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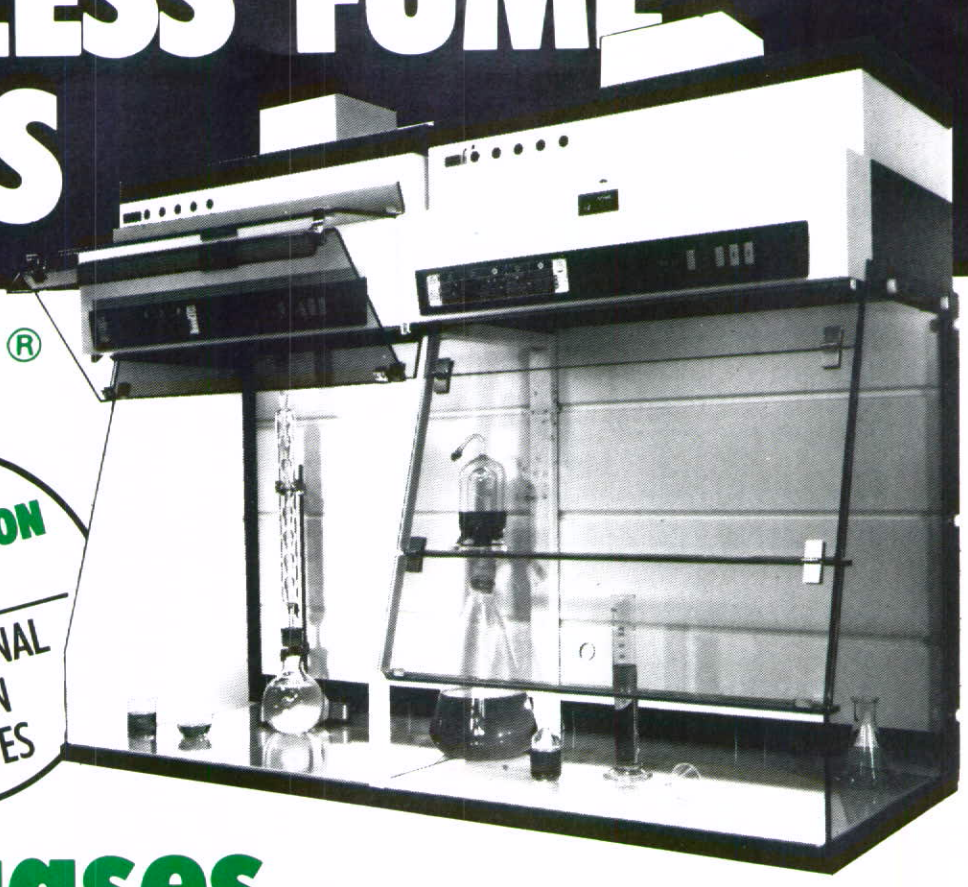

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chemistry in new zealand

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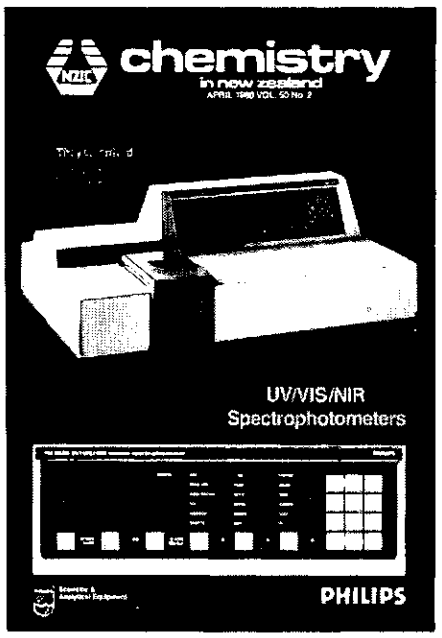
Front Cover Story



The exciting new PU 8620 Series of single beam spectrophotometers from Philips Analytical.

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Published on behalf of the New Zealand Institute of Chemistry (Inc), P.O. Box 29183, Christchurch. President: G. B. Petersen, Hon. Gen. Secretary Dr John Rogers, Registrar Dennis Hogan.

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Outline of the Institute

The New Zealand Institute of Chemistry is the primary professional and learned society for chemists, biochemists, chemical engineers, and chemistry technicians in New Zealand. Membership is open to all with appropriate tertiary qualifications in chemistry, biochemistry, or chemical engineering. There is also a student grade of membership, while those persons with a general interest in chemistry, but without the necessary qualifications, may be local members.

Institute activities are many and varied. At the local level, regular Branch meetings, lectures, and social functions provide opportunities for members to meet informally with their colleagues, as well as to keep abreast of developments within the professsion. Branches are also active in promoting chemistry in schools with various competitions and participation in science fairs. The Annual Conference of the Institute is held at a different venue each year. The programme includes invited plenary lectures, specialist lecture sessions and workshops for the presentation of current research findings, trade displays, and social activities. In the public arena the Institute has a number of committees to present members' views on chemical hazards, the environment, chemical education, and public affairs generally. The Institute also has representatives on bodies such as SANZ, AAVA, and the Royal Society of New Zealand.

To assist its members in their profession, the Institute surveys salaries periodically and publishes a Code of Ethics, and Guidelines to Professional Employment. The professional achievements of individual members are recognised each year by the awarding of a number of Institute prizes.

The NZIC has links with the Royal Society of Chemistry, the American Chemical Society, the Royal Australian Chemical Institute, the Federation of Asian Chemical Societies, and the International Union of Pure and Applied Chemistry. Members may therefore have the opportunity of participating in their activities and meeting chemists who visit this country under the auspices of the Institute. In particular, a visiting speaker scheme is currently operated with the RACI.

Application for membership of the Institute is made on a form available from the Registrar (PO Box 29-183, Christchurch). Current (1985) subscriptions for the main membership grades, including the cost of this Journal, are:

Fellows and Members (less $5 if paid before 31 Aug.)	$70 + GST
Associates (less $5 if paid before 31 Aug.)	$55 + GST
Graduates and Technicians (less $5 if paid before 1 Aug.)	$40 + GST
Students	$10 + GST

EDITORIAL

The Need to Plan Ahead

The announcement in this issue of the new subscriptions, which are nearly 25% greater than last year's rates, will concern members and it is important that I give some explanation. There are three components to the increase that Council has approved: the need for a "development fund", GST and inflation.

"Development fund": This item is half of the increase in the basic subscription rate and is a consequence of "The need to plan ahead".

For some time, Council has been aware that the efficient running of the Institute depends upon the dedication of a small number of people who have uncomplainingly accepted increased workloads as the size and complexity of the Institute's operations have increased. Our Registrar, Denis Hogan, was appointed in 1960 when the Institute was a fraction of its present size. A working member of the Institute, he was willing to take on the executive duties associated with a professional body in his spare time and is paid a small honorarium for this — a payment that effectively only covers his actual expenses. (Members of the Institute may not realise, for example, that the registered office of the Institute is a room in Denis's house).

Since 1974, Denis has been assisted by a part-time administrative secretary (Betty Wignall) who is paid a small salary. Our elected Honorary General Secretary (John Rogers) receives no remuneration at all. The Institute depends upon the efficiency of this underpaid and overworked secretariat. Mr Hogan and Mrs Wignall are both happy to continue to serve the Institute but when these two officers retire (perhaps in five to eight years time) it will be extremely difficult to find anyone willing to take on their considerable workload for a reward that, by any standards, is well below the value of the service that we have come to rely upon.

Council has discussed this problem at length and believes that the only workable solution when that time comes will be to employ a salaried executive officer. This person may be part-time or may be shared with some other professional body — the details will be worked out later. The cost of such an appointment will inevitably be substantially higher than the payment that the Institute currently makes to its executives and will, furthermore, almost certainly include a charge for properly furnished and equipped office accommodation. The result will be a major addition to the cost of running the Institute. If we do not plan ahead to meet this contingency, members of the Institute will at that time be faced with an unacceptably large jump in subscriptions.

Council's decision is to start a "development fund" by setting aside a capital sum each year that, properly invested, will accumulate over the next five to eight years to a level that will provide an annual income sufficient to meet these new demands. Council has dedicated $30,000 of the Institute's present reserves to this development and has resolved that, starting with the 1986-7 financial year, this fund will be increased by an annual amount equivalent to at least $5 per member above the grade of Student Member.

GST. From October 1 a 10% "Goods and Services Tax" will be added to most prices and charges. Societies with an annual turnover of more than $24,000 will be required to pay this tax on subscriptions. The New Zealand Institute of Chemistry subscription budget places it well over this limit and there is no way that we can escape it. The cost of this tax to the individual will be offset by changes to the income tax scales so, theoretically, members should be compensated by increased net personal income.

Our financial year starts on 1 May but GST will not be introduced until 1 October. For 1986/87, GST will thus be effectively charged at a rate of 5.83%. The full rate of 10% will apply from 1987. The GST regulations require that the subscription accounts be in the form of "subscription" $x plus GST $y, to give a total payment required of $(x+y). Members will pay correspondingly less GST by paying before 31 August — the rebate date — ($65 + $3.78), compared with ($70 + $4.08).

Inflation: Members will be well aware that inflation is still with us. Approximately one-half of the increase Council has found necessary is simply to allow the Institute to continue its operations at the same level as last year. This increase is lower than the actual inflation rate during the past year.

As professional body subscriptions go, the new rates are still modest. Council is, nevertheless, very conscious of the need for the Institute to provide value for the subscriptions — both to those members who are more interested in our role as a professional body and to those for whom the learned society role is more important. Both of these aspects of our work are heavily dependent upon the efficiency of the executive office of the Institute. We are confident that members will see clearly that the payment of this comparatively small surcharge on subscriptions will ensure that the Institute will continue in the nineties to provide the value that we now enjoy.

G. B. Petersen
President

Letter To The Editor

NZCS Syllabus

Sir,

Last year I had six weeks leave of absence from the Wellington Polytechnic under the Technical Institutes Industrial Refresher Leave scheme. I made a particular point of visiting NZCS students and past students in their work environments to gain some idea of the relevance of our chemistry syllabii to the laboratory work our students do.

I finished my leave convinced that a number of the topics and techniques that we have in our syllabii are there for no better reason than they are in standard text-books first published thirty or forty years ago.

I would be interested in any opinions as to whether some of the following techniques and topics could be eliminated from our syllabii:

— Colligative properties and the use of Beckmann thermometers to measure boiling point elevations and freezing point depressions for molecular weight determinations. In eighteen years teaching chemistry in a Technical Institute I have never come across an NZCS student who has seen, much less used, a Beckmann thermometer. Even if there is a need to measure very small temperature changes nowadays, there are digital electronic thermometers that will read to 0.01°

— Electrogravimetric analyses either by the controlled current or the controlled potential method. The technique seems to be limited to copper in brass. I have never visited a brass foundry to see if this technique is used to any extent. The best opinion I could find is that it would be more economical to send samples to an analytical laboratory to be done by A.A. rather than employ a technician to do electrogravimetric analyses.

— The use of a mercury cathode to separate aluminium and iron in alloys. (p. 529 Vogel 4th edition). Not everyone has an inductively coupled plasma instrument but surely this technique has been superseded by techniques like A.A.

— Is there any possible use for teaching the chemistry of black and white photography? It is quite interesting but who uses black and white photography apart from journalists?

Yours sincerely

G. Naish,
Chemistry Tutor,
Wellington Polytechnic.

ANZAAS Medal Award

The ANZAAS Medal is awarded annually, usually at each ANZAAS Congress. As the next ANZAAS Congress is to be held in Palmerston North, it is especially appropriate to consider whether there are any New Zealand scientists who should be nominated for the award.

The ANZAAS Medal is awarded for services in the advancement of science, including research activities, the teaching of science, or any other activities which have advanced science.

Nominations for the award may be made by any member or fellow of ANZAAS, and must be submitted at least six months before a Congress.

For further information contact the Executive Officer, Royal Society of NZ, Private Bag, Wellington. (Closing date 1 June, 1986).

THE 1986 BRANCH CHAIRS

In February we looked at the 3 southern-most branches. We now move north to complete the 'collection'.

MANAWATU — D. F. NEWSTEAD

David Newstead has been a member of the Institute since 1966, having served three terms on the Branch Committee. He received his secondary education at Christchurch Boys' High School and in 1965 he graduated MSc (hons) in physical chemistry from the University of Canterbury. In 1970 he received his PhD from Massey University, having studied physiological genetics and protein chemistry.

David joined the NZ Dairy Research Institute in 1968, starting in the Protein Chemistry Section with work on immunochemical methods and heat coagulation of milk protein systems. In 1970 he moved to the Milk Powder Section of the Institute, continuing work on the latter theme in relation to recombined (i.e. from milk powder and milk fat) products.

He spent 1978 in Germany studying processes for continuous flow ultra high temperature (UHT) sterilisation of milk products. In a shift to the Product Use and Evaluation Section in 1983, David continued his work on recombined and UHT processed products.

David now heads the newly-formed Aseptic Processing Section of the Dairy Research Institute. His main area of publication is on the heat coagulation of concentrated milk systems, with some excursions into the chemistry of early lactation milk and other areas of dairy chemistry.

WAIKATO — K. M. MACKAY

The Waikato Branch Chairman completed his B.Sc. at Aberdeen and his PhD at Cambridge in 1960. He then lectured in Inorganic Chemistry at Nottingham University from 1960-1970. He was appointed as Reader in Chemistry on the founding of the School of Science at the University of Waikato in 1970 and was made Professor in 1979. His main teaching and research interests are Inorganic and Organometallic chemistry, particularly of the germanium hydrides. In recent years the emphasis has been on work involving germanium-transition metal clusters. (*Chemistry in New Zealand*, December 1984). Professor Mackay has been a member of the NZIC since 1970 and was Chairman of the 1977 Conference Committee. He is currently Chairman of the Inorganic and Organometallic specialist group.

AUCKLAND — G. R. CLARK

George Clark was born in Hamilton, educated at Mt Roskill Grammar School, and attended Auckland University where he graduated BSc, MSc (Hons), and PhD in Chemistry. His post-graduate studies were supervised by Prof. D Hall and Prof. T N M Waters. In 1968 George was awarded a Post-Doctoral Research Fellowship with Prof. G J Palenik at the University of Waterloo, Canada, and returned to a Lectureship in Chemistry at Auckland University in 1970. He was promoted to Senior Lecturer in 1974 and to Associate Professor in 1983.

He spent a sabbatical leave at the University of Leicester, U.K. in 1977 working with Dr D R Russell.

George's research interests are in the area of structure determination by single crystal X-ray diffraction techniques, with particular interest in structure elucidation of organometallic complexes and compounds of biological significance. He has been a Member of the Institute since 1974, and was elected Fellow in 1982. Institute activities have included two years on the branch committee. Family activities, with his wife Alison and their four children, occupy much of George's spare time, and his hobbies include playing bridge and deerstalking.

CONFERENCE — 1986

1986 NZIC/NZBS Annual Conference

Sunday 24 August — Thursday 28 August

10th Conference of the Australian and New Zealand Society for Mass Spectrometry

Tuesday 26 August — Friday 29 August.

Plans are now well advanced for a very special conference programme in Dunedin in August. Two major conferences, the annual NZIC/NZBS meetings with a conference theme "Applications of Modern Instrumentation", and the 10th Conference of ANZSMS have been organised with partial overlap. Although delegates may enrol for either meeting, joint enrolment for the two conferences will afford delegates with a choice of lectures in an outstanding scientific programme. The conferences follow the meeting on "Genetic Manipulation" at Hanmer Springs and a large number of international biochemists have expressed a firm interest to participate in the Dunedin meeting.

In recognition of the entry of New Zealand chemists into the use of the new generation NMR spectrometers the Committee has arranged a one day symposium on "Applications of Nuclear Magnetic Resonance Spectroscopy". Invited speakers include **Dr Peter E Wright** (Scripps Clinic, California), **Dr George Gray** (Senior Applications Chemist, Varian, Palo Alto) and **Dr Larry R Brown** (A.N.U. NMR Centre). The biochemical programme includes a symposium entitled "Molecular Evolution and Genetics" with the President, **Professor G B Petersen, Dr Greg Winter** (MRS Laboratory of Molecular Biology, Cambridge), **Dr Neil Isaacs** (St Vincents Institute of Medical Research, Melbourne), **Dr Tom Caskey** (Baylor College of Medicine, Houston), **Dr Richard E H Wettenhall** (La Trobe University) and **Dr Darryl Reanney** (Science Focus, Melbourne) as participants. Invited overseas speakers for the NZBS Symposium in honour of **Professor B H Howard** include **Dr Colin W Jones** (Leicester University), **Dr Tom Bauchop** (The University of New England, Armidale) and **Dr Ken Nickerson** (University of Nebraska). "Applications of Mass Spectrometry" is to be the topic of a special joint NZIC/ NZBS/ ANZSMS Symposium on Wednesday 27 August when speakers will include **Professor Maurice M Bursey** (University of North Carolina) **Professor James A McCloskey** (University of Utah) and **Mr Ron Self**, Food Research Institute, Norwich. Other invited speakers in the ANZSMS Conference will include **Professor Peter J Derrick** (University of New South Wales), **Professor Ben S Freiser** (Purdue University), **Professor Arnis Kuksis** (Banting and Best Department of Medical Research, University of Toronto), **Professor Vernon Rinehold** (Harvard School of Public Health) and **Professor Helmut Schwarz** (Technical University of Berlin). Besides the usual specialist meetings there will be a joint meeting with the Australasian Society of Clinical and Experimental Pharmacologists at which "Problems in Clinical and Environmental Toxicology" will be discussed. There will also be a symposium organised by the Testing Laboratory Registration Council of New Zealand with Industrial Quality Assurance as the theme.

A second circular containing enrolment forms and the call for papers will be sent out shortly. Enquiries should be addressed to Dr John Cutfield, Department of Biochemistry, University of Otago, P.O. Box 56, Dunedin.

Conference Guests (See pg. 41)

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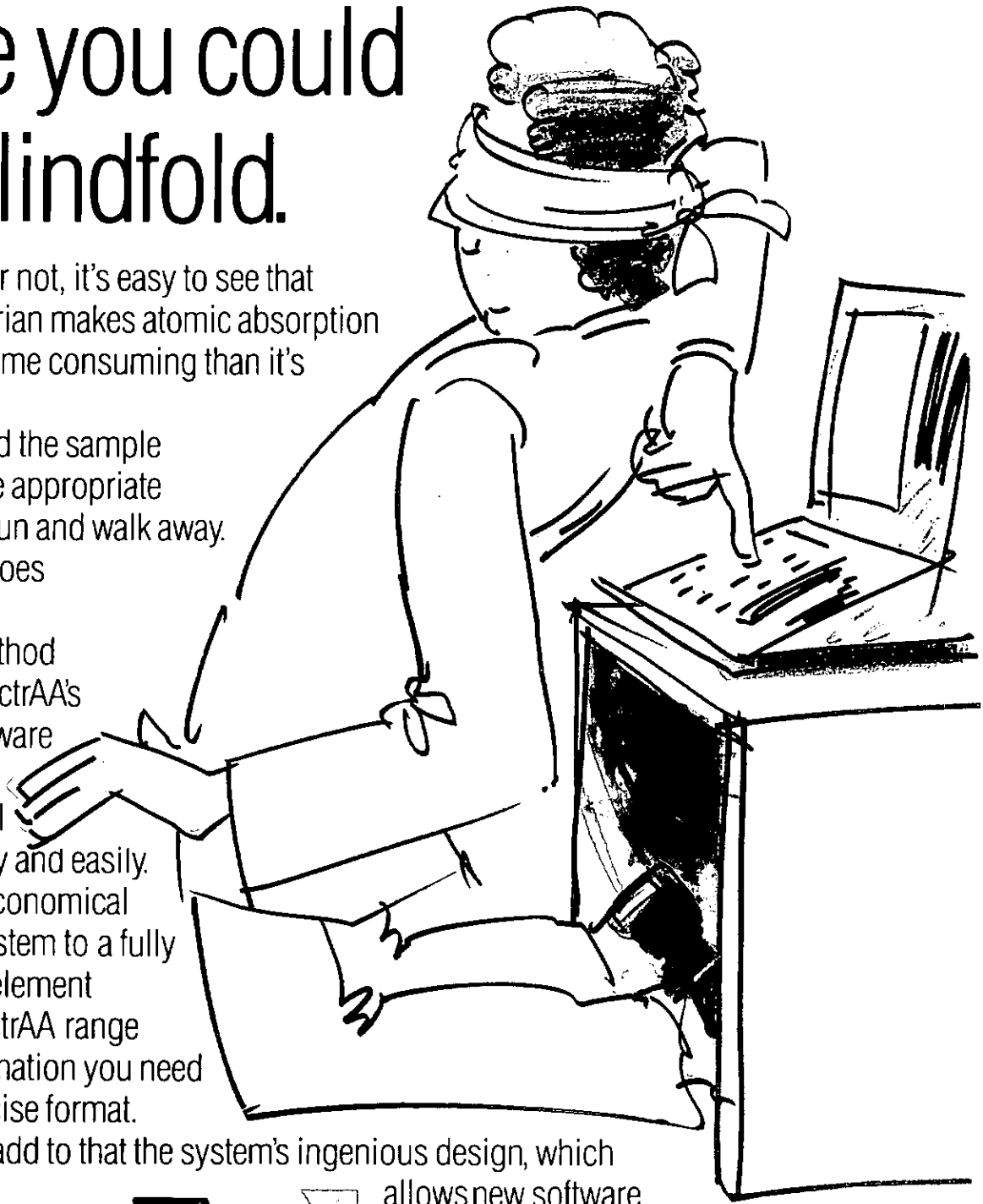

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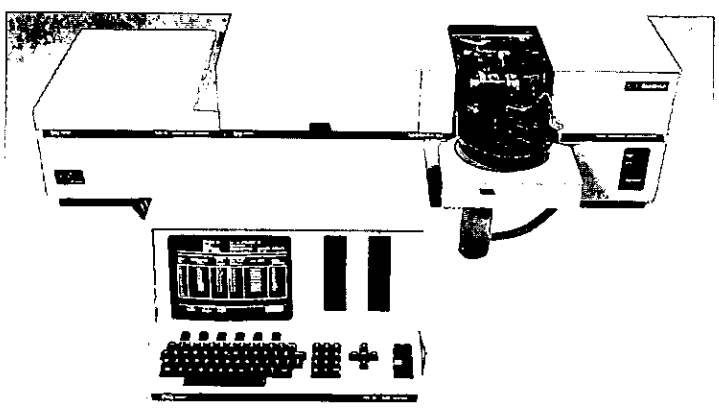

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HAEMOGLOBIN:

MORE THAN JUST AN OXYGEN CARRIER

Easterfield Address, Christchurch Conference 1985

Tom Brittain was the recipient of the Easterfield Medal in 1984. As a condition of the award the successful candidate is usually required to present an address at the annual conference of the Institute, in the year following the award. The following is a summary of the text of Tom's address to the Christchurch conference in August of last year.

