enhanced with a wavelength repeatability of better than 0.5nm, and a wavelength accuracy within 2nm over the full range.

In addition to built-in reliability and simplicity of operation, the Model 320 can be expanded with optional accessories. These include a Far UV accessory, a sample aspiration system and a wide range of cuvette adapters for square and round cuvettes.

The Model 320 is the latest addition to SEQUOIA-TURNER's new line of laboratory instrumentation. In addition to spectrophotometers the company manufactures fluorometers. For more information contact:— Kempthorne Medical Supplies Ltd, or circle 33 on the reader reply card.

FULLY AUTOMATIC LIQUID NITROGEN PLANT

Building on their long experience in the field of the production of liquid gases, which now adds up to the installation of over 3000 cryogenerators, Philips have announced the world's first fully automatic liquid nitrogen plant.



The new unit embodies the latest technology, including microprocessor control and will supply up to 100 litres of liquid nitrogen per hour. It is designed for full uninterrupted operation for up to 4000 hours and will achieve full production from a warm start in ten minutes.

Very wide application of the plant is envisaged in industrial areas, including, for example, the plastics, metal, food and petrochemical industries. It is part of the Philips "MNP" modular industrial plant range; these plants are pre-installed skid-mounted modules and are shipped ready for indoor installation, while outdoor installation can be provided for by a more durable construction.

The plant represents the extension of Philips Cryogenics group into the utilization of the pressure swing adsorption system process, as distinct from the fractionating column type. In this process, nitrogen gas is separated from the atmosphere in beds of activated carbon. It is then fed to the cryogenerator, where it is liquified into a transfer vessel.

For further information circle 20 on the reader reply card.

WATER QUALITY MEASUREMENT

A new range of portable instruments weighing from 350 to 600 grams is now available for measurements of pH, Conductivity and Dissolved Oxygen.

The pH meters feature a variety of electrode mounting options for convenience at the bench or in the field, carrying case, temperature measurement/compensation, automatic buffer recognition, self-test. Prices range from \$240 to \$350 including electrode.

The conductivity meters are also pocket sized with high quality probe and ranges suited to fresh and sea waters. Accuracies are comparable to research instruments. Prices as low as \$280 including probe.

Dissolved oxygen can now be measured by a pocket portable instrument costing less than \$450. This includes a true polarographic detector.

Enquiries to Alphatech Systems or circle 21 on the reader reply card.

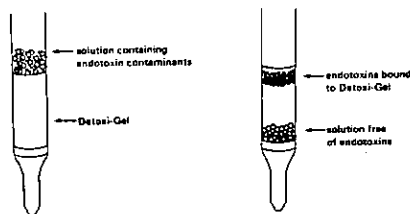
ALPHATECH

Alphatech Systems has moved to larger premises at — 35 Scarborough Terrace, Parnell, Auckland. A new P.O. Box number is 37583. Telephones remain as before on Auckland 770-392.

With increased facilities and staff, Alphatech hopes to extend its presence in the scientific instrument supply area. New products include economical high-quality pH meters, spectrophotometers.

ENDOTOXIN REMOVING GEL

Pierce Chemical Company has announced an affinity chromatography support designed to remove endotoxins from solutions. The support, called Detoxi-Gel, uses a special ligand covalently bound to an agarose matrix and has a high capacity for endotoxins.



Endotoxins are lipopolysaccharide cell wall components of gram-negative bacteria. Since these bacteria are found commonly in nature, it is not surprising that endotoxins are frequent contaminants of aqueous and physiological solutions. Endotoxin concentrations of less than 1 picogram/ml have been shown to exert potent biological effects in man and most animal species.

Detoxi-Gel was developed to provide the

researcher with a convenient, low cost way to remove endotoxins from solutions.

For more information contact Labsupply Pierce NZ Ltd or circle 22 on the reader reply card.

