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chemistry in new zealand

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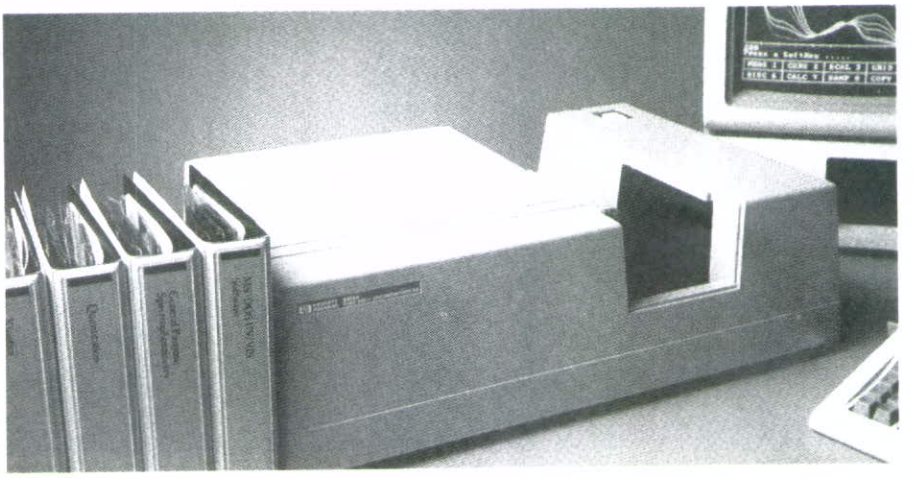

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Front Cover Story

The new non-refrigerated Mistral 3000E, latest addition to the highly successful Mistral range of centrifuges. See page 187

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Comment:
GRADES OF MEMBERSHIP

Sir — The Council news in the October issue reports that Auckland Branch has asked for the debate on non-corporate grades of membership to be re-opened and that they are to circulate a discussion paper on this proposal. It is also reported that at the AGM in August the President asked that delegates come to the February Council meeting with a clear view on this matter.

The brief report in the Council news can in no way adequately canvas the issues. The Auckland discussion paper has not been circulated and, at the time of writing, only one branch AGM outside Auckland remains to be held. Branches have essentially completed their 1986 programmes and will not meet again until after the February Council meeting. A special circular to members with a voting slip could be sent by branches in time to brief delegates but these need very careful presentation of the pros and cons of the proposal. It concerns me that the points could be differently presented in different branches and members would not necessarily be equally well informed on the issues.

I urge members to think very carefully about the consequences of the proposed changes particularly of putting NZCS and degree holders in the same grade. If we are to retain our credibility as a professional society the minimum entry requirement for admission as a corporate member must not be lowered or appear to be lowered. The present Associates have, under the existing rules, the right to apply for corporate membership.The onus is on them to prove to the Membership Committee and Council that they meet the required standard. Such elections occur regularly now — so why the need for change? Any rule change which gives the impression of equating New Zealand Certificate with degrees is both unnecessary and dangerous — imagine the Engineers or the Architects doing it! The catch cries of "simplification" and "recruitment" are used to justify the amalgamation of The Technician, Associate and Graduate grades. These are very simplistic reasons for justifying such a fundamental change. There are powerful arguments against such amalgamation and opportunities must be given for these to be presented.

D J Hogan
Honorary Fellow

GUEST EDITORIAL

"The credit for success, or the onus for failure, properly belongs to each individual member of our Institute"

With these words *Chemistry in New Zealand* was formally launched 50 years ago. It is from the service and dedication of our editors, from Tony Keys in 1936 to Bruce Graham today, and their editorial committees, that this Journal is able to complete its fiftieth volume. The early days of the Journal were not easy. Indeed, in introducing Volume 2 Keys commented "There were numerous controversies among our members upon all questions affecting this Journal". How many of our editors would agree? Whilst the viability and cost-effectiveness of *Chemistry in New Zealand* is still a matter of some concern to Council, it must be said that the editorial committee serve us well in providing a high quality, balanced, house magazine at reasonable cost. Inevitably some would disagree but I wonder how many could do better?

Whereas this Journal provides a valuable forum for the interchange of ideas and a means of up-dating ourselves on the happenings in chemistry and biochemistry in this country, it is the publicity that chemistry receives from the popular press that is of great concern. Headlines such as "Chemical found in food" from a recent NZPA account[1] does not auger well when "Greenlane tests *natural* drug for heart cases"[2] (my emphasis). Not to be accused of undue bias I must add that the headline "Arsenic-based spill" and its short ensuing account, also by NZPA[3], was completely fair to the chemistry profession. We all recognise that the complexities of chemistry can baffle even the best of us, but with assistance from our profession surely items like the following[4] can be avoided:

"Containers of other extremely volatile chemicals including phosphoric acid, hydrachloric [sic] acid, formulin [sic], ammonia, nicotine and sodium pentachloride being transported in the same wagon.