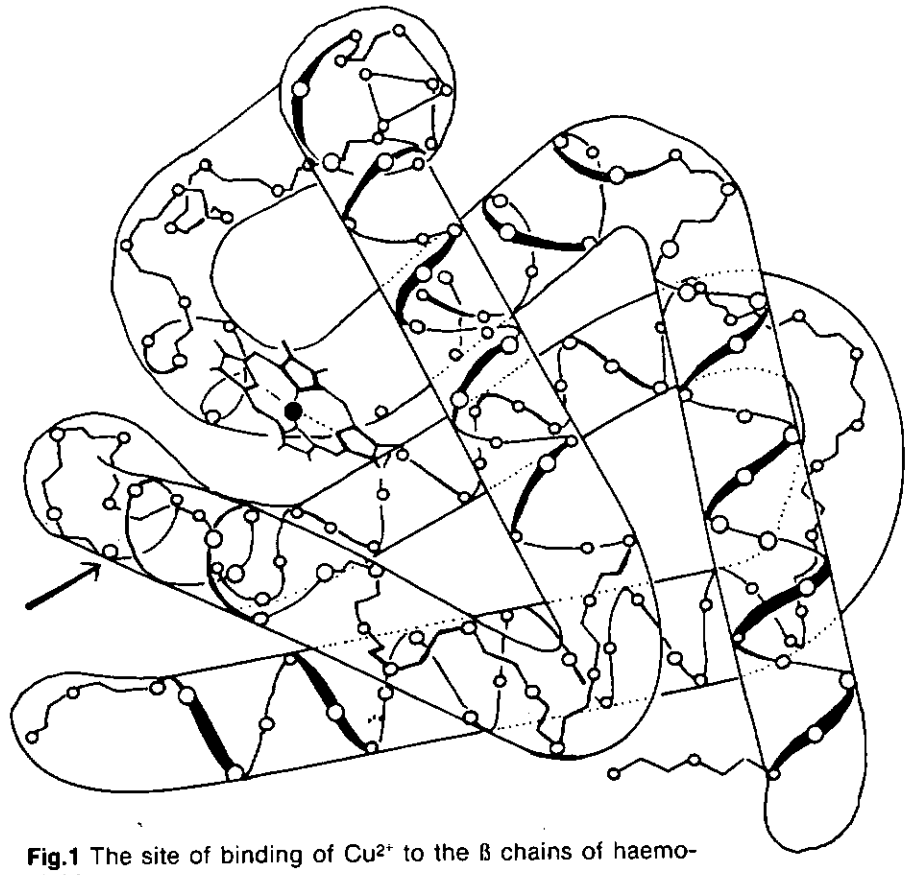

Fig.1 The site of binding of Cu^{2+} to the ß chains of haemoglobin.

The haemoglobin molecule has been of significant interest to a wide range of scientists for many decades. On the one hand it has been of great interest to the crystallographic community, being one of the first large proteins for which a crystal structure was obtained by Perutz in the 1960's. Since that time its structure has been refined to such a degree that most of the atoms in this 65,000 molecular weight protein can now be positioned in three dimensional space in both the oxygenated and deoxygenated forms. At the other end of the scientific spectrum respiratory physiologists have studied the molecule mainly in terms of empirical parameters and of comparative investigations of the oxygen binding and transport roles.

Over the past ten years or so my own interests have fallen somewhat between these two extremes. In general I have been interested in the chemical reactivity of the globin protein and its haem group. I have also used haemoglobin as a model on which to test mathematical models for protein co-operativity and more recently I have studied some quantitative aspect of haemoglobin production and function in terms of mammalian development. I would now like to review each of these areas in turn —

(a) **ELECTRON TRANSFER WITHIN THE GLOBIN PROTEIN CHAIN:**

Under normal circumstances, each day during the 120 day life time of continuous circulation of the red blood cells, approximately 2% of the haemoglobin in our blood is oxidised to the non functional ferric state. Within the red blood cell are a range of enzymatic systems whose role it is to re-reduce this oxidised haemoglobin back to the oxygen carrying ferrous form. Under conditions of oxidative stress these re-reduction mechanisms may become overloaded leading to the state known as methaemoglobinaemia. One agent capable of oxidising haemoglobin is the cupric ion. In order to better characterise this action I have studied the reaction of cupric ions with purified haemoglobin. The reaction is modestly rapid and requires the use of stopped-flow for its investigation. These studies have shown that in the deoxygenated form haemoglobin reacts in a simple bimolecular process, whilst the oxygenated form reacts via an intermediate complex. The copper atom has been shown to bind to a particular thiol group present on the ß chain at position 93 in the amino acid sequence (Fig 1). Thus electron transfer does not occur directly to the haem iron atom but at an amino acid site somewhat removed

from the haem group. An examination of the X-ray structure of the ß chains of haemoglobin shows that the cysteine amino acid to which the copper atom binds occurs on a section of helix opposite the haem ligand histidine residue. It is thus tempting to speculate that intramolecular electron transfer to the copper binding thiol occurs from the haem group via the delocalised electron system of the histidine imidazole group, very much in the same way that delocalisation is envisaged to occur in the charge relay system of the serine protease enzymes. The question arises as to why haemoglobin should possess such an electron transfer system?

Indeed the thiol at position 93 of the ß chain is conserved in all known haemoglobins. The answer may well be that this electron transfer system is present to facilitate the transfer of an electron from the oxygen radical to the outer surface thiol, where the well known thiol radical scavenging systems of the red blood cell can render the radical non-toxic. In this way the red blood cell would be protected from the toxic effects of oxygen radicals produced at the haem site as a consequence of the normal autoxidation process.

(b) **HAEM REACTIVITY**

Although the biological role of the haem group is to provide a suitable iron binding site which facilitates reversible oxygen binding and hence oxygen transport, under certain circumstances the haem can undergo covalent chemical modification. As well as the autoxidation process already outlined, in the presence of certain redox-active organic molecules, oxygenated haemoglobin can produce a hydrogen peroxide derivative. Normally this peroxide would break down to yield oxidised haemoglobin and hydroxyl radical. However in the presence of a source of sulphide a sulphur atom can be inserted into the periphery of the haem group to yield an episulphide (Fig. 2). This species then contains a chlorin, rather than a haem group. It is thus emerald green in colour! This reaction, although not normally common, does occur under treatment with certain redox active drugs and also in cases of chronic constipation(!), where normally excreted sulphide builds up in the blood stream. My own interest in this system was in characterising the green sulphaemoglobin product of this covalent modification. The sulphaemoglobin has an extremely low oxygen affinity and so I chose to study its carbon monoxide binding properties. Haem proteins normally show an approximately 250 times higher affinity for carbon monoxide than for oxygen, whilst retaining the same mechanism of binding.

Using stopped-flow, flash-photolysis and combined stopped-flow flash-photolysis it was possible to obtain mechanistic information on ligand binding to this modified haemoglobin. The protein shows a low affinity, appearing to be trapped in an unreactive structure known as the T-state. In addition, at least at low concentrations, the reactivity of this protein is predominantly controlled by dissociation of the normal tetrameric structure into dimers. The validity of the proposed mechanism has been checked by means of computer simulations.

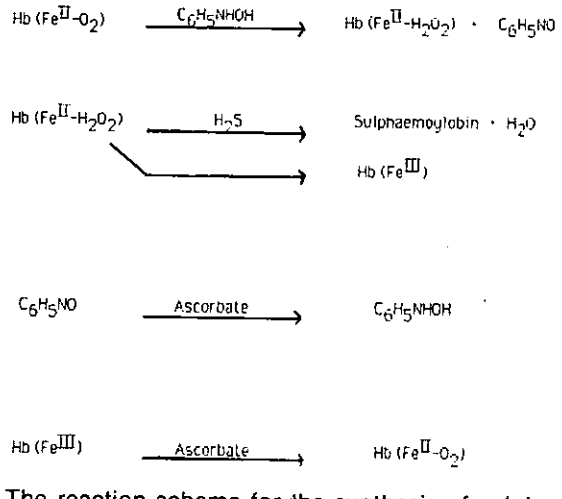

Fig.2 The reaction scheme for the synthesis of sulphaemoglobin.

(c) **A NUMERICAL DESCRIPTION OF CO-OPERATIVITY**

In the mid 1960's Monod, Wyman and Changeaux devised a numerical description of the co-operative functioning of proteins (Fig.3). According to this model the sequentially increasing affinity for oxygen of the subunits of haemoglobin arises from the progressive transformation between two states. These two states are envisaged as being different arrangements in space of the four subunits of the protein. In the deoxygenated form of the protein both states exist in equilibrium with the low affinity T state predominating. In the oxygenated form again both states exist, but in this case the high affinity R state is overwhelmingly dominant. The process of oxygenation then occurs as each subunit sequentially reacts with oxygen.

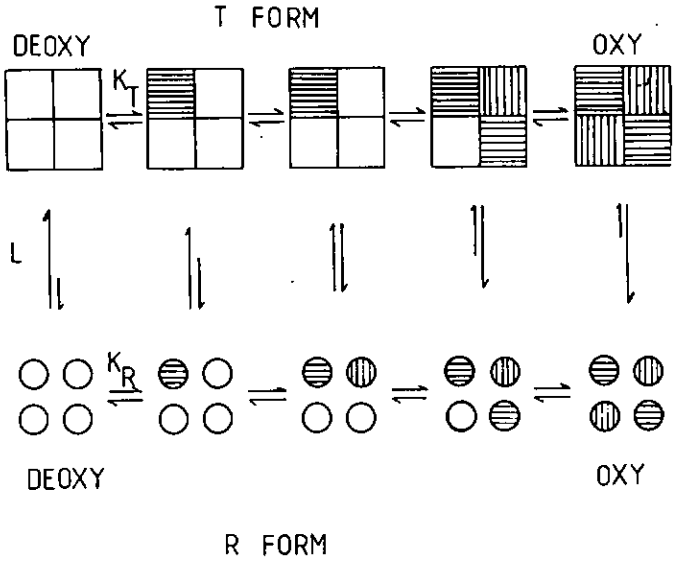

Fig.3 The two state model of co-operativity. K_R and K_T represent the equilibrium constants for binding to the two quaternary states of haemoglobin (T and R) and L represents the equilibrium constant between the two states.

In this model a catastrophic switch from predominantly T state to predominantly R state occurs at about half way through the oxygenation process i.e. when about two haems of the protein have bound oxygen. Hence the models other name — the concerted model. This model allows equations to be derived for the equilibrium oxygen binding process in terms of the affinity of the two states and an equilibrium constant describing the distribution between the two states. I have obtained haemoglobin from a wide range of species ranging from Antarctic fish, with a constant body temperature of -2°C(!), through slow swimming and rapidly swimming temperate fish, up to man. In all cases the two-state equilibrium model fits the data reasonably well. A closer investigation however, shows that other models fit just as well and so I have extended this work to include more definitive kinetic studies. In this situation binding rates are considered to be governed solely by the state of the haemoglobin tetramer. Again using the two-state model it is possible to derive equations describing the expected time course for the reaction. For reasons of simplicity the actual experiments employ flash-photolysis studies on the carbon monoxide, rather than the oxygen derivative. Combining equilibrium measurements with computer calculation of reaction time courses it is possible to compare the two-state predictions with the experimental data. For most of the systems let it suffice to say that the fit is excellent. For some systems however the model is not sufficient to account for all the experimental observations.

The net conclusion is that although the two-state model represents, at best, a limiting case, nevertheless it also represents the best general numerical description of co-operativity in proteins available today, even after nearly 20 years!

(d) **DEVELOPMENTAL ASPECTS OF HAEMOGLOBIN SYNTHESIS AND FUNCTION**

Although almost all of the work done on haemoglobin has been carried out on the adult protein (HbA), it has long been known that in mammals the individual synthesises different haemoglobins at each stage of development. Thus the adult synthesises almost exclusively HbA, which is optimised for oxygen exchange across the lungs. The fetus produces HbF which is optimised for oxygen scavenging from the maternal blood supply, across the placenta. At the pre-placental stage three poorly characterised haemoglobins have been identified in humans. Their role is to scavenge oxygen from the amniotic fluid surrounding the embryo. Over the past few years I have had an interest in the quantitative aspects of the synthesis and functioning of these early embryonic haemoglobins. We have used the mouse as a model system for studying these aspects and we have shown that the mouse produces three embryonic haemoglobins in much the same way as the human. Of these haemoglobins the earliest synthesised species, EI, appears to have anomalous non-cooperative oxygen binding characteristics. Moreover embryonic red blood cells have anomalous oxygen binding curves which show marked deviation from the normal sigmoidal curve associated with adult cells (Fig.4). By careful separation and analysis of the functioning of the individual haemoglobin components present in the embryo we have managed to show that the anomalous behaviour arises mainly from the presence of EI. Some recent studies I have carried out using laser photolysis experiments have indicated that the anomalous equilibrium properties associated with EI are also manifest as anomalous kinetic behaviour. Further investigations on this interesting system are currently in progress.

In conclusion I hope this sample of my work has, at least in part, indicated the wide range of interesting chemistry and biochemistry associated with haemoglobin, and that you will now agree with the assertion made in the title of this lecture:-

"Haemoglobin — More than just an oxygen carrier."

I would also like to take this opportunity to thank my collaborators in the various experiments described above.Dr R. M. Wells, Ms A. Pudie, Auckland; Dr V. Tetans, Aarhus Denmark; Professor C. Greenwood, Dr D. Barber, Dr J. Sutherland, Norwich, U.K.

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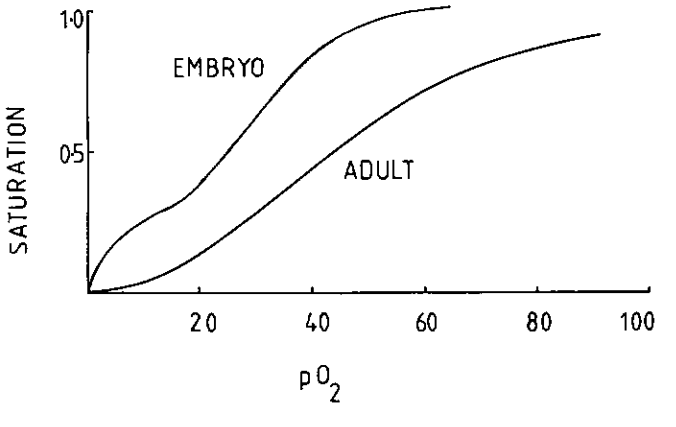

Fig.4 A comparison of the oxygen binding curves for adult and embryonic mouse blood.

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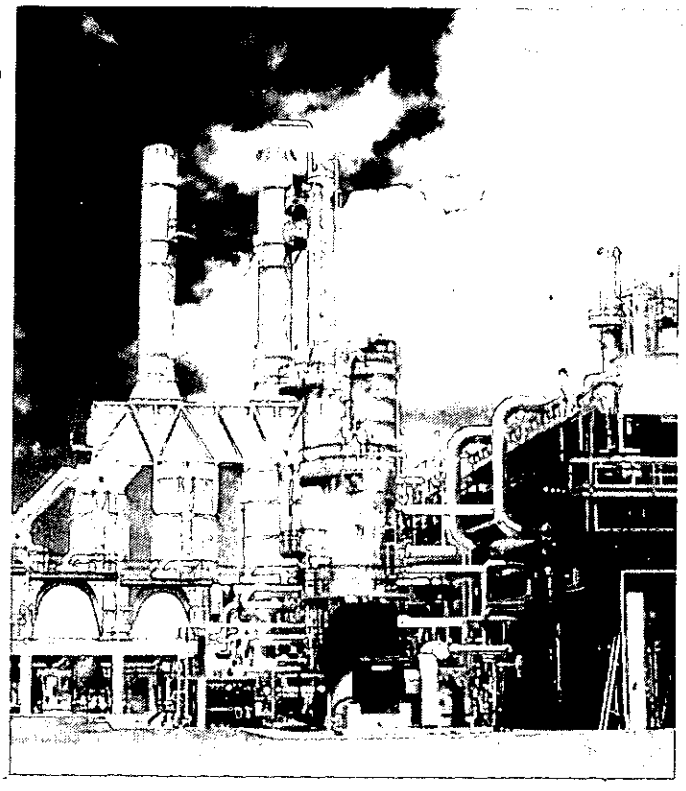

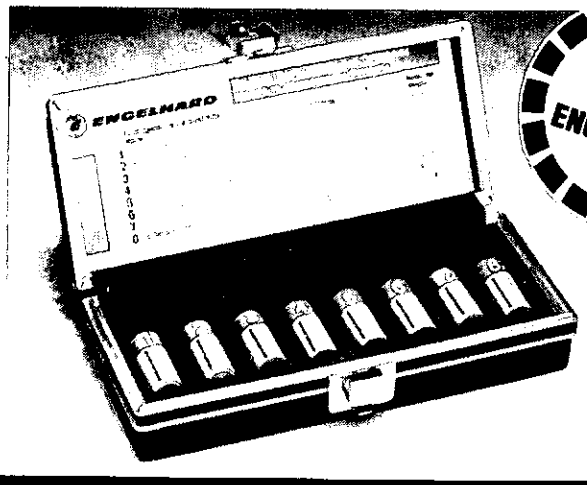

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Funding Of Science In New Zealand: A NEW SCENARIO

K. A. Hunter
B. H. Robinson
Department of Chemistry, University of Otago, Dunedin.

Even today, New Zealand is relatively isolated from other scientific communities, and does not have a major industrial research establishment to foster and develop first-class science. This, coupled with the fact that only about 1% of our GNP is earmarked for scientific research (the lowest in any developed country), makes research a difficult struggle at best. The high standing enjoyed by New Zealand science in the international scientific community testifies to the dedication, training and vitality of our research scientists.

But can this continue? This article seeks to highlight some of the problems associated with the current research funding system in New Zealand and suggests an alternative scenario.

1. Problems with Funding Research

Most researchers are only too aware of the frustrations involved in trying to maintain an active research programme within the present funding schemes. It is a difficult job to maintain the flow of funds, usually from different and unrelated sources, for salary support of research assistants and students, consumables, travel costs, publications and the purchase of major items of equipment.

It is tempting to lay the blame on a shortage of funds. While it is true that the overall funding of science in New Zealand does fall short of that maintained in other countries, we believe that the way in which research funds are distributed in this country does little to facilitate efficient, high-quality research that meets the needs of the community paying for it.

Some of the problems can be illustrated by reference to the universities where research is supported in several ways:

1. Direct state provision of student grants and scholarships.
2. Additional support for research students from departmental funds allocated for teaching support.
3. Departmental funds for consumables and minor research expenses allocated largely on the basis of student numbers.
4. Research funds set aside by some universities from their block grants for the purchase of items costing up to perhaps a few thousand dollars.
5. Support from the University Grants Committee and the Lottery Distribution Committee for the purchase of major items of equipment.
6. Funding from government agencies and industry for project-related research.

What problems does this funding structure produce for university staff who want to maintain a research programme with continuity and direction? Although most of the funds distributed by means of the categories listed above do in fact come from the same ultimate source (and are often administered by a small group of people), there is no systematic plan for connecting together the means for funding different essential parts of a research programme.

Moreover, because research funds are distributed under the different categories listed above, the allocation of money is affected by the political constraints that each allocating body is subject to. Probably the most important anomaly in this respect is the influence of the "numbers game", which means that a major part of the funds available to be used at the discretion of departmental chairmen is allocated on the basis of student numbers.

This is a consideration which has almost nothing to do with the level or quality of graduate research taking place in the department. And yet these are the funds that are often crucial to research continuity, because they are immediately available for the purchase of some minor chemical reagent or piece of equipment that has suddenly become essential, or to pay for the repair of an instrument that has broken down. Moreover, they are the funds used to support many of the graduate students who carry out supervised research.

Thus it happens only too frequently that expensive instruments purchased through UGC and related funds fall into a state of poor repair, or cease to be used, because of a lack of funds to support running costs and maintenance, or because a lack of ancillary teaching funds within the department has left the principal researcher unable to employ students as research assistants for the project.

The unco-ordinated nature of the present funding system also makes it extremely difficult to establish and maintain a coherent programme of research. Those of us who have run larger research groups know only too well the headaches involved in trying to co-ordinate funds for running costs with the arrival of new graduate students, much less to actually anticipate their needs well enough in advance to ensure that some item of equipment essential to the project arrives before the student has completed the thesis and left. Such a situation encourages waste (and empire-building).

The problems of establishing a research programme are especially difficult for young or newly-appointed staff members. In many instances the allocation of research funds is, in reality, based on a proven record of publications, numbers of existing and previous research students etc, making it difficult for new workers with good ideas to gain the kind of recognition the system requires. Inevitably, this will tend to concentrate funds in the hands of those who are already successful.

Unfortunately, this kind of problem must persist as long as we maintain the ad hoc assessment of proposals for funding that is characteristic of the present system. At the level of the UGC Research Committee, for example, it is impossible for those assessing a wide range of different proposals to have a detailed working knowledge of each branch of science to assist them in their decision-making.

While we would all like to believe that scientific merit plays a major part in the success or failure of attempts to secure research funds at this or any other level, the reality is otherwise. Even at a departmental level, it is very difficult for a head or chairman of department to be able to distribute funds in an effective way. More importantly, he or she should not have to make such decisions in the first place. It would be analogous to the editor of a scientific journal insisting on reviewing every paper submitted on his own, and never seeking an objective outside opinion.

It is, of course, difficult to reliably assess the overall scientific merit of any proposal within a framework that does not fund the research in the same overall way. We use a piecemeal way of funding and bringing together the essential components for the job, and as a result are forced to assess the work being proposed in a similarly piecemeal way.

Another feature of the present funding system is the practice of generally awarding to successful applicants only a fraction of the funds originally applied for. This is a curiously popular mannerism in all New Zealand public bodies, and is justified not only by the often erroneous assumption that the proposal was 'padded up' with a few nonessential extras in the first place, but also by the expectation that if any further funds are really required, then they can be obtained further down in the hierarchy. Not only does this encourage waste, but it makes a mockery of the idea that research proposals are scrutinised at all from the viewpoint of their scientific merit.

The lack of assessment made after research funds have been awarded is also to be deplored. Experience overseas would

suggest that this is one of the most important aspects of funding that agencies sponsoring research cannot ignore. It introduces a reasonable degree of scrutiny into the system to mitigate against abuses, and provides valuable feedback on the criteria being used to assess proposals in the first place.

Researchers should (and generally do) have to plan their research, justify it in terms of national or international scientific needs and cost out the salary, running costs and capital for major items of equipment. They should not have to jump to and fro within a funding system that at times makes the achievement of their objectives difficult and inefficient. With its limited resources and overall support of science, and with the problems of scientific isolation, New Zealand cannot afford to have an inefficient funding system that hampers productivity and creativity in any way.

2. Alternative Funding Systems

We believe that both efficiency and productivity in science can be achieved, that innovation and career satisfaction can be fostered and an environment created for better science by means of a more flexible funding system.

Our proposals are based on two precepts which we believe will serve to minimise, if not eliminate, some of the more serious problems alluded to earlier; project funding, and peer assessment.

Project Funding, in our proposed system, means that scientists would be able to seek from the one agency funds to cover consumables and running costs, salaries for technical staff or students and for items of capital equipment, where appropriate, in order to initiate or maintain a programme of research which has a definite theme.

By **Peer Assessment,** we envisage assessment not only of the scientific content of the proposed research project, but also of the funding aspects, e.g. of salaries, equipment requested and so forth. These peer reviews would be carried out by specialists working in the same scientific discipline as the applicant so that they are best able to make an informed appraisal of the project. It would be to the advantage of all concerned if overseas reviewers were included.