CATALYSTS FROM SULKEM

Further to the directory of catalyst suppliers in the December issue, Sulkem Co Ltd advise that they can supply the following products.

— FCC, Oxidation, Disproportionation, Hydrotreating, Sulphur Recovery, DeNO_x, Deodorization and custom-made catalysts produced by Catalysts & Chemicals Industries Co. Ltd., Japan.

— Precious Metals Catalysts produced by Tokuriki Honten Co. Ltd., Japan.

— Peroxides etc. produced by Kawaguchi Chemical Co. Ltd., Japan.

— Products based on antimony, barium, cerium and rare earths, chromium, cobalt, copper, iron lead, lithium, magnesium, manganese, molybdenum, nickel, tin, vanadium, zinc and zirconium produced by Mooney Chemicals Inc., U.S.A.

For further information, circle 23 on the reader reply card.

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PRECISION ELECTRONIC BALANCES

Alsep offers a wide range of reliable electronic top loading balances, starting from 180 grams to 50kg capacity. Each has a sealed display, dust tight sensitive controls and many selections covering interface options, printers, battery operation and loading tray covers.

For further information contact:



E.C. Gough Ltd

Auckland: Phone 763-174
Wellington: Phone 686-675
Christchurch: Phone 798-740
Dunedin: Phone 775-823

EG2062

For further information circle 24 on Reader Reply Card.

Chemistry in New Zealand/February 1985/27

ALSEP BALANCES

To further complement their range of chemical test equipment, E.C. Gough Ltd., are now offering a complete series of precision electronic balances. The Alsep range is available ex-stock at extremely competitive prices.



There are 32 models to choose from, ranging in capacity from 180 grams to 20 kilograms, single or dual range, counting and automatic calibrating. Resolutions (i.e. smallest scale division) range from 0.1mg or 4 decimal places with the analytical balances and from 1 gram with the industrial range.

These models also have an easy to read cobalt blue fluorescent display, dust proof touch sensitive controls, and a clear annunciator for a stable reading.

Alsep also offer a series of portable

balances for work in the field or remote areas, these run from internally stored rechargeable batteries and can operate continuously for up to six hours.

In addition to the stand-alone function, almost the entire range of balances can be expanded by the utilization of options, to perform a number of useful tasks. For example calculating net/gross weight, maximum/minimum readings among data, standard deviation and average of data and more.

A wide variety of data outputs are available, for all units, including BCD, RS-232C and IEEE-488 (GPIB) interfaces. Hard-copy readings can be obtained using one of the Alsep compact printers.

If you wish to find out more about the Alsep range of balances please contact E.C. Gough Ltd, or circle 25 on the reader reply card.

LDC/MILTON ROY CHROMATOGRAPHY INTEGRATOR

The CI-10 computing integrator is a low cost unit which nevertheless incorporates a number of advanced features, including a sampling rate programmable to 10 milliseconds for fast HPLC and capillary GC. Another key feature is its ability to reprocess complete chromatograms with a single keystroke. Start-up is made easy with a set of default parameters in permanent memory, which can be used to perform many commonly used analyses. Up to nine independent method files can be programmed and stored enabling the chromatographer to fine-tune the integrator to cope with the most sophisticated analysis.

Operation and programming of the CI-10 is conducted through a 40 key dedicated keyboard and 16 character alphanumeric display — with scroll function — allowing the user to view and review operating parameters rapidly and easily.



The CI-10 is available with a choice of printer/plotters; the NEC PC-8023 or the Sekonic S201-GP.

Standard features include: 32kB RAM, six external events, remote start/stop, autosampler interface, IEEE interface communication and data flow with floppy disc drives for mass storage.

Hardware/software packages are available for networking for up to 15 CI-10 integrators to Apple II or IIE as well as IBM PC computers. All CI-10 functions are accessible from the computer's keyboard and any CI-10 file can be loaded to the computer for further data manipulation and enhancement.

N.Z. agents: Advanced Electronics Ltd, for further information circle 26 on the reader reply card.