A Funding Structure

A National Sciences Council, or similar body, is desirable to oversee the funding of science and the allocation of resources at a national level, although we do not see such a body directly administering the grants. We would hope that active scientists from universities, government laboratories and industry would be encouraged to serve on the National Science Council for periods of time as full-time policy directors in much the same way that U.S. scientists of high calibre are seconded into the various funding offices of the National Science Foundation. One of the major benefits of this procedure is the current knowledge and creativity brought into the organisation by scientists who are in the most active phase of their career.

A three-tier system is envisaged for Universities (Fig.1). The bottom two tiers would presumably be combined for Government research institutions.

Funding at a national level would be competitive. A scientist seeking research support would submit a fully costed project proposal to the appropriate funding agency. This would be assessed on the grounds of its scientific merit and cost aspects by up to three independent referees. At least one should be an overseas expert in the area of research being considered. The referees would be directed to make their assessment on the basis of the originality of the proposal, the ability of the applicant to carry out the research proposed and the special requirements of the funding agency. The emphasis on expenditure would be for the emoluments of graduate and postgraduate workers, technical assistance, and for consumables and running costs of the project. The purchase of large, expensive items of equipment would not normally be funded at this level.

Funding at a local level would provide support for a broader research base and for routine science needs within an institution, taking into account its special activities and needs. The funds allocated at this level would be mainly for expenditure on consumables, project running costs (e.g. publication costs, fieldwork expenses), technical assistance and equipment.

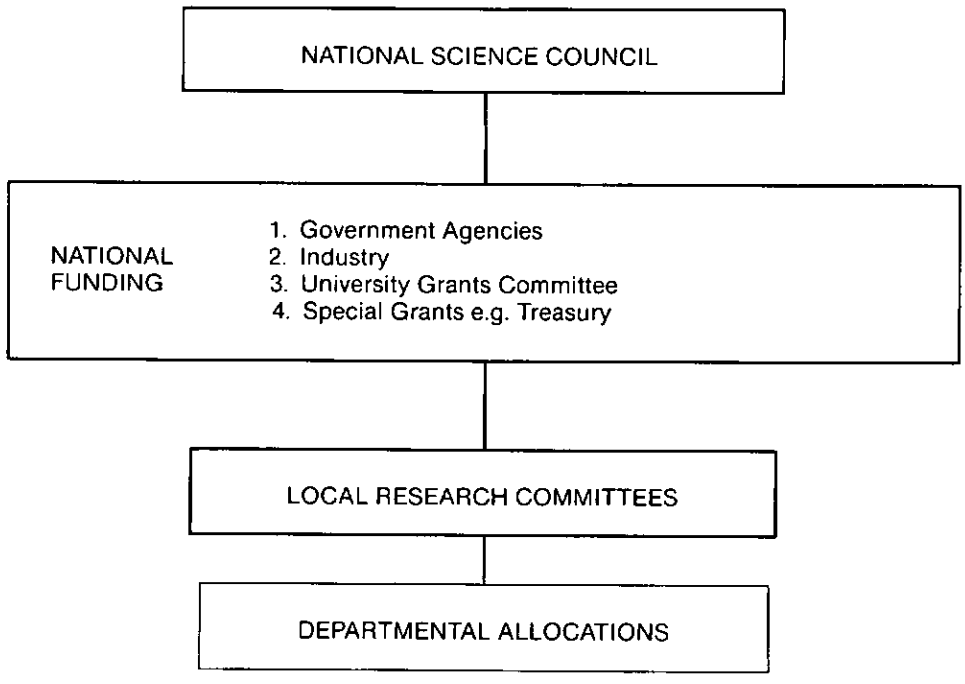
In the university situation research workers would be much less dependent on departmental funds for research costs and student emoluments, because much of the funding that now reaches departments for graduate research would be redirected through the national and local levels already discussed.

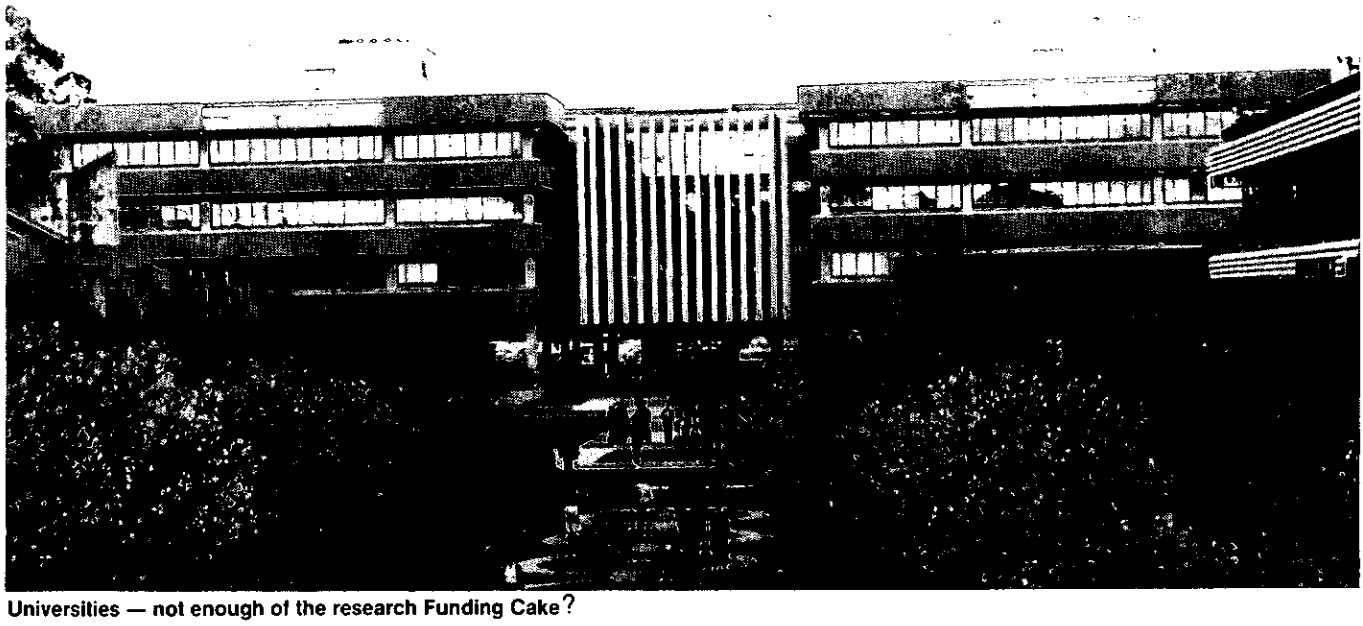
B. Granting Agencies

Three sources of funding at the national level which could operate under the aegis of a National Science Council are:

(i) Government agencies, e.g. the Liquid Fuels Trust Board, Medical Research Council. These agencies are likely to only fund 'relevant' research at the present time, but a more realistic approach to the funding of science is desirable in the future. Both University researchers and Government scientists would compete for this type of research grant. In some cases, the Universities may be in a better position to carry out some of the research work traditionally the province of Government research institutions. Correspondingly, opportunities for the joint supervision of graduate workers by Government and University scientists could be facilitated, as they are in France for example.

Figure 1. Structure of proposed funding scheme





Universities — not enough of the research Funding Cake?

(ii) Industry. With imaginative projects, personal contacts and generous tax incentives many companies may be prepared to sponsor 'speculative' as well as 'relevant' research, even if only as a long term investment in personnel. There is no doubt that this will be the future growth market in science funding that a National Science Council must penetrate. Industrial support of scientific research in New Zealand is abysmally low by comparison with our trading competitors, and the current tax regulations and entrenched attitudes of many business executives are largely to blame.

A practical method of involving industry in research funding would be to set up a system of awards for research projects to be carried out by graduate students similar to the CASE awards operated in the U.K. These could be administered directly by the UGC and other appropriate bodies, e.g. the DSIR.

(iii) University Grants Committee. While the UGC would be concerned wholly with University research funded through Treasury block grants, it should be encouraged to solicit funds from elsewhere, e.g. from industry, Government sources and overseas agencies.

We believe that the overall distribution of government-derived funds for research is greatly imbalanced in favour of government agencies, many of whom are not in the best position to conduct specific research programmes. Thus under the proposed project-based funding scheme, some of the funds currently allocated directly to government departments would have to be diverted to the UGC for distribution.

C. Types of Grants

National

(i) Total Project Grants. In this case, the full costs of the project would be met by the funding agency. These would include technical and graduate assistance, consumables and running costs, conference and related travel expenses and administrative overheads. Total project grants would be available only for projects of three years duration or more so that continuity of research is maintained and encouraged. The control of the project budget, once a project is funded and under way, would be under the individual control and discretion of the principal investigator. Where the latter is paid a part or whole of his/her salary from the grant (we believe this should be strongly encouraged, especially by the UGC) the investigator's institution would be expected to appoint temporary staff to cover the normal duties of the grant holder. In this way new blood can be brought into science.

(ii) Student Grants. Clearly there must be flexibility in the funding of post-graduate and post-doctoral students. The total project grants described above will automatically cater for a significant number of our best students, since they are most likely to be attracted to the good scientists. The UGC could therefore subdivide its present post-graduate awards into project-based awards and individual awards made on the basis of scholastic achievement. Numerically, the latter awards should dominate (we assume that the present number of scholarships supported by the UGC will increase to a more realistic level).

However, the latter student awards should not be mediated in any way by a desire to maintain a number parity between the various universities. Students should be encouraged to look seriously at the whole New Zealand scene before choosing a supervisor. We believe that getting the graduate population moving about within the country must be accorded high priority. The UGC could assist in this respect by maintaining a compendium of research projects available at different universities and making this available to scholarship recipients.

(iii) CASE Awards. These would be awarded on the same basis as the project-based student grants discussed in the previous section.

(iv) 'New Blood' Grants. These grants would be made available on an automatic basis to all new staff appointed to the Universities. They would be administered by the UGC and would provide for the support of one post-graduate student for three years together with a component for research costs.

(v) Treasury Grants. It is not the purpose of this article to address the vexed question of new technology funding and the replacement of expensive equipment. Nonetheless, it has become abundantly clear that the traditional sources of funding are now inadequate to cope with present needs for equipment updating (e.g. nmr, electron microscopes). Block grants similar to those given for computers are the only solution if we are not to become a Third World scientific community, nor suffer a major lack of funds for regular research activities in order to budget for several very expensive machines.

Local Grants

Within the university context, the areas of science funding traditionally covered by the UGC Research Committee would, other than for the large items of equipment (e.g. > $100,000) mentioned above, be taken over by the Universities to be funded at the local level. There would be a corresponding increase in the block grant to each institution, and this would be based on student numbers as at present.

3. Conclusions

The proposals for alternative funding of science put forward in this article take the emphasis away from scientific equipment and centre it on people and projects, the true resources of research. The proposals can be criticised as being idealistic and elitist. For this we make no apology, for we hope that discussion of the ideas will help to create a better environment for enthusiastic, vital and innovative science.

CONFERENCE GUESTS

Conference Guests

Professor Maurice M. Bursey. University of North Carolina at Chapel Hill.

Professor Bursey is a graduate of Johns Hopkins University, Baltimore, and was a lecturer there, and at Purdue, before joining the University of North Carolina in 1966. He has been the recipient of numerous awards including the Tanner Award for excellence in undergraduate teaching and has played a very active role in the affairs of the American Chemical Society in the North Carolina Section, the Analytical Division, and on the Advisory Board of "Accounts of Chemical Research". Recent publications report the application of a wide range of current mass spectrometry techniques including fast atom bombardment, field desorption, and thermospray liquid chromatography. He is the author of over 240 publications including several reviews.

Professor P. J. Derrick. University of New South Wales.

Professor Derrick, a graduate of King's College London, was appointed Professor of Physical Chemistry at the University of New South Wales in 1981 following earlier appointments at University College London and La Trobe University. He has also held visiting positions at universities in North America and Europe. He is a Malcolm Medallist of the Royal Society of Chemistry, a Rennie Medallist of the RACI, and a Ramsay Memorial Fellow. Current research projects concern intrinsic chemical and photochemical properties of biologically significant ions and their interactions with small molecules, intrinsic properties of industrially significant polymers, field-induced and laser-induced ionization at solid surfaces, and lifetimes and dynamics of small organic ions.

Professor Ben Freiser. Department of Chemistry, Purdue University.

Professor Ben Freiser was born in Pittsburgh, Pennsylvania and attended UCLA, where he obtained his B.S. in Chemistry (Summa Cum Laude) in 1971 and was named Phi Beta Kappa. He obtained his PhD from Caltech in 1977 where he studied the photochemistry of ions in the gas phase under the direction of Professor J L Beauchamp. While at Caltech he won the Herbert Newby McCoy Award in 1976 for "most outstanding graduate student in chemistry". He joined the faculty of Purdue University in September, 1976, was promoted to Associate Professor in July, 1982 and to Professor in August, 1985. He is currently the head of the Analytical Division. His research interests are in gas phase ion chemistry and photochemistry and Fourier transform mass spectrometry. He is the winner of the 1985 ACS Pure Chemistry Award, Fresenius Award, and ACS Akron Section Award.

Professor Vernon N. Rinehold. Department of Nutrition, Harvard University Medical School.

Professor Rinehold has a long term interest in the study of the structure of carbohydrate and glycoconjugate biopolymers initiated by post-doctoral studies which involved the purification and characterisation of porcine ribonuclease, a glycoprotein enzyme from the pancreas. With the aid of a Helen Hay Whitney Fellowship and support from the Division of Research Resources' Mass Spectrometry Facility he studied peak characterisation using gas-liquid chromatography/mass spectrometry at MIT. In 1976 Dr Rinehold was invited to join the Faculty of the Department of Biological Chemistry at Harvard Medical School where he expanded on his interests in glycoconjugate structure by establishing a program for Glycoconjugate Structural Studies (National Institutes of General Medical Sciences, NIH, 1979-1984). During this time a number of new techniques were developed to augment and improve the analytical chemistry of carbohydrates. Recent research efforts have been focused on high mass biopolymer structural studies using multiple analyzers, the characterization of bacterial oligosaccharides, and liquid chromatography-mass spectrometry interfacing.

Professor Helmut Schwarz. Technical University of Berlin.

After four years as a Technician in chemical industry, Helmut Schwarz studied at the Technical University of Berlin where he gained his PhD (1972) and his Habilitation (organic chemistry) in 1974. Appointments as Professor of Mass Spectrometry (1978) and Professor of Organic Chemistry (1983) at the Technical University of Berlin followed. He has held visiting professorships at the Ecole Polytechnique Federale de Lausanne (1979), The Hebrew University of Jerusalem (1983) and was Forchheimer Professor of the Lady Davis Foundation of Israel during 1985. Professor Schwarz also held an Overseas Fellowship at Churchill College, Cambridge in 1981. His awards include the Dozentenstipendium des Fonds der Chemischen Industrie (1978), and the Otto-Klung-Preis (1982). Professor Schwarz will lecture on two-dimensional mass spectrometry particularly as applied to sequencing cyclo- and pseudopeptides, but he has been involved in a wide range of research activities of theoretical interest as well as applications.

Mr Ron Self. A.R.C. Food Research Institute, Norwich.

Mr Self is Acting Head of the Scientific Services and Development Division of the Agricultural and Food Research Council's Food Research Institute, Norwich, U.K. An apprenticeship in food analysis, isolation, separation and purification for spectroscopic characterisation led to an interest in capillary column gas chromatography for flavour research in the late 1950's. During the 1960's attention was focused on the problem of coupling gas chromatography and mass spectrometry for the separation and on-line identification of the volatile components present in the headspace above cooked foods. In 1969 the ARC Mass Spectrometry Service was started to give wider access to the MS and GC/MS techniques developed, and since then collaborative studies with a large number of colleagues throughout the service have been used to demonstrate the potential of new accessories and new methods. Recently, interest has focused on the exploitation of desorption ionisation e.g. FAB for the analysis of involatile biopolymers, and thermally labile secondary metabolites and other minor components, including various glycosides e.g. the anthocyanins and the vegetable tannins and the latest developments relate to the use of conventional organic mass spectrometers for the quantitative analysis of mineral nutrients employing stable isotopes as tracers for turnover and availability studies.

Dr Peter E. Wright. Scripps Clinic and Research Foundation, California.

Dr Wright obtained a PhD in chemistry from the University of Auckland in 1972. He was a Post-Doctoral Fellow in the Inorganic Chemistry Laboratory at the University of Oxford from 1972 to 1976, was Lecturer and Senior Lecturer at the University of Sydney, Australia, from 1976 to 1984 and then joined the Department of Molecular Biology at the Research Institute of Scripps Clinic, La Jolla, California, USA. His research interests concern applications of high resolution NMR spectroscopy for investigating the structures and dynamics of peptides, proteins and other biomolecules in solution. Areas of particular interest include development of multiple quantum methods for simplification and analysis of protein NMR spectra, determination of structure-function and dynamics of proteins, and investigation of structure-function relationships in monomeric hemoglobins and myoglobins. More recently, he has taken an active interest in the pathways of protein folding and the use of NMR to identify nucleation structures in immunogenic peptide fragments of proteins.

Annual Conference — 1987

A start has been made to prepare for the August 1987 conference which is to be held in Auckland. **Dr Peter Nelson** has been appointed chairman of the conference organizing committee and **Paul Farr** the secretary.

They promise a conference with a difference and are anticipating a debate on the contrast between academic and industrial chemistry. As well as this the specialist groups of the Institute will be organising activities. So far the electrochemical, forensic, education, polymer, and oil and fats group have indicated that they will be participating.

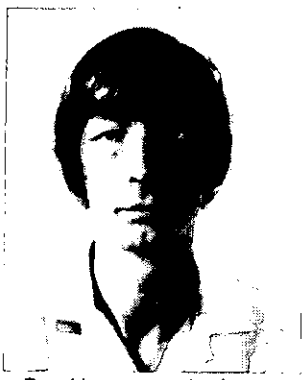
To involve our industrial members there will also be sessions on the importance of effective dialogue between academic and industrial chemists and on the support the institute can offer the chemist working in isolation in industry. These should be of interest to upper company management.

The secretary and chairman would welcome suggestions and contributions for speakers, topics etc, particularly those related to industrial chemistry. If you have any please contact Paul Farr, c/-QuikStik International, P.O. Box 76221, Manukau City, Ph 278-0939.

UNIVERSITY NEWS

Waikato

The new Head of the Chemistry Department is **Dr Derek Smith.** Derek has a BSc from St Andrews (1965) and a D Phil from Oxford (1968). He was an ICI Research Fellow at Sheffield from 1968 to 1970, and then held a temporary lectureship at the same university until his appointment to the staff at Waikato in 1973.



Derek's research interests are in liquid field theory, molecular orbital theory as applied to metallic structure and bonding, and inorganic thermochemistry. He recently returned from study leave at Cambridge where he was successful in getting underway a book ('A Guide to the Study of Descriptive Inorganic Chemistry') which will be published by the Cambridge University Press in 1987 or 88. He also attended the IUPAC Congress in Manchester.

We have been pleased to welcome **Professor Heinrich Vahrenkamp** from Freiburg, who spoke on recent work on organometallic clusters, and **Professor Hubert Schmidbauer** who gave a seminar entitled "Silicon, Gallium and Gold: Elements with a relevance for the Microelectronics Industry". Other visitors included **Dr Alan Thomas** from Switzerland, who spoke on Monoterpenes, and **Dr Jan Harding** of Chelsea College who addressed a seminar on Chemical Education.

We congratulate **Glen Barris** and **Jan Whittaker** who have been awarded UGC Scholarships to undertake D Phil studies. We also welcome **Miranda Service** who graduated from Heriot Watt University, and joins us to do D Phil studies on a Petroleum Research Fund Scholarship.

Auckland

The start of the new academic year sees the appointment of two new professors at Auckland. **Chairman J. O'Connor** has been awarded a personal chair, while **R. P. Cooney** takes up the Chair in Physical Chemistry.

Three recent visitors from overseas who will be with us for the next few months are **Professor J. H. Lunsford** from Texas A & M University, **Professor B. L. Shaw,** University of Leeds, and **R. S. Smythe** of the James Cook University, Queensland.

ATI

Mr David Wilkins of Auckland Technical Institute is now on industrial leave until May. He will be visiting Pharmaceutical Sales and Marketing, MAF Lynfield laboratories, Ruakura Research Station, MRINZ, Economics Laboratories, NZ Refining Company, NZFP, and Sci-Med.

Auckland Technical Institute has opened a Teachers Refresher Course, designed to give science teachers a chance to practise the laboratory skills they are required to teach. The course organiser, **Dr Roger Whiting,** described the response as pleasing, with twelve teachers enrolled for the initial block.

Canterbury

Dr Ward Robinson visited China to teach scientists to use certain computing systems for X-ray crystal structure analysis, December 1985 — February 1986. He also visited the United States.

Dr Robinson has worked closely with the Nicolet Instrument Company in developing computer programs in the laboratory at Ilam and the collaboration led to an invitation to teach Chinese scientists at the Beijing Technical Institute, the Cheng-du Academy of Science, the Beijing Academy of Science and the Changchun Academy of Science.

Each of the institutions has equipment similar to that at Canterbury and Dr Robinson's task was to provide instruction in the use of the computing systems supplied by the manufacturer, for X-ray crystal structure analysis, as well as software he developed for controlling X-ray data collection experiments.

In January, Dr Robinson visited the United States for further consulting, one result of which was that he will continue to obtain pre-release versions of Nicolet software containing improvements in addition to those he originated. He also consulted with the Crystalytics Company and visited several university laboratories with equipment similar to that at Canterbury.

Dr John Blunt attended the IUPAC Symposium in Shanghai and visited the Harbor Branch Foundation and other institutions in the U.S.A. while on leave, 9 November — 13 December 1985.

Dr Jim Coxon has been awarded a Claude McCarthy Fellowship. He will be visiting the University of Florida, March-May 1986.

Dr Alan Happer has returned from twelve months study leave at the University of Sussex with Professor C. Eaborn.

Dr Chris Easton is resigning in May to take up an appointment at the University of Adelaide.

Manawatu Polytechnic

Dr Ken Whittle was recently promoted to Head of the Science and Electrode Technology Department of the Manawatu Polytechnic. Ken was Branch Chairman in 1984, and Council Delegate for the last two years.

Otago

In the Chemistry Department, **Assoc. Prof. Ross Grimmett** has returned from a year at the University of Exeter where he was researching and writing chapters in collaboration with Dr Brian Keene and Prof. Ken Schofield on the chemistry of monocyclic azines. He also worked on nucleophilic displacements in sterically crowded iodonitroimidazoles, and performed some exploratory work on the phase-transfer alkylation of imidazoles with dihaloalkanes. During the year he travelled north to give research talks on azoles at Durham, Edinburgh and Glasgow Universities. One of the highlights of the year was the spectacle of

Dr Rob McKeown (Pharmacy Department) ensconced in the Royal Society of Chemistry Library in Burlington House entirely surrounded by tall piles of open volumes of chemistry journals, oblivious to the dangers of imminent avalanche and to the discomfort of the distraught librarian ruefully surveying his empty shelves.

Prof. B. H. Robinson attended the RACI Inorganic Chemistry Conference in Melbourne in January where he presented a paper on electron transfer in acetylenic clusters. While in Australia, he also investigated Fourier Transform I. R. instruments at the Digilab Laboratories in Sydney.

Prof. Heinrich Vahrenkamp, from the University of Freiburg, F.R.G., will be spending 3 weeks with Prof. Robinson's Group in March during which time he will lecture and carry out some research. **Wayne Webley** has returned from post-doctoral studies at Caltec and is currently working again with **Prof. D. A. Buckingham's** Group as an Otago University Research Fellow.

The Pharmacology Department has received a grant of $45,000 from the N.Z. Lottery Board Medical Research Distribution Committee for HPLC analytical equipment to support several departmental studies. The equipment is to include pumps, injectors and fluorimeter and coulometer detectors. **Dr Ralph Edwards,** Assoc. Prof. of Clinical Pharmacology, is currently on study leave, in the course of which he will be studying the activities of European centres concerned with adverse drug reactions and poisons control.

In the Nutrition Department, **Dr Laurie Melton** has received a grant from the N.Z. Kiwifruit Authority for research into changes in pectic substances during the ripening of kiwifruit.

From the Department of Biochemistry, **Dr Kevin Farnden** has attended the DSIR Biotechnology Workshops:- "Prospects for Biochemical Production from Cultures of Plant Cells", and "New Developments in Biochemical Processing". Also attending was Otago Biochemistry graduate, **Dr Brian Mansfield,** who returned recently from post-doctoral studies at the John Hopkins University School of Medicine, Baltimore, with Nobel Laureate, Dan Nathans. Dr Mansfield will take up an appointment in Genetics and Microbiology at Massey University. Another Biochemistry graduate, **Dr Gary Hayward,** now a senior scientist at John Hopkins University where he is researching into the molecular genetics of Herpes and related viruses, will visit N.Z. in March.

Current graduate students on the move include **Yvonne Kuys** who has left for Heidelburg for further studies on a DAAD fellowship, and **Cheng Chi Lee** who leaves for Houston in March for post-doctoral studies

Cont'd on pg. 45

GOVT DEPTS & RESEARCH INSTITUTES

BUILDING RESEARCH ASSOCIATION

Helen Brown has joined the Building Science Section at BRANZ as a Materials Scientist. Helen has recently completed her Masters degree at Canterbury University.

Dr Peter Foster will be attending a CIB board meeting in Dublin at the end of April. On route to this meeting he will visit the China Academy of Building Science in Beijing. He will also be looking at building controls in England and visiting the National Research Council of Canada and Forintek (also in Canada) on the way home.

FERTILIZER MANUFACTURERS RESEARCH ASSN

Mr Leith Gibson has left FMRA to take a position with ChemTest Laboratories.

MOWD

Dr Dave Smith, a scientist at the Water Quality Monitoring Group, M.W.D., Hamilton, has been awarded a RSNZ Prince & Princess of Wales Science Award, to visit a number of water management agencies in the United Kingdom, and to discuss with the Department of the Environment, the setting up of their national water quality monitoring network. It is hoped information gained will have application in New Zealand.

WOOL RESEARCH ORGANISATION

Rex Stewart, John McKinnon and **Campbell Page** report that after several years research and development, the continuous chemical setting and scouring process for carpet yarns is about to become a commercial reality. In early April the first "Chemset" plant will be commissioned in Christchurch, closely followed by two further plants in the North Island. Each plant costs approximately $1 million, with approximately 70% N.Z. made components, and further sales in NZ as well as overseas are envisaged.

DSIR

Wheat Research Institute

Mr Bob Cawley retired at the end of February after nearly forty years involvement with the wheat industry in N.Z. This ranged from research into wheat and flour quality, to 15 years spent as Director of the Wheat Research Institute.

Dr Nigel Larsen presented a talk titled "Harvest Testbaking and Quality Control" to Quality Bakers NZ Ltd flour seminars in Hamilton, Palmerston North and Christchurch during March.

Chemistry Division, Christchurch

Rob Martin has joined the staff to work on microorganics in the environment and **Marion Cowlishaw** has been appointed to the Toxicology Section after working for the Clinical Chemistry Department of the Christchurch Public Hospital.

Mr B. I. Mattingley, late of the Cawthron Institute, has been appointed to the Water Section.

Chemistry Division, Wellington

The following staff have been appointed to Chemistry Division.

Dr C Cardile. Solid State Section; **Mr K H Patterson.** Spectroscopy; **Mr H Ranchod,** Geochemistry; **Mr D H Marston,** Instruments; **Dr R Blattner,** Applied Chemistry; **Dr D Fenemor,** Food Section; and **Dr R S Temple,** Computing Science.

The Divisional request for fragments of the pink terraces to study their chemistry has evoked an enormous response from the public, and a few apparently genuine samples. The pink colour appears to be caused by the presence of antimony and arsenic sulphides, which also occur in existing geothermal waters.

Recent visitors to Chemistry Division include The Prime Minister of South Korea, who was interested in the Geochemistry Section and the ceramics studies carried out by the Solid State Section.

Dr R L Williams, Director of the Metropolitan Police Forensic Science Laboratory, and **Prof. H L MacDonell,** Director of the Laboratory of Forensic Science at Corning in New York, also visited the Gracefield laboratory.

Professor Sun Dawang and **Mr M A Zichao** from Nanjing University of Forestry are visiting Chemistry Division as part of a collaborative study on the chemistry of condensed tannins of Chinese commercial plant materials. This work is being carried out with **Dr Yeap Foo** in the Organic Section.

Dr D Bibby, Head of the Inorganic Materials Section recently attended a two day workshop on fuel conversion research at the CSIRO Division of Material Science, Melbourne. This workshop was organised by the NERDDC to assess present and future priorities in catalyst research in Australia.

HEALTH DEPT

Brian Cavit has resigned from the National Environmental Chemistry & Acoustics Lab in Auckland, to study for a degree in theology at Knox College in Dunedin.

Inorganic Chemistry '86 (Melbourne) — Some New Zealand Impressions

This Conference, the successor to the COMO series, was held at the University of Melbourne on 28th-31st January 1986, organised by a committee chaired by Prof. Tom O'Donnell and with Dr Peter Tregloan as secretary. Although neglected in the publicity, this conference continued the series mounted by the RACI Inorganic Division with the support of the NZIC Inorganic and Organometallic Specialist Group. New Zealand provided about a tenth of the 200 participants.

An excellent list of plenary lecturers was headed by Nobel daureates, Henry Taube and Roald Hoffman, ably complemented by Professors W. Keim (Aachen), R. Hoppe (Giessen), H. Schmidbaur (Munich), J. K. Burdett (Chicago), B. L. Shaw (Leeds) and B. G. Hyde (ANU), together with the New Zealand lecturer, Ted Baker who delivered a well-received paper on "Iron Binding and Transport Proteins: Structure and Function". The Burrows Lecture was given by Professor Brian Figgis (Western Australia). The New Zealand contribution to the Session Lectures was presented by Brian Robinson on "Synthesis and Electron Transfer Properties of Acetylene-Capped Clusters". About a dozen of the posters reported New Zealand work from Auckland, Waikato and Massey and it was pleasant to meet some of our "exiles" including Eck Sinn and Kevin Grundy, who is now at Dalhousie.

Overall the impression was of a very strong, broadly based conference covering the major areas of current interest in Inorganic Chemistry. One main theme of the conference covered preparations, structure and bonding in the solid state, an ancient part of the field undergoing a substantial renaissance. In all, the organisers are to be congratulated on an excellent conference and Melbourne played its part with the weather. The next combined Inorganic Chemistry meeting will be held as part of the RACI national congress in Sydney in 1987.

K. M. Mackay

Materials Science and Technology Research Seminar

It is planned to hold a one day materials science and technology research seminar at the DSIR Campus Gracefield on 25 June 1986.

Materials science and technology involves understanding basic phenomena to do with the fabrication, microstructure and properties of (solid) materials and using this understanding to modify materials or processing routes, develop new ones and predict service performance. The field is multi-disciplinary with foundations built on a thorough understanding of physics, chemistry and mechanics.

The aims of the seminar will be to promote an exchange of information between Materials Science and Technology Researchers in the Wellington region by:

— Creating an awareness of equipment that is available and the capabilities of this equipment for materials investigations

— Identification of the expertise that is available

— Discussion of materials problems

— Identification of materials usage and trends

It is anticipated the audience will be scientists and technologists (including graduate students) in the Wellington Region (including Palmerston North and Nelson), involved in materials research, problem solving or development.

The seminar organisers are particularly keen to hear from industrial technologists who would be prepared to present a short case-history on a materials problem.

For further details please contact:
R. S. Whitney, BRANZ, Private Bag, Porirua, phone 357-600; or S. D. Devine, PEL DSIR, Private Bag, Lower Hutt, phone 690-288; or H. J. Trodahl, Physics Dept., VUW, Private Bag, Wellington, phone 721-000, ex 2871.

BRANCH NEWS

Auckland

Dr R D Williams addressed a group of 50 people at a joint meeting of the Auckland branch and the Forensic Science Society on 24th February. Dr Williams has been Director of the Metropolitan Police Laboratory U.K. for 18 years.

Dr Williams spoke on the Evidential Value of Items Found at the Scenes of Crimes. He made the point that these items can be extremely small and spoke of the value of new analytical techniques such as FTIR and MS. The meeting finished with some lively discussion.

Dr Alan Thomas of Firmenich gave a fascinating address entitled "From Natural Product Analysis to Industrial Synthesis of Perfumes" to a small group of 16 people. Dr Thomas first described how GC and MS techniques combined with the perfumer's nose can be used to identify fragrances, then discussed the various factors (chemical and industrial) involved in the choice of synthetic routes to produce the perfumes.

Waikato

Dr Alan Thomas of Firmenich SA, Geneva addressed the first evening branch meeting of the year on March 5. His talk entitled "From natural products analysis to industrial synthesis of perfumes" was of considerable interest to the audience at the well attended meeting.

Manawatu

Manawatu Branch members were treated to a very stimulating double dose of German inorganic chemistry on 28 February, through the visits of **Professors Hubert Schmidbauer** (of the Technical University of Munich) and **Heinrich Vahrenkamp** (of the University of Freiburg). Professor Schmidbauer gave a fascinating insight into the chemistry of silicon, gallium and gold, three elements of great importance to the microelectronics industry. Much of the work was concerned with developing new compounds with structures and thermal stabilities which would make them attractive starting materials for the industrial production of amorphous silicon or gallium, or of tracers of gold for circuits. It was a good example of research pursued for academic reasons, but at the same time underpinning industrial develg the background in which industry can flourish", as Professor Schmidbauer put it). Professor Vahrenkamp described an intriguing series of experiments aimed at producing cluster compounds containing as many as four different metals. Much of the research was synthetic, backed up with extensive opment. ("Providinuse of X-ray crystallography for characterising the new compounds. Professor Vahrenkamp pointed out that although such clusters are of considerable interest because of their potential catalytic roles, caution was needed in ascribing catalytic activity to a given cluster structure, because of the uncertainty introduced by unknown reaction mechanisms.

At a Branch meeting on 10 March, the audience was introduced to the intriguing world of perfumery by **Dr Alan Thomas** of Firmenich SA, Switzerland. Topics covered by Dr Thomas included the isolation and identification of compounds from odorous sources — both natural and processed (eg. from roasted or fermented products) — leading to their laboratory (academic) and industrial synthesis. The inability to use some compounds (eg. vinyl chloride) because of pressure from consumer interests, and some solvents (eg. chloroform, dimethyl sulphoxide and hydrochloric acid) because of process difficulties, can place limitations on possible industrial synthetic methods. According to Dr Thomas, the aim of all of this work is the production of patents for the use of "natural" compounds in products that result in perfume formulations characteristic of a particular company.

Wellington

The following students have been awarded prizes by the Wellington Branch, resulting from their performances in the 1985 examinations at Victoria University: **J A Baker** (Chem 100), **M E Bowden** (Chem 200), **K A Larking** (Chem 300), **D J Burkin** (Biochem 200), **S L Davies** (Biochem 300).

Canterbury

The first meeting on the 1986 agenda involved informative visits to the Applied Biochemistry and Entymology Divisions of DSIR, and the Wool Research Organization of NZ, at Lincoln on February 10. The March meeting will include a lecture by **Dr Alan F. Thomas,** an NZIC sponsored visitor, titled "From Natural Products Analysis to Industrial Synthesis of Perfumes".

Dr Selwyn Maister (Christchurch Polytech) is organizing a chemical hazards workshop for September 12, 1986. Titled "Chemical Hazards in the Workplace — Who can assist?", it is aimed at Safety Officers, Personnel Officers, Factory Managers, Union Representatives etc., with the objective being to establish the roles of the multitude of authorities, in the area of chemical hazards.

PUBLICATIONS AVAILABLE

Polymer Group — Adhesives Technology Course

Limited numbers of the proceedings from this course are available from the Polymer Group of NZIC, at $50 per copy. The course, which was held in 1985, included twelve lectures covering a wide range of topics on applied adhesives technology. For further information contact Dr Rodney Norris, Chemistry Divn, DSIR, P.O. Box 2224, Auckland.

Auckland Branch — Fire Hazards Symposium

The proceedings of this symposium are also available — contact Graham Ryburn, Aspak Industries Ltd, Box 51-213, Pakuranga, Auckland.

Research in Oceanography and Freshwater, 1985

This annual publication presents popular summaries of recent publications from the Division of Marine and Freshwater Science, DSIR. The Division comprises the New Zealand Oceanographic Institute and the Taupo Research Laboratory; the former being responsible for investigations of marine life, seafloor geology and minerals, and the physical aspects of the seas around New Zealand; the latter for studies of the factors which affect the quality of water in our lakes, rivers and estuaries.

Topics covered in the most recent booklet (the third in the series) include The Nature of the "Nelson Slime", The Pacific as a Nuclear-Waste Dump, The Seas and Manganese, and Mining at the Bottom of the Sea.

For a copy of this booklet contact The Information Officer, NZOI, DSIR, P.O. Box 12-346, Wellington North.

Directory of Metallurgical Services and Facilities in New Zealand

Who are New Zealand's metallurgical specialists, and what facilities are available throughout New Zealand to help manufacturing industry and other users of metals? The answers to these and other questions can be found in this Directory, compiled by DSIR's Auckland Industrial Development and Industrial Processing Divisions, and published by Science Information Publishing Centre. The Directory details the specialised services offered throughout New Zealand by companies, consultants, and Government Departments involved in metallurgical testing and research. Price $7.95 (+ p & p $0.40 in New Zealand, $0.90 overseas). Contact Science Information Publishing Centre, P.O. Box 9741, Wellington.

Australian Polymer Science and Engineering

The Polymer Division of the RACI has recently produced this 108-page booklet which contains details of laboratories and individual scientists involved in research in polymer science in Australia. It is intended to cover the chemistry, physics and engineering of polymers and to include academic, government and industrial laboratories around Australia. A useful source of information for any polymer scientist planning to visit our trans-Tasman colleagues, or just wanting to know who's who in the field in that part of the world.

The Editor has a copy of this publication (free to a good home!) Alternatively, contact the Chairman of the Polymer Division, c/- RACI Headquarters, 191 Royal Parade, Vic. 3052, Australia.

NZFMRA Annual Report, 1984-85

We have received a copy of this publication, which includes research reviews in areas of Fertiliser Manufacture, Fertiliser Economics, Analysis and Agronomy, as well as details of the Research Association's other activities over the year. Copies of the report should be available from NZFMRA, P.O. Box 23-637, Hunters Corner, Auckland.

University News Cont'd From pg. 42

with Professor C. Thomas Caskey. **Prof. Caskey,** renowned for work on human and molecular genetics, will visit New Zealand as a keynote speaker at both the forthcoming Genetics meeting at Hanmer and the NZIC/NZBS Conference in August. Another PhD student, **Tony Manning,** was awarded the J.D.S. Roberts Foundation (N.Z.) Prize to speak at the Australia and New Zealand Society for Cell Biology meeting on Regulatory Mechanisms of the Cell in Sydney in February. **Dr Clive Trotman** presented a paper at the same meeting on the localisation of haemoglobin during development in the brine shrimp, Artemia, using the immunogold labelling technique. **Tony Cooper,** an honours graduate from the class of '84, recently took up a Commonwealth Scholarship at McGill University in Canada to do PhD work in eukaryotic genetics.

COUNCIL NEWS

Professor George Petersen presided over meetings of Council in Wellington on Tuesday 11th and Wednesday 12th February. Mr T. R. Hitchings, Second Vice-President, associate professor G. R. Clark, Auckland Branch Delegate and Dr D. R. Llewellyn, Waikato Branch Delegate, were welcomed as new members of Council.

Prizes. Council reminds members that applications for the Easterfield, ICI and Shell Prizes close with the Administrative Secretary, PO Box 29-183, Christchurch, on 30th April 1986. See page 35, 1985 Yearbook for details.

For the Student Essay Prize the closing date was extended to 30th June 1986.

Council also established an annual NZIC Award for Chemical Education. Entries will close at PO Box 29-183, Christchurch, on 30th June 1986 and on 30th April in future years.

The award of a certificate and a prize of $250 is not restricted to financial members of NZIC. Applications are invited from teachers of Chemistry. Also nominations may be made by Branch Committees or by individual NZIC members.

The award will normally be made to a teacher of High School Chemistry who in the opinion of Council has made an important contribution to Chemical Education in New Zealand.

This new award is being advertised through Branches, Chem NZ, PPTA Journal, Education Gazette and NZ Science Teacher. Entries must include a written statement of the teaching work of the applicant and its significance to Chemical Education.

Nominations of RACI members for the 1987 NZIC-RACI Visiting Speaker Award are required from Branches by 30th June 1986 for submission to RACI Council following the August meeting of NZIC's Council.

Applications or nominations for the ACA-NZIC A. C. Kennett Memorial Award are required by 31st July 1986 by the New Zealand Branch, Australasian Corrosion Association, PO Box 5961, Wellesley Street, Auckland.

Associate Professor Graham Wright has accepted Council's invitation to serve as its nominee on the sub-committee of the New Zealand Branch of the Australasian Corrosion Association to act as a trustee of this award.

Subscriptions. On the recommendation of the Finance Committee (President, two Vice-Presidents, General Secretary and Registrar ex officio) Council resolved to increase subscriptions for the financial year beginning 1st May 1986 by $10+GST to:

$65+GST for Fellows and Members

$50+GST for Associates

$35+GST for Graduates and Technicians.

If paid after 31st August 1986 these subscriptions will be increased $5 and attract correspondingly more GST. There was a $10 increase in subscriptions for Members and Fellows in 1985/86.

Student Member subscriptions remain at $10 with the addition of GST. The President, in the leading article of this issue backgrounds Council's discussion and its decision to launch a NZIC Development Fund to ensure a continued and improved level of service to members in the 1990's and beyond.

Salary Survey. The Registrar reported Dr Graeme Gainsford and Wendy Singers had agreed to arrange a survey of members' salaries as at 1.4.86. It is hoped this will be published in the August issue of "Chemistry in New Zealand". Council asked that questions on fringe benefits to members employed in industry be included in this review.

Recruitment. Council noted the need for recruitment when it approved 16 members being struck off in arrears, transferred 16 to Life Membership, accepted 10 resignations and noted 2 deaths with regret. The loss of these 44 subscribers was offset by only 10 elections of new members.

Branches reported their plans for recruiting Student and other grades of members. The President asked that Branches make recruitment a feature of their programmes in this and future years.

The Editor is preparing a special June issue of "Chemistry in New Zealand", additional copies of which will be used by Branches in their July recruitment drives. The next issue of the List of Members is to be published in the Yearbook in January 1987. This timing will make the List, in which details of Branch Officers, Prize regulations et al appear, of more current use to members.

Mr Hitchings noted that the annual subscriptions paid by teachers to PPTA were $110 and to the Secondary Teachers' Association, $20. Nevertheless, in his opinion, NZIC's initiatives in Chemical Education such as Chem NZ, the Chemical Education Award and a trust to be funded by contributions from the NZIC and Chemical Industry provided a good basis for recruiting teachers of Chemistry in High Schools.

The Publications Committee was asked to produce an attractive recruitment brochure similar to one circulated. The Editorial Committee was asked to examine the costs of producing a Handbook of Members similar to that published in 1985 by the Royal Society of Chemistry.

Branches were asked to send the President nominations for Honorary Fellowship before 30th June.

"Chemistry in New Zealand". Council expresses its appreciation of a letter received from Dr B.W.L. Graham, Editor of "Chemistry in New Zealand", commenting on a letter from the Otago Branch dated 10.12.85, the content of the Journal and its cost. Branches were asked to express to Council their views of the proposal to circulate a questionnaire to members to obtain feedback on the content and development of the Journal before 30th June via the General Secretary.

The Editorial Committee was asked to report further to the August Council meeting about specific proposals in Dr Graham's letter to reduce the cost of the Journal. Council supported the proposals in principle.

AAVA. Mr Walter Freitag was nominated for a further term from 1.4.86 on the Course Committee for Science of the Authority for Advanced Vocational Awards. Mr Neil Edmonds of the Auckland Technical Institute has agreed to continue as deputy for Mr Freitag as and when required.

Royal Society of New Zealand. Dr H. J. Percival was renominated for membership of the Member Bodies Management Committee of the Royal Society of New Zealand.

Nominations were also submitted for membership of the Chemistry and other National Committees of the Royal Society.

SANZ. Dr Percival reported to Council on changes to the structure of the Standards Council proposed by the Minister of Trade and Industry. It was agreed that if NZIC were invited to make a nomination to replace Dr Percival whose term expires 31.3.86, that the Wellington Branch would be asked to submit candidates to Council from its membership.

IUPAC Recommendations. Comments are invited on synopses of IUPAC recommendations for the "Presentation of Molecular Parameter Values for Infra-red and Raman Intensity Measurements" and "Glossary of Terms used in Photochemistry" before the end of December 1986. Copies of these recommendations and the address to which comments should be sent are available from the General Secretary, PO Box 29-183, Christchurch.

Twenty NZIC members have enrolled as IUPAC Affiliate Members, the Registrar reported.

International Chemistry. Council resolved to bring to the attention of the organisers of the RACI/FACS and Malaysian Institute of Chemistry/FACS Conferences in Darwin 7/11 July 1986 and Kuala Lumpur 19/20 November 1986, NZIC members who could contribute to their meetings.

Copies of the First Circular of the Asian Chemical Congress to be hosted by the Korean Chemical Society in Seoul June 29th to July 3rd, 1987, have been distributed to Branch Secretaries. The theme is "Challenge in Chemistry for Asian Development". The 4th Biennial FACS General Assembly will be held during the Congress.

Full information with registration forms will be included in the Second Circular to be sent towards the end of August 1986 to all intending to participate who have returned the advance registration form.

This year the Council through the Overseas Visitors' Fund has contributed to the visits of Professor H. Schmidbaur, Technical University of Munich, Dr R. L. Williams, Director of the Metropolitan Police Forensic Science Laboratory, London, Dr A. F. Thomas, Firmenich, Geneva, Professor Y. Masur, Weizmann Institute, Israel, and Dr R.D.H. Murray, University of Glasgow.

Council noted the formation of the Chemical Society of the South Pacific, based at the University of the South Pacific, Suva, Fiji, and received the first issue of its Newsletter.

An invitation from the Bangladesh Chemical Society to participate in the 9th Annual Conference at the University of Dhaka in January 1986 was received. A further invitation was received in March for NZIC members to take part in the Society's 10th Annual Conference. Further information is available from Dr M. T. Rahman, General Secretary, Department of Chemistry, University of Dhaka, Dhaka 2, Bangladesh.