GOW-MAC PRODUCTS

Gow-Mac have a wide range of binary gas analyzers available, through their sole New Zealand distributors, Alltech New Zealand. Included in this range are: Gas Masters for quantitative analysis, Portable Gas Analyser, Fumigant Gas Analyser, Temperature Regulated T/C Analysers, Continuous Gas Analysers, CO₂ Monitor.

Brochures are available from Alltech NZ, by circling 27 on the reader reply card.

Gow-Mac have introduced their new 69-740P F.I.D. temperature programmed gas chromatograph, which will be a feature of their exhibit at February's Pittsburgh Conference.

This low-cost G.C. is now available in New Zealand, and can be viewed at Alltech NZ, 13/46 Ellice Road, Glenfield.

Also available for demonstration by Alltech, is the Gow-Mac Gas Leak Detector, and the Photovac 10A10 Photoionization G.C., and the new 'TIP', for air analysis. For further information, circle 28 on the reader reply card.

FRONT COVER STORY

NEW ANALYTICAL BALANCES FROM PRECISA

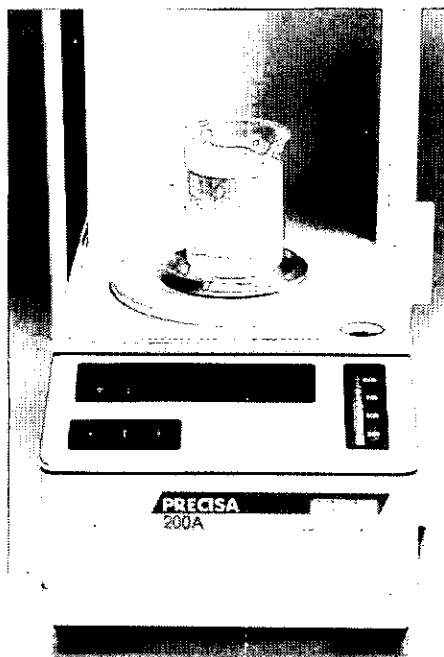
1985 sees the introduction to the New Zealand market of 3 new analytical balances from Precisa, the 120A, 160A and 200A.

All three have a resolution of 0.1mg and capacities of 120g, 160g and 200g respectively. The calibrations can be carried out automatically with the integrated calibration programme. Furthermore, the required check weight of 100g (120A and 160A) and 200g (200A) respectively, is supplied as standard. This means after a computerised quality control at the factory, balances do not normally require specialised service.

The design, as with other balances in the Precisa range, is compatible with the Precisa Multi Function Box.

The most important weighing applications are integrated and memorised in the microprocessor for the balance and can be recalled with the multi-function unit. Operations such as parts counting, changing to other calibration standards, animal weighing, net totalling, become easy to operate.

For data processing applications the Precisa range are equipped with analog output and can, thanks to the integrated software, be equipped with different digital outputs, for example, RS232/V24, 20 mA current loop, IEC625/IEEE488. Ideal to connect to computers, printers, etc.



Precisa — a quality Swiss product carries a two year warranty. A demonstration or further details can be obtained from Kempthorne Medical Supplies Limited or by circling 29 on the reader reply card.

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FOR SALE

Adalab A/D Card for APPLE II, and Chromatograph software. Converts APPLE II to chromatography workstation. System tested, but otherwise unused. \$2000 o.n.o. Dr M.H.G. Munro, Department of Chemistry, university of Canterbury.