Council also noted the 69th Canadian Chemical Conference and Exhibition 1/4 June 1986 in Saskatoon, the 3rd Papua/New Guinea Chemical Congress 11/14 September 1986 in Goroka and the 9th Analyti-

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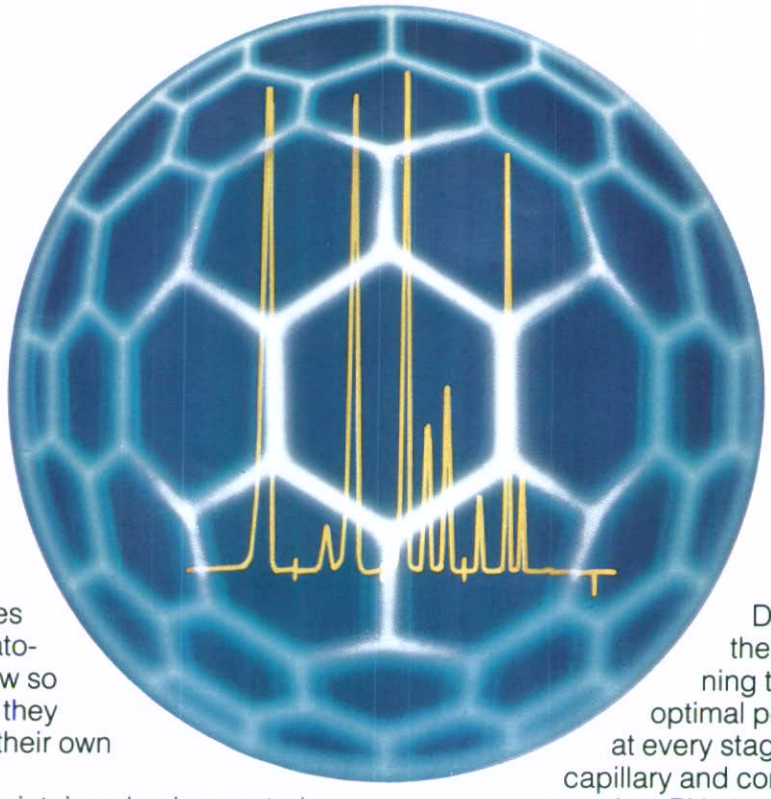

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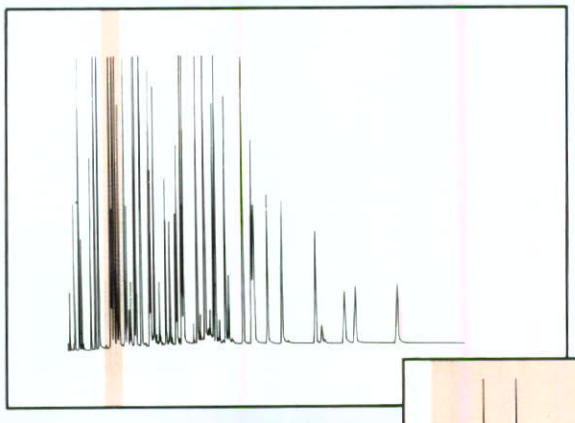

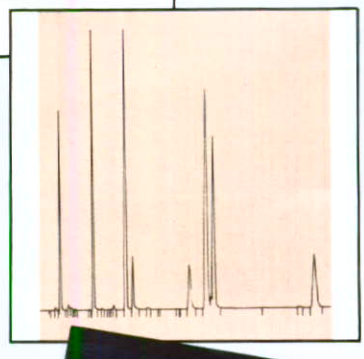

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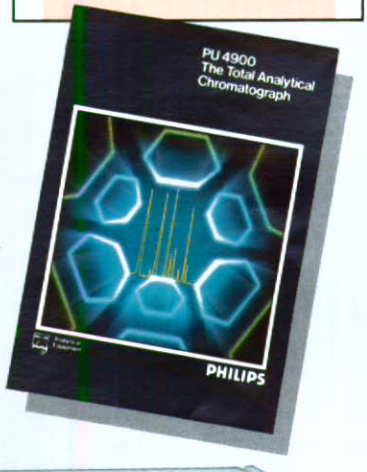

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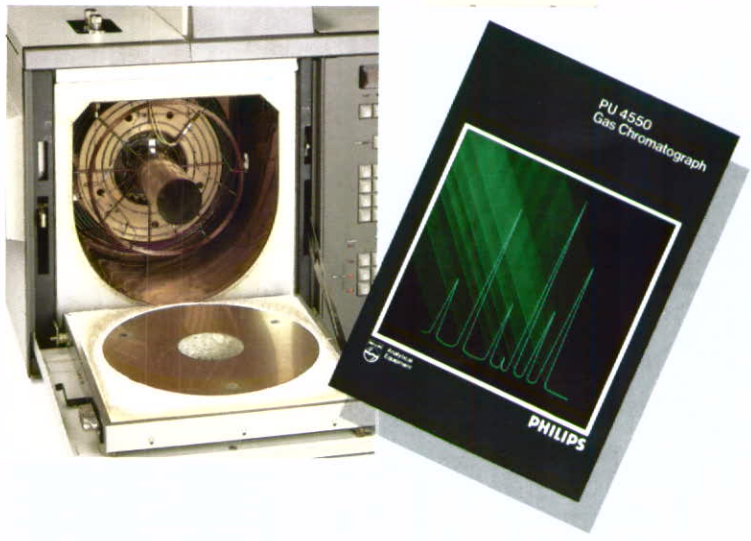

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COUNCIL NEWS

cal Chemistry Symposium RACI 27th April/1st May 1987 in Sydney.

Ties, Scarves and "Chemistry in a Young Country". Members are reminded that ties (blue, brown and maroon) and scarves bearing the NZIC logo are available from Branch Secretaries and the Registrar at $10 each. Copies of "Chemistry in a Young Country" are also still available at $10 each.

Council Meetings. A telephone meeting of the Standing Committee is planned for Wednesday 7th May. The Finance Committee meets on Saturday 23rd August prior to the Council meeting on Sunday 24th.

J. Rogers
Honorary General Secretary
23 March 1986.

Membership: The following applications and changes in status were approved:

Fellowship:

France, John Terence, MSc(NZ) PhD(Auck). Post-Grad. School of O & G, Medical School, Auckland. (Assoc. Professor).
Gawne, Kenneth Maxwell, BSc MChem (NSW). Dept of Chemical Technology, Unitech PMB Lae, Papua New Guinea. (Assoc. Prof. Applied Chem and Director Nat. Anal. Lab.)
Kirkman, John Henry, BAgric Sc(Hons)(Durham) PhD(Aberdeen). Dept of Soil Science, Massey University. (Snr. Lecturer).
Newth, Ronald Penrose, NZCS, MNZIC. Ruakura Agric Res Centre. Hamilton. (Snr. Technical Officer).
Pybus, John, BSc. Pathology Dept. Auckland Hospital. (Snr. Scientific Officer).
Rodgers, Kerry Anthony, MSc PhD(Auck). Dept. of Geology, University of Auckland. (Assoc. Professor).
Roughan, Philip Grattan, MSc (Otago) PhD(Massey). DSIR Divn of Hort. & Processing, Auckland. (Scientist).
Rutledge, Peter Stewart, MSc PhD(NZ). Chemistry Dept, University of Auckland. (Assoc. Professor).
Sprott, Thomas James, MSc PhD(NZ). Retired.
Zabkiewicz, Jerzy Antoni, BSc (Hons) PhD(Glasgow). Forest Res. Institute, Rotorua. (Scientist).

Membership:

Allbrook, Mrs Rosemary Janet, BA MSc(Waikato). School of Science, University of Waikato. (Part-time Lecturer).
Chew, Steven, MSc PhD(Well). Australian National University, Canberra. (Post-Doctoral Fellow).
Granger, David John, BSc. W Grayson & Associates, Penrose, Auckland. (Head: Environmental Laboratory).
Satherly, John, BSc(Hons) PhD (Well). Southhampton University, U.K. (Post-Doctoral Fellow).
Van Der Beeke, Paul Gerard Johan, MSc DPhil (Waikato). NZ Steel Ltd, Auckland. (Analytical Chemist).

Associate to Member:

Hackney, Thomas, ANZIC. Oregon Paint Co. Ltd. Auckland. (Technical Director).
Karl, Dennis Peter, NZCS ANZIC. Scientific & Technical Consultants, Auckland. (Consultant).
Komen, Franciscus Gerardus, ANZIC. NZ Steel Ltd. Auckland. (Process Control Chemist).

Graduate to Member:

Bosma, Grant Marcellus, BSc. Pavroc Holdings Ltd. Christchurch. (Materials Technologist).
Brauer, Ralf Manfred, BSc BE (Chem & Mat). Fischer & Paykel Allied Product Division, Auckland. (R & D Engineer).
Chin, Anthony Paul, BSc. Emoleum-Neuchatel Ltd. Auckland. (Sales Chemist).
Cressey, Peter John, BSc (Hons) (Cantuar). Wheat Research Institute, Christchurch. (Scientist).
Jacobson, David Roy, BSc (Hons) (Well). ICI NZ Ltd. Lower Hutt. (Technical Officer).
Lawrence, Mark John Frederick, MSc(Hons)(Waikato). Geology Dept. University of Canterbury. (Technician).
Martyn, Robert John, BSc (Hons) PhD(Cantuar). Chemistry Divn. DSIR, Christchurch. (Scientist).
McDonald, Hamish, MSc (Auck). Coopers Animal Health NZ Ltd. Auckland. (Biological Production Manager).
Tempest, Geoffrey Bryce, BTech (Food). Northern Roller Milling Co Ltd. Auckland. (Technical Manager).
Whyte, Andrew Robert, BSc(Hons) PhD(Cantuar). Chemistry Dept. University of Canterbury.

Technician to Associate:

Batchelor, Jeremy Paul, NZCS. NZ Steel Ltd. Auckland. (Development Analyst).
Smith, Ronald David, NZCS. Philips Industries Ltd. Auckland. (Sales Rep).
Steedman, Murray Rex, NZCS. FERNZ Corpn. Ltd. Whangarei. (Technical Services Controller).

Graduate:

Davis, Howard Haupai Joseph, BSc. W Grayson & Associates, Auckland. (Analyst).
Doolin, Ms Laurie Carina, BSc. Chemistry Dept University of Waikato. (MSc Student).
Shirer, Ms Carol Anne, BSc. May & Baker Ltd. Lower Hutt. (Laboratory Supervisor).

Technician:

Gunn, Bruce Ian, NZCS. Alex Harvey Industries, Auckland. (Laboratory Supervisor). (from Student member).
Strickett, Warren Edward, NZCS. Caxton Printing Works, Auckland. (Development Technician).

Reinstatement as Member:

McNaught, Robert Leslie, BSc (Wellington).

Deaths: W. G. Whittlestone (Waikato), A. G. Freeman (Wellington).

Life Membership: E. Moustafa, T. J. Sprott, T. A. Turney (Auckland), A. E. Lambden (Waikato), E. G. Brooker (Manawatu), G. W. Butler, I. R. McDonald (Wellington), W. N. Baird, R. W. Cawley, B. H. Howard, R. D. Walker (Canterbury), A. J. Robb, A. D. Wilson (Otago), C. M. Anderson, J. R. Hunt, C. W. Weston (O/S).

Resignations: B. E. Cavit (Auckland), D. F. Campbell, D. R. Lind (Waikato), B. G. Streeter (Manawatu), P. R. Herrington, B. Jacobson, J. W. McLachan (Wellington), R. Davidson, B. H. Thomson (Canterbury), D. J. Hawke (Otago).

Struck Off: F. Denton, W. R. Dive, M. R. Jarrett, W. T. Jennings (Auckland), M. J. Severensen (Waikato), J. Goldsmith, V. Metanandra (Wellington), R. H. Beresford, J. S. Dennison, J. Pollock, R. F. Smith (Otago), F. R. Grasse, G. J. Gordon, C. Huntrakul, P. W. Moors (O/S).

Industrial News

Mr I. D. (Ian) Beatson has been appointed chief executive of Chemby Industries Limited, a wholly-owned subsidiary of Unity Group Limited.

Mr Beatson was formerly general manager of Chemby Marketing. He took up his new appointment on January 1.

Mr Beatson has recently returned from the United States where he attended a three month Advanced Management Programme course at the Harvard Business School in Cambridge, Massachusetts.

Auckland

Mr Simon McCall has left Oasis Industries to take a position as laboratory supervisor with Pharmaceutical Sales and Marketing.

Lester Stonyer of Smith-Biolab is retiring after 49 years in the industry. Lester started work as a laboratory assistant in 1936 with Davies Gelatine while studying part-time at Canterbury College.

During the war he worked for the Australian government on explosives manufacture and after the war returned to New Zealand to work with Mobil Oil as a chemist. While with Mobil he transferred into the sales area but then went back to the lab. to work in the paint field with Premier Products at Waikanae. Premier Products then became Tasman Vaccine Laboratories in Upper Hutt and Lester became Chemical Production Supervisor and then Medical Division Production Manager. ICI bought the company and when Lester reached the ICI retirement age in 1980 he left.

In 1981 Lester moved to warmer climes and did some consulting in Auckland until he started work with Smith-Biolab, where he has been for five years. He retires on 31 March but plans to do a little consulting to keep in touch with the industry.

Otago

After a stagnant period at the Comalco Aluminium Smelter, Tiwai Point, **John French** reports that the commercial scene has now improved to the point at which the Company has started to refurbish smelting pots again as overhauls become due. Also, a new ARL emission spectrograph, fitted with a Siemenz XRD/XRF attachment, has been installed in the Company's X-ray analytical laboratory.

John Kenny, Chemist at the Southland Co-op Phosphate Co. works, Awarua, will present a paper on rape seed utilization at the NZIC Fats and Oils Conference to be held in Auckland in March.

Canterbury

Geoff Wright, formerly of Shell, has now joined the Christchurch branch of Philips, as an instrument sales and services rep.

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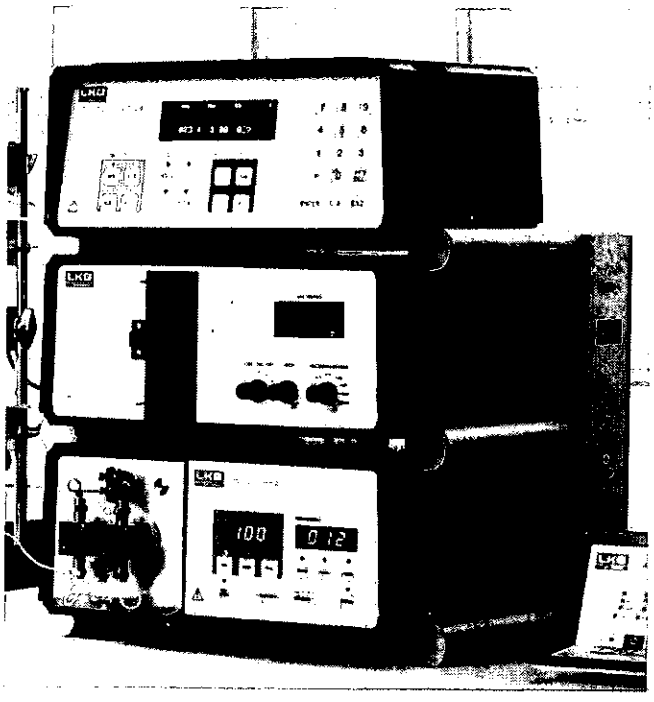

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FROM THE RETORT

Pink and White What?

It appears that the public imagination has been captured somewhat by the search by DSIR for clues to the chemistry of the famed pink and white terraces. The proposal to recreate these as a tourist attraction has aroused considerable interest, if not a little opposition in some quarters as well.

We have recently learned of another related venture, but in this case involving the much more controversial techniques of genetic engineering. For obvious reasons the project is being given a low profile — at least until preliminary experiments have indicated the likelihood of success or failure.

According to our normally reliable source, the idea originated with staff of MAF, who felt that DSIR should not be the only group to benefit from the financial spin-offs of any tourism-oriented research. For the past few months a quiet search has been going on through museums and university archeology departments, up and down the country. The target — the slightest traces of viable DNA attached to remnants of the now extinct moa! Should suitable material be found, the plan is to attach it to DNA from an appropriate host species, using the technique known as gene splicing. If the graft is successful, and the material can be safely cultured through the normal stages of embryo development, the result should be a brand-new moa chick, identical in every way to its long since dead predecessors.

Well, almost identical! Unfortunately it appears there is likely to be some difficulty in achieving effective transfer of pigmentation in the gene splicing technique. It is here that doubts about the public acceptability of the whole project arise. Apparently the most suitable host species is the ostrich. Should pigment transfer fail to occur the likely outcome of the experiment will still be a moa, but one coloured pink, white, and black.

It has been suggested that should this be the outcome, the scene would be set for a scientific version of the Walt Disney classic, Fantasia. Pink and white moas on the pink and white terraces, to the music of Tchaikovsky! In actual fact, if the creature fails to develop in its natural colouring, the project will be quietly shelved (poor bird!).

Watch this column for further developments.

And More Fantasy?

Many readers will be aware of the controversy in the United States over claims by the State Department for evidence of the use of mycotoxins in so-called "yellow rain", in the Vietnam war. Having lost that battle it appears they have now started on a new campaign, with accusations about the use of tracer chemicals by the Soviet Union, as a means of keeping track of U.S. Citizens in that country.

One chemical in particular, 5-(4-nitrophenyl) — 2, 4-pentadienal (NPPD), has been cited by the Department, along with claims that tests by an unnamed laboratory show it to be a mutagen. Problem: none of the Government agencies normally involved with chemical safety had heard of NPPD prior to the announcement. Nor had any of them tested NPPD for mutagenicity for the State Department.

Adding further to the doubts in the scientific community, the Department described NPPD as colourless, and not detectable by fluorescence. The question is, how then is it used as a tracer?, and for people in particular? Presumably the Soviets have developed a remote-sensing mass spectrometer that requires no sample input. Are there any other suggestions.

On a More Serious Note

A survey in the United States has found that over the past five years nearly 7000 accidents involving toxic chemicals have killed 139 people and injured 1478. Chlorine, with almost 10% of the total, was the chemical responsible for the most deaths and injuries. Other chemicals cited include anhydrous ammonia, sulphuric acid, PCBs, hydrochloric acid, and toluene. Fatal accidents happened most often to chemical plant workers, and the majority of those occurred because of failure of a storage container.

The survey was carried out to assist the EPA in compiling a "hit" list of chemical hazards. The information would appear to be of considerable value for the New Zealand scene as well.

Now if all that has got you thoroughly depressed, how about some

Inspiration From Sir George

In his Plenary Lecture at the official opening of the 30th IUPAC Congress in Manchester, last year, Sir George Porter had the following to say on chemistry's troubled image:

Accepting that it is our destiny to live in a chemical world we had better learn some chemistry. How can we help people to understand that we are, ourselves, chemically constituted bodies, living wholly in a world of chemical substances, eating them, burning them, smelling them (for better or worse), and spending every second of our lives looking at them and manipulating them in some way or other; that every little bit of us is a chemical entity; all our living, illnesses and dying are chemical processes? One might as well try to do without chemistry as an attempt to stop the world and get off. Since it appears that the media, like television, which began with so much promise, are going to contribute little enlightenment, we must go look again to the teaching in our schools, particularly at the most elementary level. This will be one of the most important tasks for chemists in the next few decades.

An equally important task will be to get our politicians and policy makers (including, I have to add, some *scientists* who make policy) to understand the importance of chemistry.

(The full text of Sir George's address is published in Chemistry International, **8**, 17-23, (1986)).

Finally, We Might Look Back:

One hundred and twenty five years ago, last September, the first international scientific conference ever held, took place in Germany.

At the top of the agenda of points to be discussed at the Karlsruhe Congress of Chemists was the question, "Shall a difference be made between the expressions *molecule* and *atom*, such that a molecule be named the smallest particle of bodies which can enter into chemical reactions and which may be compared to each other in regard to physical properties — atoms being the smallest particles of those bodies which are contained in molecules?" No consensus was reached!

(Acknowledgements to Chemistry International, **8**, 12, (1986)).

Unniloctium

Fats & Oils Group

Twenty-five people attended a barbecue meal on December 3rd, 1985 to review the year for the fats and oils group and to discuss its future activities. A brief informal and noisy AGM preceded the barbecue meal instead of following it, due to a minor hiccup with the catering arrangements. (The outside barbecue was cancelled due to Auckland's fickle weather.)

The following were elected to the committee for 1986: Dr L. Eyres (Chairman), Dr S. Hannan (Secretary), Mr G. Winward (Treasurer), Ms D. M. Fenton (Publicity), Mr D. Illingworth (Member, Palmerston North), Mr P. Atkinson (Member, Auckland), Mr C. Lee (Member, Wellington).

In addition the gathering unanimously voted for Mr S. G. Brooker as the group's patron, recognising his many years of practice in the field.

Several topics arose during the meeting which included the forthcoming seminar in March 1986, the visit of Professor Kuksis in August 1986, the Honolulu AOCS conference in May 1986 and a proposal from S. G. Brooker to run an AOCS conference in New Zealand in 1989.

For those interested in the activities of the group and in joining (open to anyone), please contact L. Eyres, phone 548-145. Fee $2.00. Current membership is about 78 people.

NZWSDA
Ron Hicks Memorial Award

The award will be made again this year and readers are reminded that the award will be made to the author(s) of an article or paper considered significant in solving or clarifying sewage treatment or water pollution problems in New Zealand.

Awards may take the form of cash, books, equipment, etc as seen appropriate to the Trustees in each case. This year we expect the award could be worth at least $500.

Applications or submissions for consideration of an award should be addressed to "Ronald Hicks Memorial Trust", c/-NZWSDA, P.O. Box 4088, Hamilton East, N.Z. to arrive by 20th June, 1986.

The application should include a copy of the article or paper together with the name(s) and address(es) of the author(s) and a brief justification of the significance of the contents. Where the submission is by a third party, their name and address should also be provided. Non-members of WSDA are also eligible.

SAFETY

Monitoring For Chemicals In The Workplace

Gases and Vapours

A wide variety of methods are available for the monitoring of chemicals in the workplace. The following notes give a brief overview of the most common of these. Anyone with an interest in monitoring for specific substances should feel free to contact any of the Health Department's laboratories for further advice.

Also not covered are the rationale of sampling, sampling strategies, and the interpretation of results. These are dealt with adequately in standard texts on Industrial Hygiene.[1]

(i) **Detector Tubes**

Detector tubes date back to the year 1919, but still have an important part to play in the monitoring of air contaminants. Probably best known are the Drager range, but other brands

Figure 1. Detector tubes, unused (top) and showing 50ppm ammonia.

are now available on the local market (Gastec/Kempthorne Medical Supplies and Associated Process Control, Matheson-Kitigawa/NZ Industrial Gases, etc). Essentially these consist of a glass tube packed with an inert material which has been impregnated with appropriate reagents. When air is drawn through the tube the contaminant(s) of interest react with the reagents to produce a coloured stain, the length of which is related to the quantity of contaminant sampled. There are now more than 150 tubes in the Drager range covering a wide range of substances. Full details on the use of each tube, the principle of operation, and potential interferents are given in an excellent handbook.[2]

Note that detector tubes are essentially a "grab" sampling system, giving an indication of contaminant concentrations at the moment of sampling only. A range of long-term detector tubes is also available for a limited number of compounds, and these are used with a special low-flow pump. Two alternative approaches are to either take a number of spot tests and analyse the results statistically, or use bag sampling with slow collection over a period of time, and analyse the bag contents with a single tube test.