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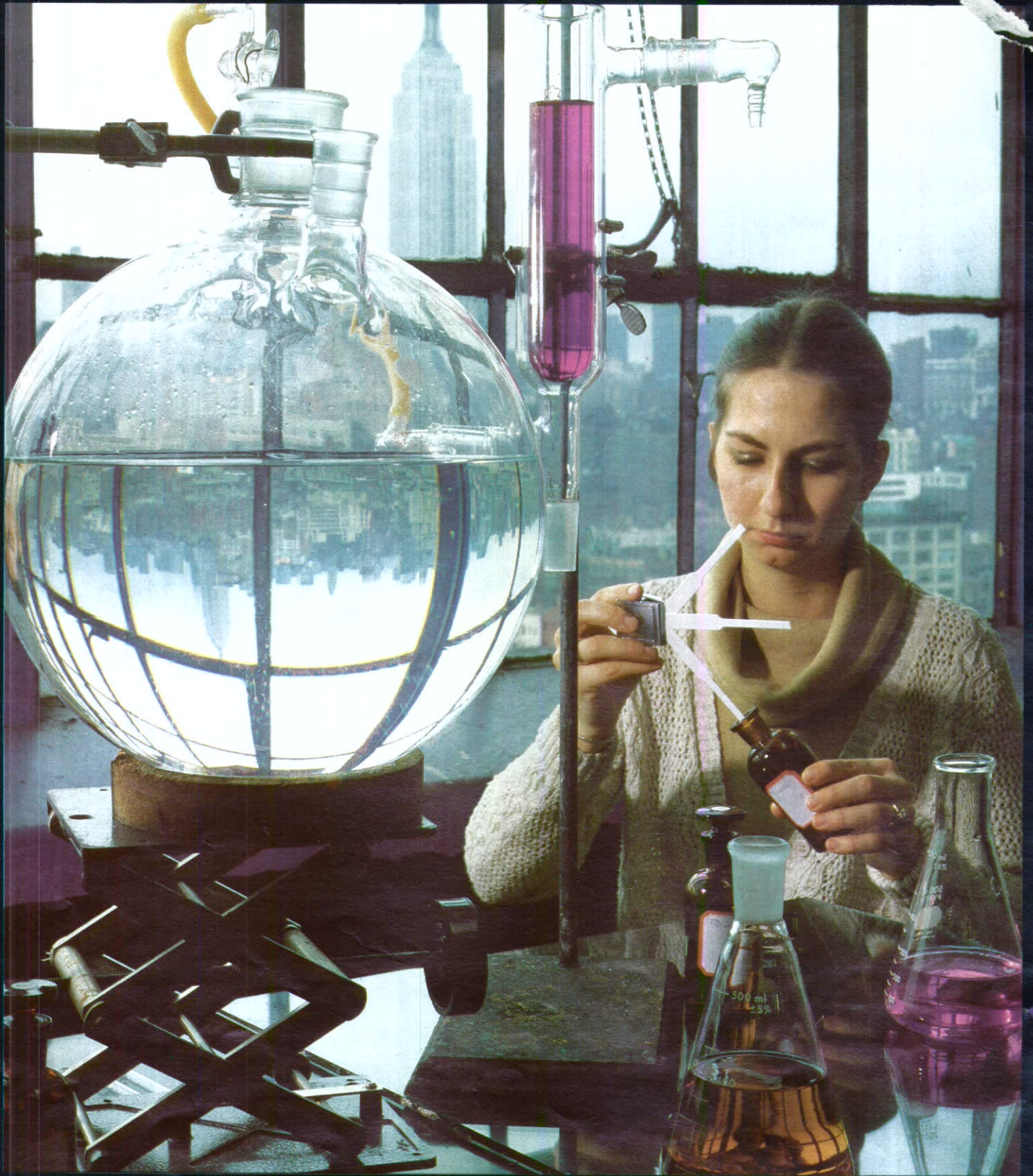
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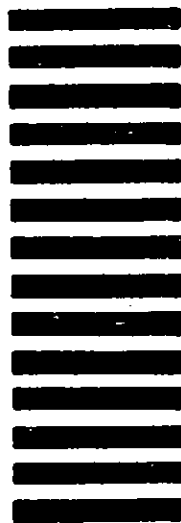
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Chemistry in New Zealand/February 1985

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