(ii) **Paper Tape Samplers**

A variation on the detector tube principle uses a paper tape impregnated with chemical reagents. Air is sampled through the tape, with a stain developing in the presence of the contaminant of interest. The tape is periodically (or continually) advanced, allowing a number of samples to be taken over time. In modern instruments the stains on the tape are measured photometrically within the instrument, and a dial or digital readout gives the result in concentration units.

This system has been applied mainly to reactive gases such as hydrogen chloride, and hydrogen sulphide but has also been used for more complex problems such as monitoring di-socyanates used in polyurethane manufacture. The units are available as either portable or fixed monitors, from a number of manufacturers (Drager, MDA Scientific, Houston Instruments).

(iii) **Liquid Bubblers, Impingers, etc**

A traditional method of air sampling is to draw the air through a bubbler, such as a Dreschel Bottle or specially designed impinger, with the contaminants being trapped in the liquid. This method is applicable to most air contaminants provided a suitable absorber is available. The absorber may contain reagents for *in situ* analysis of the sample, or the solution may be removed for subsequent processing. Because of the fragile nature of the glassware, this method is not generally suitable for personal sampling. Specially designed spill-proof bubblers are available, as are others made from plastics. However, there is still a degree of opposition to attaching these to the clothing of a

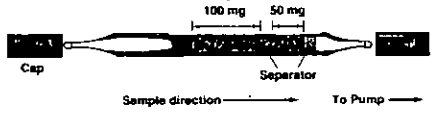
SAFETY

"typical" factory worker — especially in cases where the absorber is particularly corrosive (e.g. for formaldehyde/chromotropic acid in concentrated sulphuric acid solution).

(iv) **Absorption Tubes**

One of the most widely used air sampling methods of the present time, and one for which new applications are being constantly developed, is the use of tubes packed with a solid absorbent. Initially materials such as charcoal were used and this restricted the method to relatively stable compounds such as the common solvents. However, alternative absorbents, such as those used as chromatography supports, can be used on their own or precoated with derivatising reagents, and this has allowed the method to be extended to more reactive compounds.

A typical charcoal absorption tube is shown in the figure.



A measured volume of air is drawn through the tube, and it is then returned to the laboratory for analysis. The charcoal is removed from the tube and the collected material desorbed from it with a solvent such as carbon disulphide. Analysis is typically by gas chromatography, which allows separation of multi-component samples.

The tube contains a back-up section to indicate overloading. Other absorbents such as silica gel, Tenax, and the Porapak and Chromosorb series have been used, and thermal desorption is a developing alternative to the use of solvents. The great advantage of the method is its small size and convenience of use, and the fact that samples may be taken over any time period from a few minutes to a few hours by use of an appropriate air sampling rate.

(v) **Passive Samplers**

A recent development from the absorption tube, and one which requires no pump, is the passive sampler. These are rather like the badges worn to monitor radiation doses, and depend for their sampling mechanism on the movement of contaminants across a diffusion or permeation barrier. The samplers contain an absorbent similar to the absorption tubes, and the analysis is generally the same. A variety of commercial units are available, and their performance as reported in the literature is generally satisfactory. The great advantage of the samplers is their freedom from any mechanical or electrical devices such as air sampling pumps. Unfortunately, unit costs of most systems are quite high. However, as the manufacturers rightly point out these must be offset against the cost of initial investment in alternative systems.

(vi) **Direct Reading Instruments**

Space does not allow for a discussion of the wide range of direct reading instruments available for monitoring air contaminants. Detailed coverage is given in a recent ACGIH publication.[3] These utilise many of the common instrumental chemistry techniques (ir, uv, flame ionisation, etc) and are usually available as either fixed or portable installations.

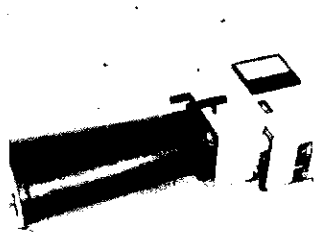


Figure 3. The Miran-1A variable wavelength infrared air analyser.

References

1. e.g. Patty's Industrial Hygiene and Toxicology, 3rd Edition, Wiley, (1982).
2. Detector Tube Handbook, 5th Edition, Dragerwerk AG Lubeck, (1983).
3. Air Sampling Instruments for the Evaluation of Atmospheric Contaminants, 6th Edition, ACGIH, (1983).

COVER STORY

New PU 8620 Series Announced

An exciting new range of low cost, single beam spectrophotometers and accessories has been announced by Philips Analytical.

Having clearly established itself as market leader, the PU8600 is now superseded by the UV/VIS/NIR PU8620 series. Featuring a new Philips-designed, solid state, diode detector, the PU8620 is a direct result of Philips Analytical's commitment to improved product quality and technical innovation.

The new series offers proven, superb analytical performance and an extended wavelength range of 195 or 325-1100 nm, providing that extra performance ideal for more demanding high wavelength applications such as trace silicates or phosphates.

Other features include fast, error-free operation, non-volatile method storage, automatic self test and an extensive accessory range.

The new spectrophotometers have no slow 'piano' keys or manual controls and are extremely fast to set up and easy to use, irrespective of operator skill. Simply dab the touch-tone keys to select the mode and enter the desired settings. For wavelength selection, touch the appropriate parameter key and the current wavelength is displayed. Key in the new value and the wavelength is reset at a phenomenal 100 nm/s.

All versions of the PU8620 series display results directly in concentration after entering the value of a standard or via a predetermined factor. In addition the PU8680 and its UV/VIS counterpart, the PU8630, feature extensive kinetics software for enzyme rate assays as well as the facility for setting the measurement temperature via the keyboard.

Having rapidly programmed appropriate instrument and accessory parameters, up to ten analytical methods can be stored in non-volatile memory for instant future recall.

The PU8620 series also features a large, lidded sample compartment with excellent accessibility, permitting rapid interchange of accessories, as well as convenient built-in service routes for flow cell or thermostatting tubing.

Right from power-up, the new spectrophotometers instill confidence in the quality of your analytical results by checking memory, displays, sources, etc and by calibrating the wavelength.

The operator is alerted to any problems encountered during this self test, or in normal operation, by an audible warning and flashing error signal. And if the printer is fitted a concise message stating the nature of the problems is presented.

The quality performance of the PU8620 series stems from the use of master holographic gratings and silica coated optics and re-emphasises Philips Analytical's track record in producing innovative, state-of-the-art optics.

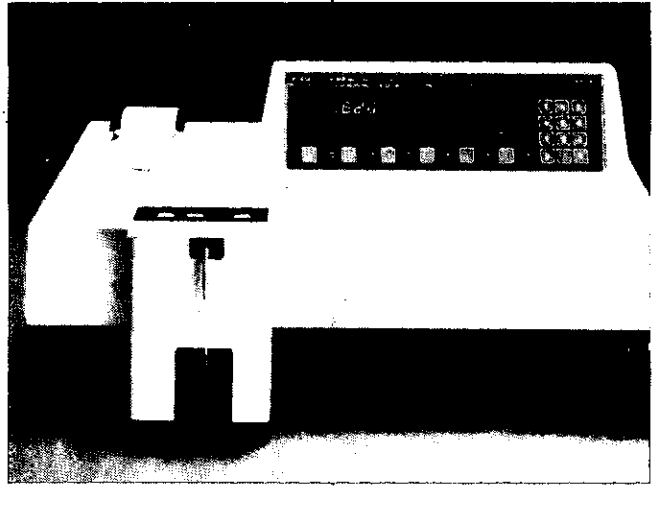
The PU8620 series uses a new diode detector which has been custom designed by Philips Research laboratories. Its response has been optimised to produce excellent stray light characteristics across the extended 195-1100 nm wavelength range, good signal to noise, first class stability and even greater reliability.

There are versions of the PU8620 for industrial, educational and life science uses. The series consists of four models with the choice of standard, factory tested configurations and instruments providing extensive kinetics facilities, optimised for life science applications.

In addition a PC-based Philips Analytical data station provides a route to low cost scanning.

All PU8620 models are available in VIS/NIR or UV/VIS/NIR options and accept any of the vast range of accessories.

Should you require further information on this new system or wish to use one of our demonstration models please do not hesitate to contact your local Philips office.



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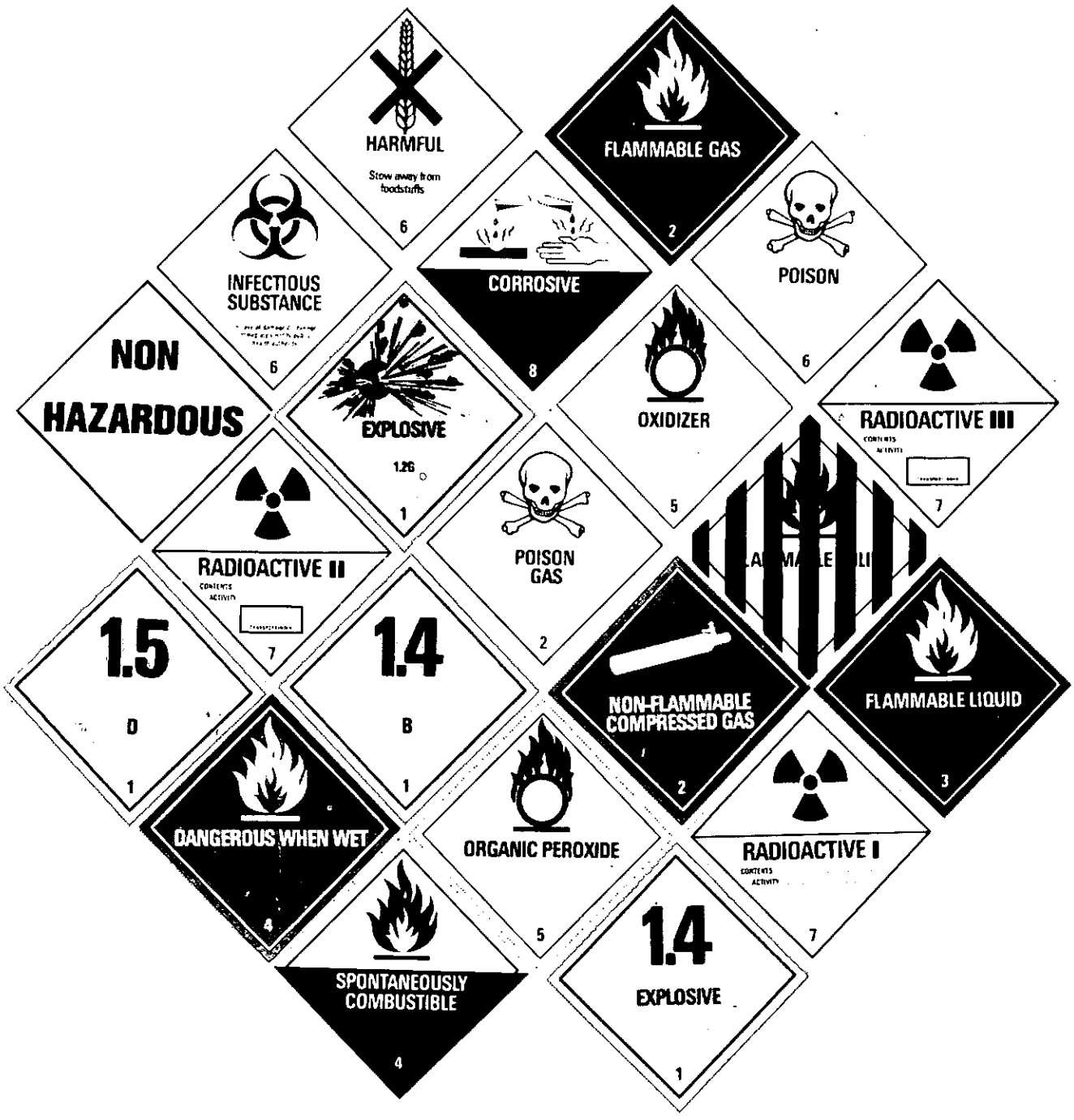

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ADVANCES IN DETECTORS FOR UV/VISIBLE SPECTROPHOTOMETERS

D Irish and S Bonham,
Pye Unicam Limited, Cambridge

Electronic components have undergone something of a complete revolution in the last decade. One has to look no further than the domestic radio or TV to note how the age of the valve is long past; discrete transistors are on the wane, and we are currently in the age of integrated circuits, exemplified, for example, by the microprocessor chip. This revolution has occurred in all areas of electronics including the circuitry found in spectrophotometers, and has brought with it much greater reliability and functionality.

One electronic component in spectrophotometers however has remained unchanged for many years, — and that is the detector. Simple instruments have utilised a vacuum photocell, whilst more expensive instruments have incorporated either a side or end window photomultiplier. Both types of device have much in common with the technology of the valve, and whilst the photomultiplier remains unchallenged in performance by virtue of its intrinsic high gain and low noise, the phototube has for general use, been seriously challenged by the solid state photodiode. Many types of photodiodes exist, based on silicon, gallium arsenide, germanium etc., and are widely used in many applications — eg. photographic exposure meters, street light controls etc. For spectrophotometric applications however, they all suffer from one major drawback — they have the wrong spectral response, with little or no response in the ultra violet and too much response in the red. The irony of too much response in the red is that it causes stray light problems in the UV/blue! — Ref (1). Fig (1) shows typical response curves for photomultipliers, normal photodiodes, and an ideal photodiode for spectroscopy. A simple introduction to the various types of detectors can be found in Ref (2).

Apart from 1 or 2 specialist applications like spectroscopy, the demand for detectors with the sort of response shown in Fig (1) is quite small, as few other applications require UV response. Some commercial devices do exist, but none had the price/performance ratio which Philips Analytical was seeking for incorporation into its new PU8620 series of UV/Vis spectrophotometers.

The PU8620 series of instru-

Figure 1: Detector Characteristics

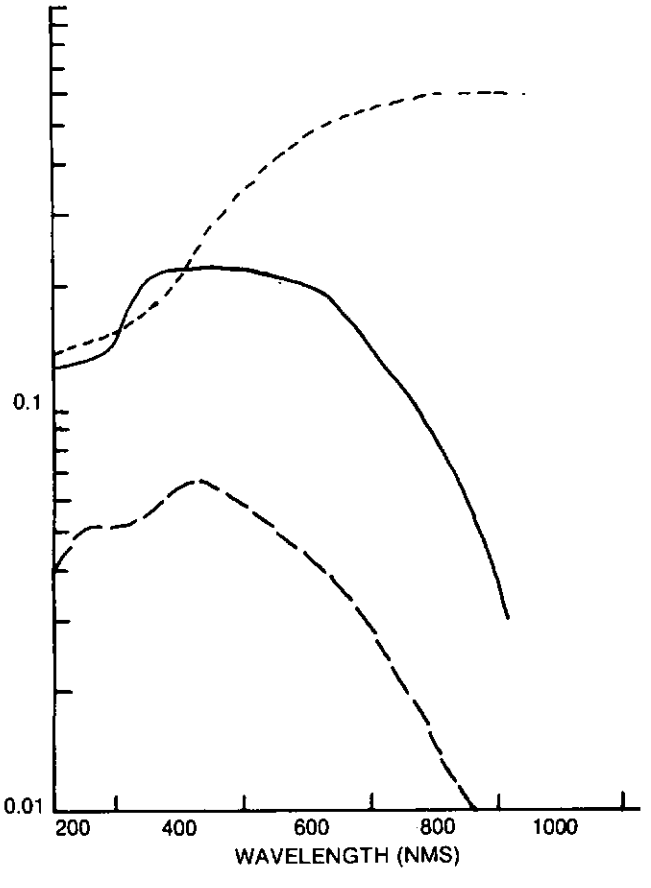
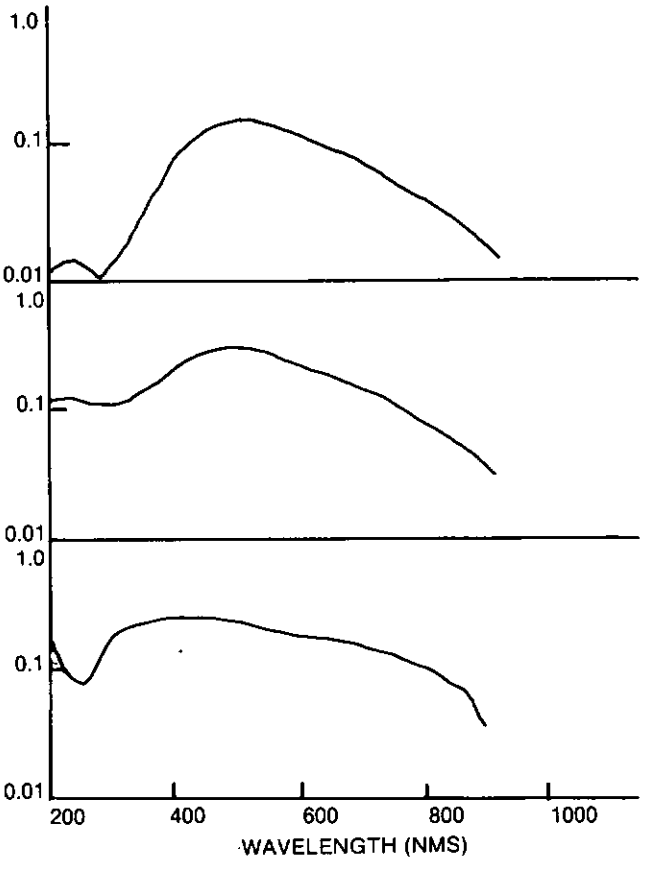


Figure 2: Photodiode Coating Effects



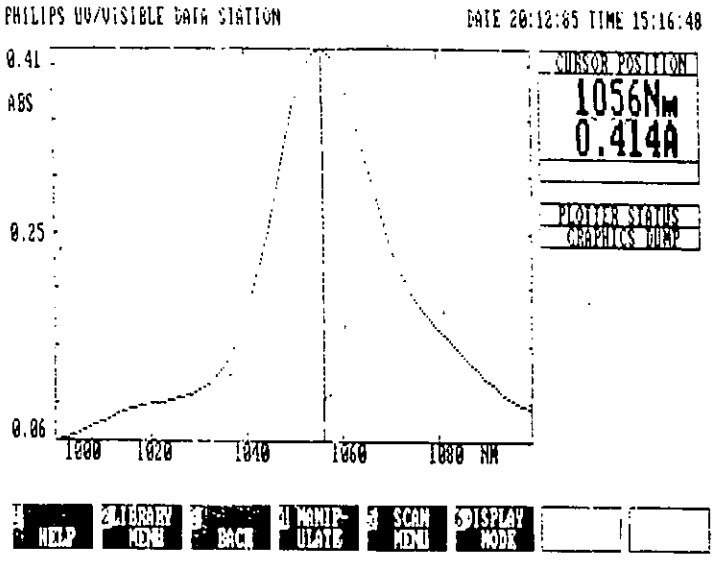


Figure 3: 100% v/v Triethylenetetramine

ments have developed from the highly successful range of PU8600 instruments, and incorporates many unique features to ensure accuracy and ease of use. For example, all instruments maintain the Pye Unicam tradition of incorporating a master blazed holographic grating, whilst features such as stored programs and self test routines considerably simplify the analyst's workload.

In order to produce the photodiode for the PU8620, a Senior Pye Unicam Scientist was seconded to the Philips Research Laboratories in Eindhoven, tasked with studying the exact requirements for such a device. No less than 17 performance parameters were found necessary to be specified; covering not only obvious aspects such as spectral sensitivity and noise, but also details of leakage current, capacitance, response uniformity, temperature stability, etc.

This specification was then taken by solid state scientists at the research labs and developed into prototype devices to meet the stringent Pye Unicam requirements. Extensive evaluation and testing followed, resulting in detectors now being made by Philips exclusively for incorporation into the PU8620 series of instruments. It is yet another example of Pye Unicam's commitment to excellence (exemplified by the incorporation of master blazed holographic gratings in its low cost UV/Vis instruments). It is also a measure of the success of the PU8600 series of instruments in the marketplace which has allowed Pye Unicam to commission a dedicated 'chip' specifically for use in the PU8620.

To highlight the skills and innovation which has gone into the development of these devices, it is perhaps worth exploring one or two specific performance parameters.

(a) **Wavelength Response**

As shown in fig. (1), the major stumbling block in using photodiodes in UV/Vis Spectroscopy is their wavelength response. The technique developed by Philips to provide the correct response is complex and cannot be described here. Once this response has been roughly achieved (which is no mean feat!) it can be tailored to meet the exact needs by evaporating a special anti reflection coating onto the photodiode. The thickness of the coating applied is very critical. Fig. (2) illustrates how the spectral response can vary with coating thickness.

As mentioned earlier, a major effect of the response can be seen in the measured stray light figures for the instrument. Typical results for a commercially available photodiode and for the Philips photodiode fitted into the PU8620 are shown in Table (1).

b) **Noise Performance**

To compare the performance of photodiodes, a single method of specifying noise is needed. One means of achieving this is by a term known as the 'dynamic resistance'.

The theoretical current voltage characteristic for a semiconductor photodiode is given by:

$$I = I_0(e^{c(v-IRs)/kT}-1)-I_L \qquad (1)$$

where
I = Device current
V = Voltage across device
I_0 = Leakage current
R_s = Device series resistance
I_L = Photocurrent
c = Electronic charge
kT = Boltzmanns Constant

When the device current is very low (I = 0) and it is not illuminated

(I_L = 0) Eqn (1) becomes

$$I = I_0(e^{cv/kt}-1) \qquad (2)$$

and the dynamic resistance

$$R_d = \frac{(dv)}{(dI)\ v=0} = \frac{kt}{eI_0} \qquad (3)$$

The photodiode mean square thermal noise current (similar to Johnson noise) is given by

$$In^2 = 4eI_0\sigma f_b$$

$$= \frac{4kT\sigma F_b}{R_d}$$

R_d can thus be taken as measure of photodiode noise (the higher R_d, the lower the noise).

Measurements made on the Philips detectors and the commercially available devices used for the stray light tests showed the Philips device to have an R_d of 1 x 10^9 ohms, and the commercially available detector an R_d of 3 x 10^7. Allowing for the difference in areas (R_d is proportional to area), this detector would have a comparable R_d of 1.2 x 10^8. Thus one concludes from these tests that the Philips detector when incorporated into the PU8620 series of instruments should give excellent noise performance, as indeed it does.

Applications

The Philips photodiode not only provides great improvements in stray light response and stability, it also has the added benefit of spectral sensitivity in the near infra-red.

The near infra-red (NIR) region of the electromagnetic spectrum consists of radiation of wavelengths extending from the fundamental IR absorption bands near 2500 nm. The expanded range of the PU8620, fitted with the Philips diode, with the upper wavelength limit increased from 900 to 1100 nm, makes this instrument particularly useful for analyses which

Table (1)

	Test	Commercially Available Photodiode	Philips Photodiode
220	NaI	39%	.05%
340	NaNo2	0.02%	.05%
550	09550	1.25%	.04%
800	C9788	70%	.02%

Figure 5: 1% v/v triethylenetetramine in water

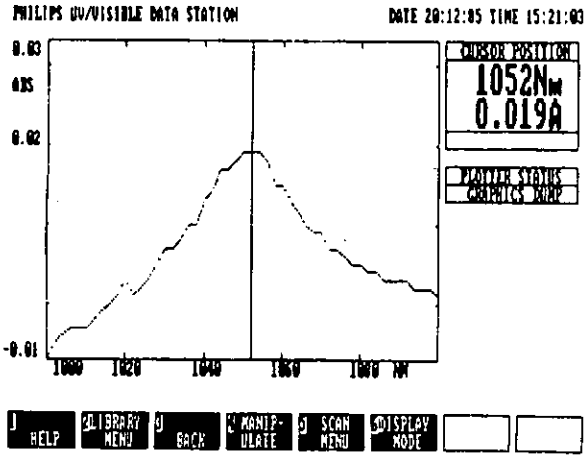
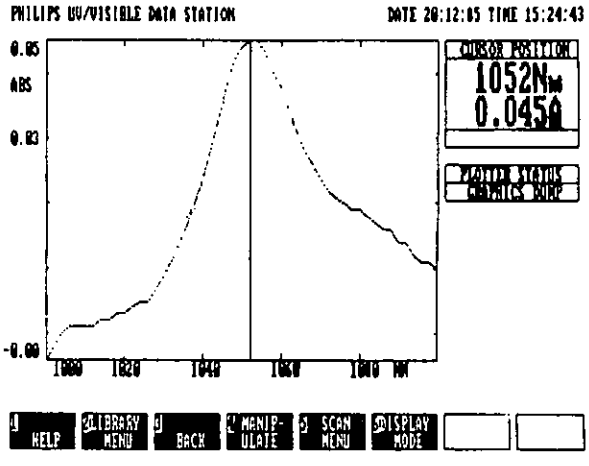


Figure 6: 2% v/v triethylenetetramine in water



are performed in the region where the visible and the near-IR overlap. This range of 800-1100 nm is used particularly for a number of important determinations in water pollution control and the analysis of geological samples, and some of these methods are discussed below. With the PU8620, such analyses are no longer carried out near the end of the instrument's operating range.

The determination of phosphates in waters is important in water pollution analysis, and low concentrations of phosphate may be measured by the ascorbic acid method. In this procedure, ammonium molybdate and potassium antimonyl tartrate react in an acidic medium with dilute solutions of orthophosphate, for example in samples of domestic waste water, to form a heteropolyacid (phosphomolybdic acid), which is reduced to the intensely coloured molybdenum blue by ascorbic acid. This species may be determined by measuring its absorbance at 880 nm. The procedure is very sensitive, and is able to detect the presence of phosphate down to levels of around 30 micrograms/litre, with a 50 mm pathlength cell.

In acidic media, ammonium molybdate also reacts with free silica (SiO^2) in a sample of rock, for example, to produce a heteropolyacid. Any interferences from phosphates present in the sample may be eliminated by using tartaric, citric or oxalic acids to destroy the phosphomolybdic acid compound which may be used in the determination if desired, but a significant increase in sensitivity is obtained if the heteropolyacid is reduced by the addition of 1-amino-2-naphthol-4-sulphuric acid to give heteropoly blue, which has a much more intense colour. Measurement of the absorbance of this species at 815 nm provides a sensitive determination, with a detection limit of around 20 micrograms of silica/litre.

Similar methods to the above may be used in the determination of arsenic and germanium. Both of these metals react with ammonium molybdate in an acidic medium to form heteropolyacids, which may readily be reduced to intensely coloured molybdenum blue species. The absorbance of the arsenic-molybdenum blue is measured at 840 nm, whilst the analogous germanium compound is measured at 800 nm.

Above a wavelength of 1000 nm, few electronic absorption bands are observed. Throughout most of the NIR region, most of the absorption intensities are contributed by weak overtones and combinations of the vibrational bands from the middle infra-red (mid-IR) by the standards of typical mid-IR and UV/Visible spectroscopy, these NIR absorptions are orders of magnitude weaker, especially at the shorter wavelengths, where the successfully higher overtones eventually become undetectable. The region 900-1100 nm shows a number of absorptions attributable to the second harmonic over-vibrations of C-H and N-H groups in organic compounds. For example, absorptions due to the following moieties may be observed:

Terminal alkyne C-H
Cis CH=CH groups
Aliphatic N-H
Aromatic N-H
Hydrazine NH_2
Imides
Some terminal CH_2
Some vinyloxy groups

Fig. 3 shows a scan of triethylenetetramine between 1000 and 1100 nm, obtained using the PU8620 scanning software package, running on the IBM PC-based Philips UV/Visible Data Station. The absorption at 1050 nm is due to the second harmonic vibration of the N-H groups. The spectrum was recorded with a sample of neat triethylenetetramine in a 10 mm pathlength cell. Fig. 4 shows a

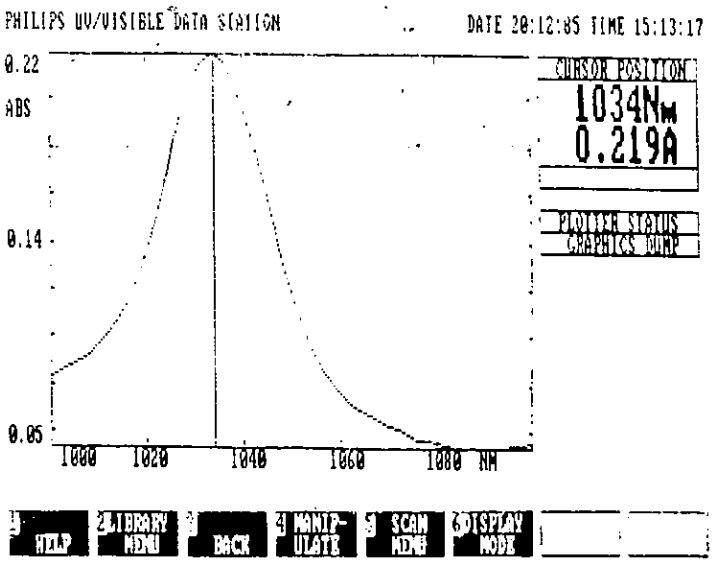


Figure 4: 100% v/v — m-toluidine

scan of m-toluidine recorded in a similar manner, the absorption band at 1035 nm being due to an overtone of the aromatic N-H group vibration.

Due to the weakness of the second harmonic vibrational absorptions in this region, any analytical methodology based on such absorptions would require the use of longer pathlength cells (40-50 mm). For example, Figs. 5-7 show the absorption peaks obtained for 1, 2 and 4% v/v solutions of triethylenetetramine in de-ionised water (run against a water background), using a 40 mm pathlength cell. The spectra have been optimised using a scaling feature of the scanning software. Fig. 8 shows the calibration curve drawn from the spectral data at 1052 nm, and it demonstrates that Beer's Law is obeyed by this system. The scanning software is not necessary for this kind of work, however. These absorptions can be located using the PU8620 PEAK SEEK routine, and fixed wavelength measurements can be made in the usual manner.

One of the biological applications in the NIR makes use of the fact that only weak overtones from the mid-IR are present in this region. In this example 1000 nm is chosen as the wavelength which has very little interference from the consistuents of a bright beer sample and can therefore be used in a determination of yeast concentrations directly in undiluted beer[3].

Conclusion

The PU8620 has reinforced Philips Analytical's long history of innovation and market leading in the field of UV/Vis Spectroscopy. The integral photodiode detector, tailored exactly to meet the spectroscopists needs, allows measurements to be made over a greater wavelength range whilst still maintaining the other parameters so fundamental to good specifications.

References

(1) Sharpe, M. R., Analytical Chemistry, 1984, **56**, 339A
(2) Knowles, A. and Burgess, C., Practical Absorption Spectrometry, Chapman and Hall, 1984
(3) Upperton, A. M., J. Inst. Brew., 1969, **75**, 464

Figure 7: 4% v/v triethylenetetramine in water

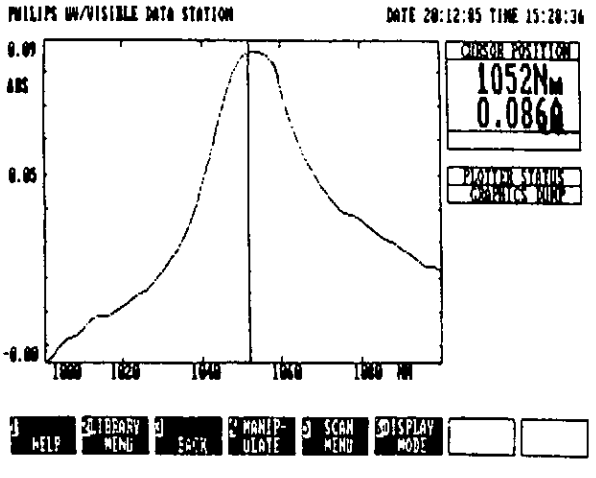
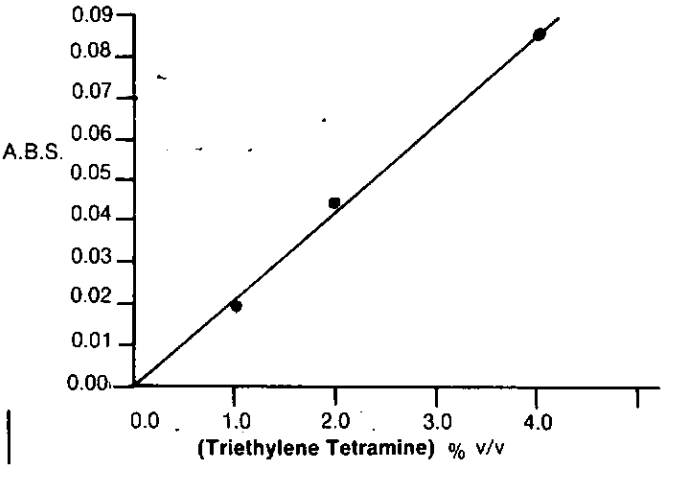


Figure 8: Triethylenetetramine Calibration Curve (1052 nm).



PRODUCT NEWS

Instrumental Neutron Activation Analysis Now available in New Zealand

Instrumental Neutron Activation Analysis (INAA) is now offered for the first time through a New Zealand company. Independent Service Laboratories (ISL) of Nelson is able to introduce this service to Science and Industry throughout New Zealand, Australia and the South Pacific having been appointed sole agents for Becquerel Laboratories Inc of Canada.

INAA is a complementary technique to XRF, AA, etc but has particular application where large numbers of samples require multi-element analysis to very low detection limits. Over 50 elements can be analysed simultaneously, and usually samples are not required to go through any chemical preparation steps prior to analysis. This has obvious advantages where contamination from reagents etc poses a problem. In the case of water analysis a sample preconcentration step may be used; this allows detection limits down to parts per billion, and in the case of gold, to parts per trillion.

INAA 'sees' only the nucleii of a sample. Thus INAA gives very accurate 'total element' concentration, irrespective of the chemical or physical forms of the elements of interest.

As INAA facilitates analysis of materials derived from mineral and biological forms, its applications cover a broad range of disciplines. It is an especially useful tool in quantification of trace elements in rocks, soils, vegetation, mineral concentrates, ores, and natural waters. Obviously INAA also has relevance in Medical and Research areas.

Analysis costs are relatively low, and significant savings can be made over comparable techniques, when multi-element analysis of large numbers of samples is required.

A complete schedule of Neutron Activation services and fees is available — telephone ISL Freefone (054) 82-660, or circle **6** on the reader reply card.

Original Ika Stirring Motors RW20

The RW20 series of stirring units is characterised by a particularly powerful drive whilst having compact dimensions.

Exemplary ease of operation, best possible overload protection, maintenance-free capacitor motor, trouble-free handling and the proverbial IKA reliability ensure the smooth functioning of all the RW20 models.

The standard version of the basic model is equipped with a connection for the revolution counter so that the latter can be added at any time.

Moreover, all the RW20 models can boast a number of technical attractions:

- Reversible speed ranges: Range I: 60-500 r.p.m. Range II: 240-2000 r.p.m.
- Overload protection with temperature sensor in the motor winding.
- High prolonged output of 26 W.
- Additional 35% power reserve (up to 35 W depending on load).
- Standard version of RW20 basic model equipped with connection for IKA revolution counter type DZM 1.
- Chuck and hollow shaft suitable for insertion and height adjustment of stirring elements with up to 10 mm shaft diameter.

Further details are available from IKA's New Zealand distributors: Kempthorne Medical Supplies Ltd, PO Box 1234, Auckland. (Contact: John Clark, Product Manager); or circle **7** on the reader reply card.

PRODUCT NEWS

Product News From Sci-Med

Akashi (ISI) Distributorship

Akashi Seisakusho Ltd of Tokyo Japan, have appointed Sci-Med as their sole distributors of their total product line, which includes SEM's, TEM's, materials testing and earthquake monitoring/prediction equipment. Akashi is a "new" name outside of Japan as their SEM's and TEM's have been sold worldwide through their wholly owned U.S. subsidiary, ISI— (international Scientific Instruments).

So, to improve communications, service, marketing and sales to their customers, Akashi have decided to deal directly with distributors worldwide as with Sci-Med in New Zealand.

★ ★ ★ ★ ★

Akashi TEM

Akashi introduce new technology with their 002A TEM, realising a resolution of 0.21 nm. This 120 kV instrument is the result of many years in R&D by the design team who joined Akashi around eight years ago ex JEOL.

The electron optical system, consisting of a 5-stage illumination system and a 6-stage imaging lens system, offers three operating modes, i.e. "standard high resolution mode", "high tilt mode", and "ultra-high resolution mode" (option). Switching from one operating mode to another is simple due to the incorporation of computer control of the lens system. The magnification can be changed over a wide range from 50x to 1,200,000x (1,900,000x option).

For further information, please contact your local SCI-MED branch or Andrew Pearce at P.O. Box 321, Dunedin. Ph. 755-531.

★ ★ ★ ★ ★

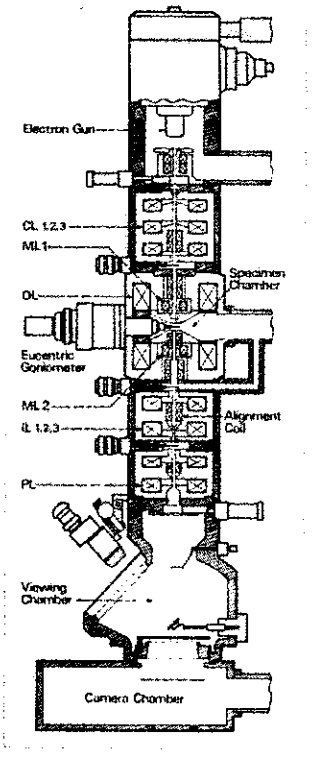
Ultrospec II

Yet another step forward in spectrophotometry

Three successful years after the introduction of Ultrospec, LKB proudly introduces its successor, Ultrospec II.

Ultrospec II keeps all the major features that contributed to Ultrospec's outstanding success in the field of UV/Visible single beam spectrophotometry, and gained it the acknowlegement of a prestigious Design Council Award, as an outstanding British product of 1984.

Pursuing the LKB policy of continual development in the search for technical excellence,



Ultrospec II combines ease of use, with improved performance, and added features. Completely re-designed electronic circuitry and a new optical system gives a greater photometric range, with absorbance values: linear to 3.0A, even better stray light performance, faster response and remarkable stability. It now takes less than one second for Ultrospec II to give a stable reading from a sample, a result you can rely upon — absolutely.

LKB's search for excellence is not carried out in isolation. We have listened carefully to users of our instruments, and strived to meet their requirements. Ultrospec II includes many features that users have requested such as "peak check facility". With a simple key operation, Ultrospec II will search around the chosen wavelength, to confirm the precise location of the point of maximum absorbance, or minimum transmission, for any samples. Ultrospec always made operation simple, by using the intelligence of a microprocessor, Ultrospec II takes that intelligence even further, with automatic cell holder recognition; the instrument performing its own positive recognition of which of the wide range of cell holders available from LKB is in place, and responding accordingly.

Ultrospec II's usefulness in any laboratory is further enhanced by a range of software available for use with Apple and IBM-PC/XT/AT microcomputers. This new generation software, for functions like wavelength scanning and reaction rate monitoring is the most versatile and user-friendly yet!

★ ★ ★ ★ ★

Two New Guidebooks for Liquid Chromatography Systems

A new 16 page publication from LKB now enables highly simplified and more cost-effective selection of any liquid chromatography system. The guidebook presents a broad overview of the many different chromatography systems for both LC and Traditional Chromatography.

By using a Core System approach for LC, researchers can now acquire a complete, high performance solvent delivery unit, with a choice of either steel or inert fluidics. The Chromatography Systems are modular, and thereby allow the user to simply extend his system whenever required. By adding from a very wide variety of columns, detectors, output devices and software, fraction collectors and peripheral units, the user can customize a system which exactly meets his needs.

A useful feature of this new guidebook is the presentation of dedicated systems for specific applications. Each application system shows and lists which Core System should be used, as well as the modules needed for the complete system extension. The section on Traditional Chromatography presents application systems, showing the units selected for isocratic and gradient systems, on either a laboratory or preparative scale.

The new guidebook also features all the modules offered by LKB, together with a reference list for Technical Literature and Application Notes.

The configurations shown for both LC and Traditional Chromatography represent only a few of the many different systems that can be assembled. With a choice of more than 20 modules, and over 90 columns, the variation possibilities are virtually endless.

LKB have therefore also published a new Ordering Guide, which will help to make correct selection of components even easier. For a copy of both these publications, please contact: your nearest Sci-Med Branch.

For further information on any of the above products contact Sci-Med, or circle **5** on the reader reply card.

Mettler LP16 Dryer Unit

Mettler's new LP16 is on the one hand an extremely easy to operate infrared drying unit for routine determinations of moisture and dry weight in production control. At the simple push of a button it performs drying cycles automatically, with every aspect closely controlled.

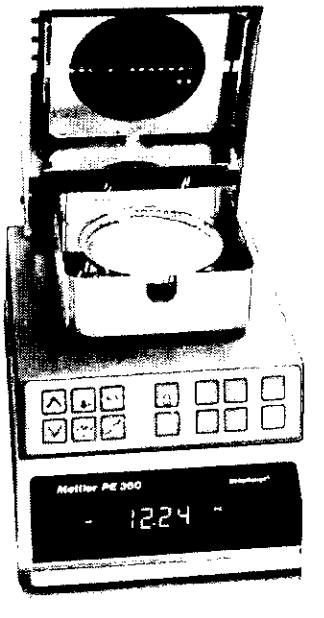
But the LP16 also meets the exacting requirements of modern quality assurance laboratories. It analyses any sample precisely, under reproducible drying conditions. The instrument is quickly and easily configured for specimens of all kinds.

The drying temperature is set in advance: two built-in sensors continually measure and regulate the temperature, so controlling the drying sequence. The infrared drying unit will not only heat for a chosen length of time; determinations to a definable dryness end-point can also be configured. Furthermore, there are four different evaluation programs for computing the results. Once the parameters are decided, drying is again started by merely pressing a button.

The LP16 is used together with a Mettler precision balance, although the two can very quickly be disconnected. The balance can then be used quite normally for weighing.

Like all Mettler balances and instruments, standard features of the LP16 are data interfaces for connecting to a printer to provide automatic, detailed records. For more extensive data processing the infrared drying unit can link up to computers as well.

For further information circle **4** on the reader reply card, or contact Watson Victor Ltd.



PRODUCT NEWS

New options boost power of Philips Analytical Gas Chromatograph

The capability of Philips Analytical's highly-acclaimed PU4900 Total Analytical Gas Chromatograph has been further extended by the introduction of new disc and graphics options.

The dual disc unit enables raw data, results and methods to be stored, copied from one disc to another, and transferred between instruments. More than 120 methods can be called up from disc to fulfil the analytical requirements of different samples.

Used in conjunction with the Philips Analytical PU4700 autosampler, over 100 types of sample can be analysed with up to 60 different methods entirely automatically.

The graphics option allows the user to monitor up to three channels of data simultaneously on the VDU screen. In the post-run mode raw data from any analysis can be called up from internal memory or disc.

The full chromatogram can be displayed and any portion of the trace expanded. Positioning of peak start, finish and baseline can then be examined in detail.

If necessary, parameters can be altered to reposition these features until correct data allocation occurs. Full integration and calculation are then followed by a hard copy report.

Should you require further details or wish to attend one of the countrywide PU4900 launch seminars planned for late May 1986 please contact your local Philips office:

Auckland 894-160 Dave Morgan

Wellington 735-735 Alasdair Hall

Christchurch 798-030 Geoff Wright

Changes at John Morris Scientific

John Morris Scientific Ltd are pleased to announce some major changes to their Wellington Branch office which they believe will be of mutual benefit, to staff and customers alike.

As of April 28th, **Mark Sharples** will no longer be combining the roles of both Sales and Service, but will be fully engaged in service commitments.

Mr David Anderson will be joining the group as Sales Representative. David may already be known to readers from his past experience in the scientific sales field.

Mrs Elizabeth Johnson is also joining the staff, to handle the office affairs, and to be the first line of contact in the future.

On top of this, there will be some structural changes to the premises, though both phone and postal details remain as before.

The management sincerely believe that the changes and the new team should solve any "growing pain" problems, and look forward to your continued and future custom.

CO_2 FROM WASTE FLUE GAS

A joint project between Mesco Liquid Air Limited and N.Z. Forest Products Limited is turning waste flue gas into CO_2.

Mesco Liquid Air has constructed a recovery plant on NZFP's pulp and paper mill site in Te Papapa, which came on stream in March. The plant will harness boiler flue gas 24 hours a day, seven days a week, and have sufficient capacity to supply the entire North Island with CO_2. The new facility will, in fact, have three times the capacity of Mesco Liquid Air's current sales. However, there is a growing demand for bulk CO_2 for various applications for freezing, carbonating beverages, welding, etc. The Te Papapa plant ensures that the demand will be met.

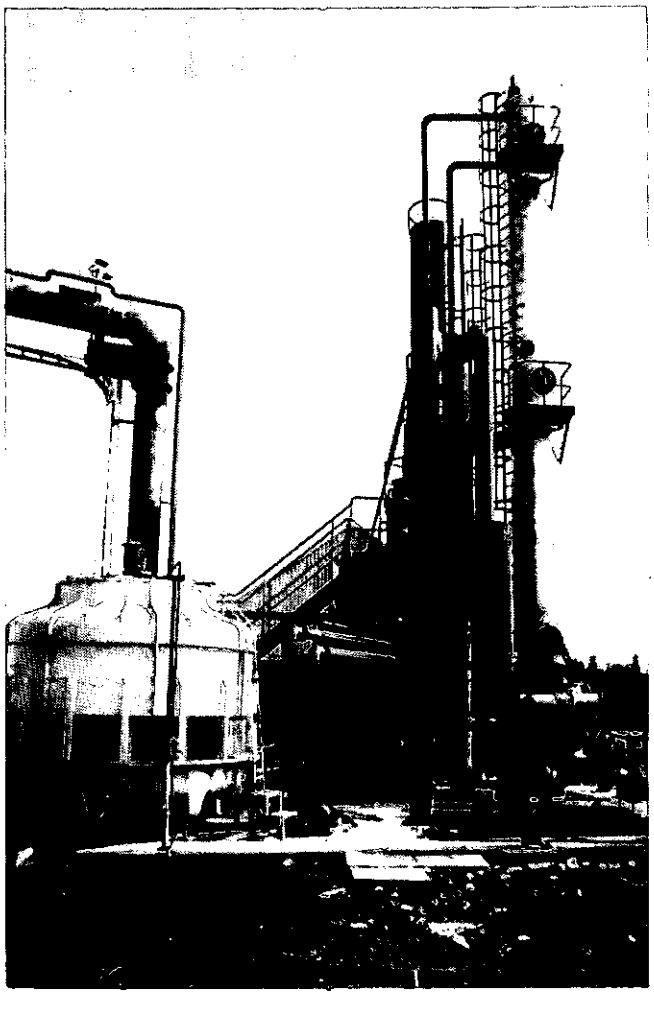
The waste flue gas produced by a coal fired boiler contains 12 percent carbon dioxide. To extract the CO_2, the gas is put through a number of cleaning processes to remove emission particles — from the resultant "clean gas", the CO_2 is taken out and further purified. The remaining waste gas not able to be used is vented into the atmosphere free of contamination.

The CO_2 is ultimately liquified and cooled until it is stored in an insulated tank ready for distribution. The tank has a capacity to 100 tonnes. It is 15 metres long by three meters in diameter and manufactured in Christchurch from 19mm steel with a temperature rating of minus 40 degrees Celsius.

Until Mesco Liquid Air and NZFP began negotiations, the flue gas was simply wasted. Mesco's managing director, Mr Alain Geron, says he saw an opportunity to save a significant amount of energy. NZFP's chief engineer at Penrose Industries, Mr Barry Robert, says this will be the first time his company's "chimney smoke" has been used for CO_2 manufacture. "NZFP believes in utilising waste," he said. "The paper mill produces corrugated paper from 100% waste paper, so it is therefore appropriate that Mesco Liquid Air should set up a plant on site to utilise chimney emissions."

The CO_2 recovery plant will be fully automatic. Only the scrubbers and recharging absorption towers will require manual washing out.

This new plant is part of the on-going capital expansion programme of Mesco Liquid Air, confirming its commitment and belief in the future of the gas industry in New Zealand.



PRODUCT NEWS

News from Alltech

Alltech New Zealand have been appointed an official distributor for Scientific Glass Engineering (S.G.E.), of Melbourne, Australia, and have acquired the entire stock of S.G.E. products formerly held by PHILIPS NZ Ltd.

With new delivery schedules being made available from S.G.E., faster ordering, etc, the New Zealand market is assured of top-class service from this Australian company, who have established themselves as world-class suppliers of specialist products for the scientist.

In addition to the S.G.E. Catalogue, a useful Syringe Comparison brochure is available from ALLTECH, giving direct equivalents for S.G.E. and HAMILTON syringes.

★ ★ ★ ★ ★

A new 30-page Glassware and Autosampler Vials Catalogue is available from ALLTECH NEW ZEALAND. With full cross-referencing, with over 50 different types of Autosamplers catered for, this Catalogue also details a full range of environmental apparatus, as well as Centaur and Wheaton Pipettes.

★ ★ ★ ★ ★

In order to provide a New Zealand-wide service, ALLTECH NEW ZEALAND have listed their Auckland office 'phone as **Toll-Free.** Their number, (09) 444-3230, can be called direct, from anywhere in the country, free of charge to the caller.

★ ★ ★ ★ ★

The GAUSS MAUS® is a hand held portable instrument for the measurement of alternating magnetic fields. It is particularly useful for the detection of fields which disturb sensitive instruments such as Electron Microscopes. The instrument comprises of a measuring unit, linked to a sensor unit by a spring coil cable, and is fully portable, and easy to use.

Available from AGAR AIDS LTD, of England, full details on the GAUSS MAUS® can be obtained from ALLTECH NEW ZEALAND.

★ ★ ★ ★ ★

The GASTEC Precision Gas Detector system is a low-cost tube system, available from GASUKURO KOGYO, of Tokyo, through their N.Z. distributors, ALLTECH/APPLIED SCIENCE, of Auckland.

The pump unit comes in a stylish shoulder carry bag, which hods the pump and spare tubes. The latter are available for many different types of gases, and have been NIOSH certified.

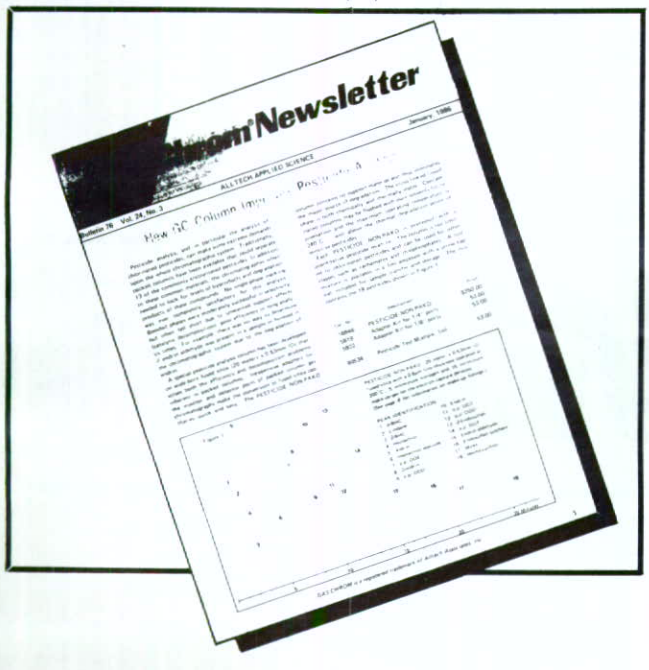
Full details can be obtained from ALLTECH.

★ ★ ★ ★ ★

Gas Chrom Newsletter

Published four times a year, the GAS CHROM NEWSLETTER deals with the latest advances in chromatography and new products. This newsletter regularly reports on technical trends within GC, HPLC, and TLC. A must-read periodical for the practicing chromatographer. Included in this quarter's issue is a pesticide FSOT column and the new HayeSep porous polymer material. Send for your free copy today.

For information on any of the above circle on the reader reply card, or contact: Alltech Associates N.Z., P.O. Box 33-527, Takapuna, Auckland 9. Ph: (09) 444-3230 Telex: NZ61111.



SHIMADZU UV-VIS RECORDING SPECTROPHOTOMETER UV-160

FEATURES

UNITIZED COMPACT DESIGN

The monochromator, the operation unit, the CRT, and the graphic printer are integrated into a compact body.

HIGH SPEED SCANNING

It takes only 25 seconds to scan the entire spectral range of 1100 to 200nm with the spectrum displayed on the CRT, including lamp change. Wavelength setting is made at the high rate of 60nm/sec.

A LARGE VARIETY OF QUANTITATIVE FUNCTIONS

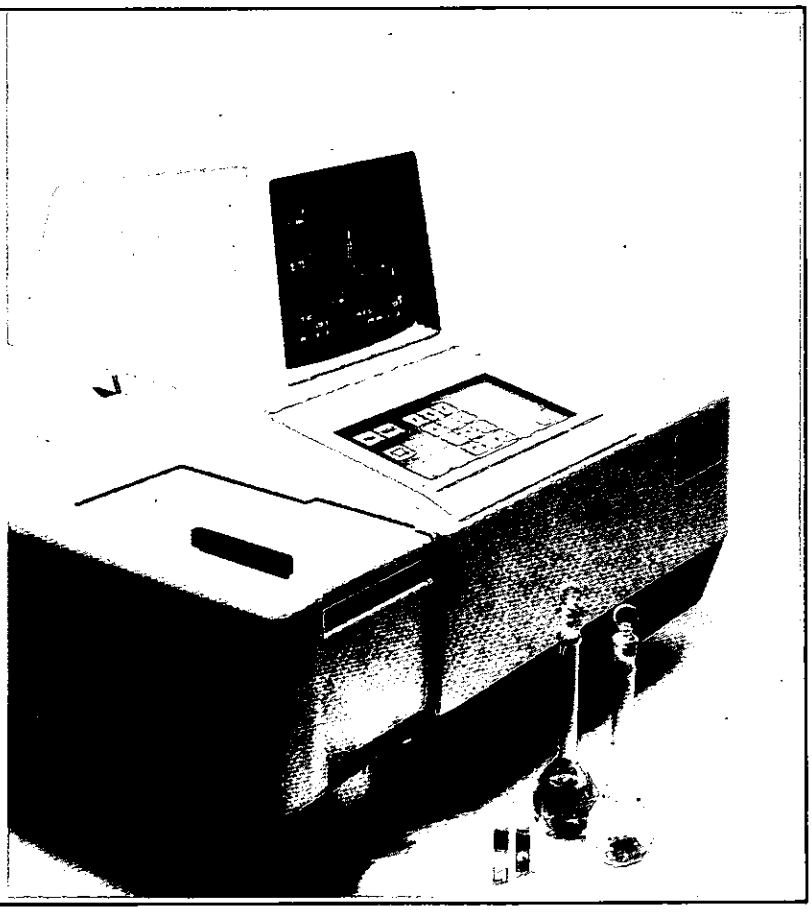
The standard programs incude: (1) quantitation by the least square calibration method using single wavelength, two/three wavelengths, or derivative values, (2) kinetic assay, and (3) multicomponent analysis.

EXCELLENT EASE OF OPERATION

The UV-160 has only 24 keys, which are all single-function type. High-level data processing can be easily carried out through dialog with the CRT.

HIGHEST SPECTRUM DATA PROCESSING CAPABILITY IN THIS CLASS

Expansion and compression of spectra, peak picking, differentiation of spectra, smoothing of spectra, data memory, arithmetic calculation between spectra, etc. are all available.



- DOUBLE BEAM HIGH SPEED SCANNING SPECTROPHOTOMETER
- ADVANCED QUANTITATIVE SOFTWARE
- FULL SPECTRAL MANIPULATION
- SPECTROPHOTOMETRY IN SIX MODES
- FULL RANGE OF ACCESSORIES AVAILABLE

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PORIRUA **P.O. Box 50-248**
WELLINGTON **P.O. Box 830**
CHRISTCHURCH **P.O. Box 32-054**

AWA SCIENTIFIC & MEDICAL

A DIVISION OF AWA NEW ZEALAND LIMITED

PRODUCT NEWS

New Agents for Shimadzu

AWA are proud to announce their appointment as the sole New Zealand representatives for Shimadzu Corporation Scientific Instruments, as from the beginning of April 1986. Concurrent with this they also announce the appointment of Alan Corney, with 10 years experience of Shimadzu instruments, to manage this product line.

They expect that with the quality products provided by Shimadzu coupled with AWA's depth of computing and engineering experience to offer an even greater range of service than has been possible in the past.

Because of the vast array of Shimadzu instruments spread throughout the country and to ensure continuity of service AWA suggest that current users of Shimadzu instruments take advantage of the prepaid card enclosed to log their instruments with our central service department.

Fused Silica Capillary Columns

A selection of fused silica capillary GC columns has been introduced by Pierce Chemical Company. Consistent, high quality columns are assured because Pierce manufactures its own capillary tubing. Every column is tested with a modified grob test mixture to show its separation abilities. The test chromatogram and column data sheet are supplied in the column package along with the test mixture. Columns are available with seven stationary phases, three film thicknesses, two internal diameters and three lengths.

Triple your sample preparation capacity with Reacti-Therm™ III

Pierce Chemical Company introduces the newly developed Reacti-Therm III Heating and Heating/Stirring Modules. The new design provides for the use of three Reacti-Block™ Aluminium Blocks to triple your sample preparation capacity. The units are ideal for high temperature derivatizations and protein hydrolyses due to their expanded temperature range of ambient to 200°C. The Reacti-Therm III Heating/Stirring Module, with its built-in stirrer, is the unit of choice for promoting smooth, uniform reactions and dissolving sticky residues. A versatile 27-port evaporator, the Reacti-Vap™ III, facilitates sample isolation and concentration.

The "original" Reacti-Therm Heating and Heating/Stirring Modules are still available to service your single block requirements. Stirring and evaporating capabilities are available with these units. Their temperature range is ambient to 150°C.

For additional information contact NZ agents Lab Supply Pierce (NZ) Ltd, P.O. Box 74-234, Auckland, or circle **2** on the reader reply card.

Passive Dosi-Tubes from Gastec

Time-weighted average determination tube, for workplace monitoring.
Measures: Carbon Monoxide, Hydrogen Sulphide, Sulphur Dioxide, Hydrogen Cyanide.

Gastec Passive Dosi-Tubes are used for measuring the time-weighted average gas concentration over a full work shift.

The Passive Dosi-Tubes are filled with diffuser and chemical reagent parallel in each glass tube. This helps to diffuse the gases at a constant rate and provides a greater length of discoloration and clearer demarcation in the tube.

The Dosi-Tubes can be placed within the breathing zone of personnel and/or the working environment for area monitoring.

The obtained results can be easily compared with Threshold Limit Values as set by ACGIH (American Conference of Governmental Industrial Hygienists), and used in this country.

Features:

1. No motor driven air sampler or aspiration type pump is necessary.
2. Simply cut the tube at the score mark and put it in the tube holder.
3. Direct reading diffusion scale printed on each tube.
4. Just read the length of discoloration of the tube.
5. No need for subsequent analytical techniques.

Further details are available from Gastec's New Zealand distributors: Kempthorne Medical Supplies Ltd, PO Box 1234, Auckland. (Contact: John Clark, Product Manager); or circle **3** on the reader reply card.

PRODUCT NEWS

Filtration Products From Schleicher & Schuell

Filtration Catalogue

A line of filter papers and extraction thimbles is described in a 36-page illustrated catalogue. Together with the traditional cellulose-based products, synthetic fibre products have been gaining in importance. Glass fibre filters are opening up new areas of filtration. Indicator, reagent and special purpose papers complete the product range. The booklet contains technical data and examples of application for all grades presently available.

Bio-Trap for Separation of Large Molecules

The Schleicher & Schuell Bio-Trap.

• A new inert membrane from Schleicher & Schuell retains charged macromolecules in an electric field without adsorption. This membrane retains macromolecules larger than 5,000 daltons in size. Application of the inert membrane in the Bio-Trap dialysis system enables the user to elute charged macromolecules (DNA, RNA and proteins) from gels, to concentrate, dialyse and separate them isoelectrically. In the Bio-Trap, the macromolecules are driven into a 'membrane-trap' by means of an electric field where they are quantitatively caught in a volume of 200 to 400 microlitres and are easily removed with a Pasteur pipette. The recovered macromolecules are suitable for enzyme digestion or other experiments without centrifugation, precipitation or other steps. Bio-Trap can be employed without additional equipment in a conventional electrophoresis chamber.

Membrane Filters

Nytran® membranes are positively charged Nylon 66 membranes for the immobilization of nucleic acids and proteins. They interact with negatively charged biopolymers which become selectively bound and immobilized on the membrane. Because of its high binding capacity and good mechanical, thermal, and chemical resistance properties, Nytran is an excellent medium for electrophoretic transfer methods in molecular biology.

Schleicher & Schuell

Filter Papers
Extraction Thimbles/Filter Thimbles
Special Purpose Papers

For information on any of the above products circle **1** on the reader reply card, or contact the NZ agents: Behring Diagnostics Section, Hoechst New Zealand Limited, C.P.O. Box 67, Auckland. Phone 578-068. Telex 2338.

PRODUCT NEWS

Basic, versatile Beckman Spectrophotometer offers programmability, scanning.

Beckman Instruments, Inc. has incorporated modern Stable Beam Technology and simplified electronics into a new series of basic, easy-to-use, highly reliable UV/Visible spectrophotometers.

Designed for laboratories that require quantitative calculations from the spectral data read by the spectrophotometer, the top-of-the-line DU-50 Spectrophotometer performs wavelength scanning and offers a built-in programmable calculator. Ideal for methods development in quality control laboratories, the DU-50 enables the operator to write 100-line programs to completely control instrument functions. They include: collection of data at any wavelength, wavelengths, or region of a spectrum from a scan; calculation of the answer most meaningful to the operator using the equation he or she writes; printout of results in the operator's own format with annotations meaningful to the operator's analysis; and sending of messages to the operation in his or her own language on instrument operations, sample preparation and use of the results.

The DU-50 can store four such methods internally in non-volatile EPROM memory safe from accidental erasure. Memory-Pak Modules, each of which stores two methods, provide unlimited storage. An optional Cookbook of programmed methods includes many of the most common tests and shows examples of how to write equations, send messages, store data and format outputs.

In addition, the DU-50 can be used in the same manner as a pocket calculator. It performs addition, subtraction, multiplication, division, square root, YX, log, natural log, statistical analysis, slope, intercept and correlation coefficient. Data can be entered directly by the user as on a calculator, or it can come from the data on the instrument display or from a Memory-Pak.

Scanning data is recorded in a fully labeled presentation with the accessory printer/plotter. The sample wavelength is clearly readable.

Stable Beam Technology insures data integrity, even when scanning at fast speeds. Stable Beam optics also provide accurate tracking of very fast time-based analyses such as kinetic reactions, very high sample throughput, uniform sensitivity throughout the wavelength range and reduced light levels.

Beckman offers preprogrammed Soft-Pak Modules for the most common analyses. They include: peak pick and point pick of spectral data, calibration curves and kinetic analysis.

A wide choice of sampling accessories for the DU-50 Spectrophotometer meets particular analysis needs. They are a single cell holder for 1 cm rectangular cells or microcells, long pathlength cell holders for 5 cm-pathlength rectangular cells or 10 cm-pathlength cylindrical cells, a manual or automatic 6-sampler for six 1 cm rectangular cells, a sipper sampler used with the sipper sampler for unattended analysis for up to 114 samples. Temperature control options include both Peltier and water-regulation. There are cuvettes for each type of sample holder.

Data output options include a digital printer/plotter, a digital printer/plotter interface, analog output and serial computer interface.

Other models in the series are the DU-40 Spectrophotometer for fast scanning; the DU-30 Spectrophotometer, a programmable, non-scanning instrument; and the DU-20 Spectrophotometer, a non-scanning, non-programmable instrument for routine applications.

For more information, or to arrange for a demonstration, contact Alphatech Systems Ltd, Box 37-583, Auckland, phone (09) 770-392; or circle on the reader reply card.

Conference Announcement

The Asian-Pacific Congress on Occupational Health and Safety is to be held at Massey University during 17-20 November, 1986. The Congress will provide a forum for the promotion of occupational health and safety principles and practice with the theme: "Health, Safety and Productivity — Partners in Progress Towards 2000". Further information can be obtained from; The Congress Secretariat, Asia-Pacific Congress, Management Education & Development Centre, Massey University, Private Bag, Palmerston North.

Now there's a super-productive diode array spectrophotometer that's easy to use and easy to buy...the HP 8452A

The new HP 8452A Diode Array Spectrophotometer is designed to be the fastest, most productive UV/VIS spectrophotometer in your laboratory. It is offered with a choice of computer controllers, software and accessories that extend the capability of diode array spectrophotometry and make it available at a low entry price.

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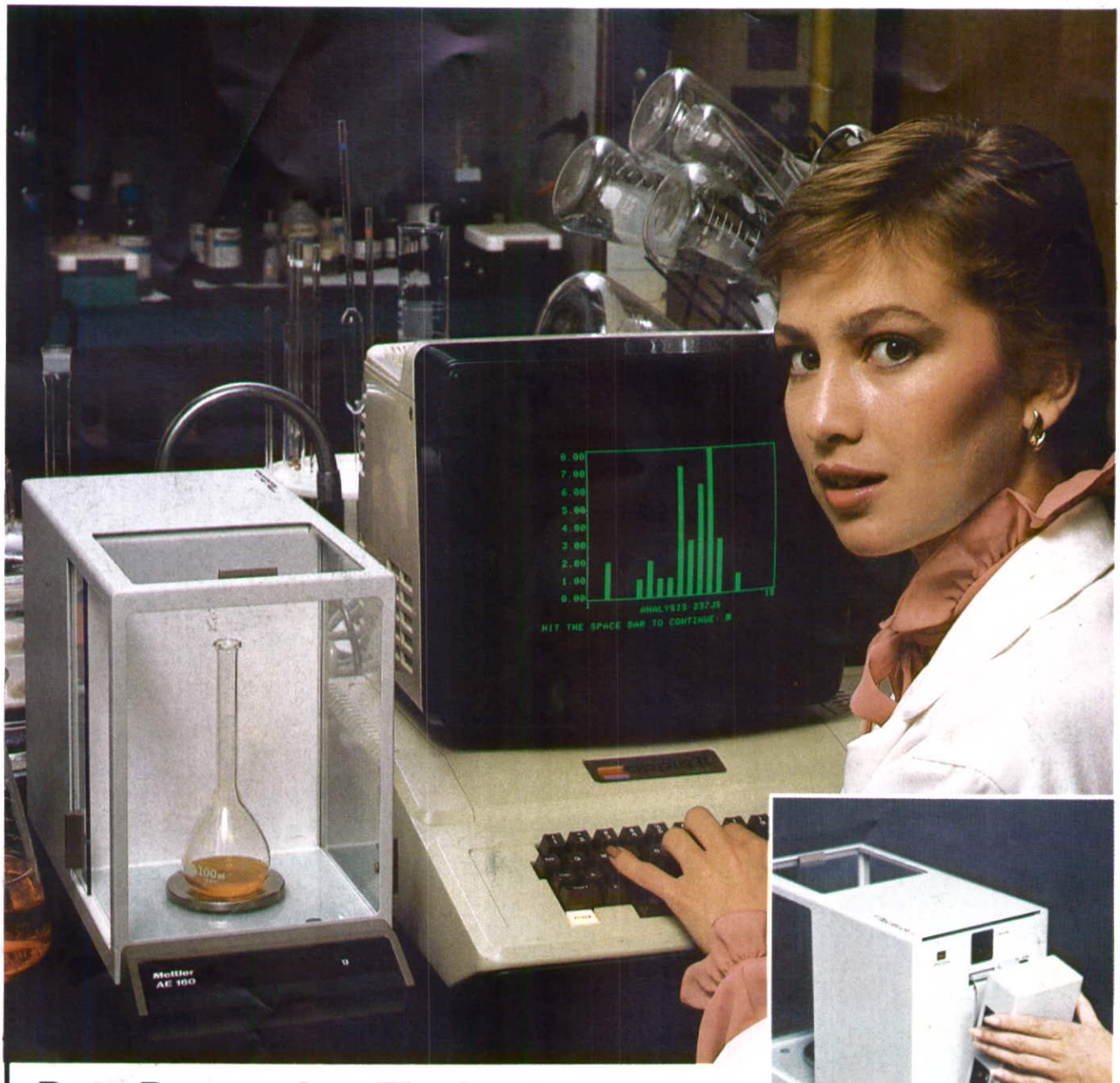

Data Processing. The best reason yet to give up my mechanical.

New Mettler AE electronic analytical balances can put a whole range of data processing options at your fingertips. Options you never had in a mechanical balance. Options that you can set up yourself without tools.

It's really a snap.

Just plug a Mettler data output option into your AE balance and you're ready for error-free transfer of weighing results to a wide variety of computers, calculators, printers and peripherals. AE balances will interface with computers using IEEE-488,20 mA current loop, RS232C, or BCD-parallel standards. Automatic stability detector ensures that only stable values are transferred for data processing. Weighing results are always reliable even under hectic weighing conditions.

Mettler's foolproof single control bar lets you operate all functions simply and reliably. Top loading pan is stable and only 55 mm above the work bench surface, so it's much easier to fill. The Mettler Delta Display filling guide speeds up weighing-in procedures by automatically adjusting to your pouring speed until the target weight is reached.

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If you're looking for data processing capability in an analytical balance, you'll find it very easy to move up to electronics with a new Mettler balance. You'll also find the price easy to take. A brand new AE costs about the same as a mechanical balance.

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