Council has recently advised the Branches and its subcommittees of procedures which should provide for effective press releases. Whilst this may go some way to ensuring our own concerns are expressed aptly, it does nothing for the journalist preparing a chemistry-based news item. It is to these individuals that we should offer our professional assistance. Indeed, each centre should identify some of its members to whom the local science reporter(s) can turn for assistance. Hopefully, this will minimise the damaging publicity our profession most frequently receives. If today's popular press is to be believed chemicals cause concern whereas medicines are marvellous! Those in industry should seek advertising which extols the virtues of the chemicals used in their sphere of operation. In this context the recent series from BASF must be cited as a step in the right direction. Even factual chemistry can be appealing — at least Alcan have brought correct definitions of alum, alumina and aluminium before the New Zealand public. A recent article in *Consumer* must be commended for taking pains to point out that *natural* and *synthetic* are not the opposites some would have us believe.[5]

The high technological society of New Zealand today is woefully ignorant of matters scientific. As a professional body, and as individual members, we must play our part in redressing the balance. Positive comment on our chosen profession *is* warranted. Chemists *do* care. Chemicals *are* the substance of society. As our Code of Ethics tells us "every member of NZIC is under an obligation to advance the science and art of chemistry, to guard and uphold its high standard of honour, and to conform to the principles of professional conduct". The words used by Keys in 1936 are as true of our profession today as they were then. The credit for success, or the onus for failure, properly belongs to each individual member of our Institute.

Brian Halton
President

References

1. NZPA report in *The Evening Post* 5 September 1986.
2. *The Evening Post* 19 July 1986.
3. NZPA report in *The Evening Post* 5 September 1986.
4. NZPA report in *The Evening Post* 14 March 1986.
5. *Consumer*, No. 243, p.261, (1986).

"CHEMISTRY IN NEW ZEALAND" 1936 — 1986

Bruce W L Graham, Editor

With the publication of this issue, *Chemistry in New Zealand* completes its 50th year. The time is therefore appropriate to look back at what has been achieved and acknowledge the efforts of those who have passed this way before.

In so many of the activities of the Institute we depend upon the dedicated efforts of many people and, in that respect, the Journal has been no exception. The editors, branch editors, members of editorial committees, and, of course, the contributors, have all done their share. To each we owe a sincere vote of acknowledgement and thanks.

By far the greatest workload has probably been borne by my predecessors, the nine people who served as editor up to 1984, i.e. Tony Keys (1936-1938), Hugh Parton (1940-47), Stan Brooker (1948-1953), Garth Wallace (1954), Bill McGillivray (1955-1959), Norm Clare (1960-1964), Joan Mattingly (1965-1976), Lawrie Creamer (1977-1978), Stan Brooker, again (1979-1981) and Tony Herd (1982-1984). The reminiscences and recollections of most of these people were recorded in the special issue of 1981, produced by Stan Brooker for the Institute's jubilee year (45, p35, 1981). It is particularly sad that in this issue we carry an obituary for Stan, who contributed so much to the Journal's success over so many years.

But what have all these people given us in the eight thousand pages and fifty volumes that constitute *Chemistry in New Zealand*? Is it truly the "Journal" of the NZIC?** I think the answer to this question has to be an unqualified "yes". If one browses through the pages from any year, the activities of the Institute and the activities of the chemists of New Zealand are recorded for all to see. Perhaps not everything of importance has been noted — I am not in a position to judge. However, I think a few jottings from the early years will illustrate my point.

Chemistry in a young country

One of my first impressions leafing through the early issues is the extent of coverage given to industrial chemistry and chemistry as applied to the requirements of the country at that time. For example, in Volume 2, the papers published are on subjects such as the adulteration of food (R L Andrew, p9), industrial effluent and stream pollution (F P Worley, in planning for the pulp mills of the future, p16), the chemistry of pigments and paints (W Krumbhaar, p22), diesel fuel (M L H Stewart, p29), byproducts from lactose manufacture (W G Whittlestone, p35), and the analysis of cobalt (T A & T E Thomson, p39). In the same year, seven papers were presented before the Auckland branch, and every one of these was also on an applied topic (tanning, wood analysis, testing of tin plate, coal gas manufacture, bacteriology of milk, cement manufacture and biological testing of blood.

A similar emphasis can be seen in some of the papers presented at some of the early conferences, to the extent that, in 1945, some members felt justified in raising the matter at the AGM. Apparently one of the speakers at the conference that year had felt it necessary to apologise for introducing some pure chemistry into his lecture! (9(4), p7, 1945).

Institute affairs

A primary aim of the journal has always been to report on the Institute's affairs. This has been achieved in full measure with the steady recording of Institute and Branch officers, prize winners, minutes, reports of meetings and so on. But there is more to be gathered than just these "bare bones". There is the recording of the various issues that have troubled the Institute from time to time, and there are also some of the answers, albeit retrospectively, to the question "What's in it for me?" (C L H Stonyer, 50, p134, 1986, and G A Lawrence, 3, p24, 1938).

Variations on the theme of "grades of membership" appear with a steady regularity from as far back as volume 4. A correspondent (G L) suggested that the (then) three grades of membership should be scrapped and membership be open to all [4(1), p16, 1940]. It would appear that entropy and the "establishment " prevailed, so that we now have eight grades of membership and discussions focussing on the technician grade. The first rumblings with regard to the latter can be found in the annual report of 1962 (26, p181):

It seems probable that, in the future, the Institute must become increasingly interested in the further qualifications of those who complete the National Certificate in Science (Chemistry), a group who will soon be appearing and may present special problems.

Enough of these "difficulties" though. What has the Institute done for you and me? The list is, in fact, quite impressive, and I regret that space permits only a few examples here.

In the 1930s and 1940s, members' salaries were a major concern. Frequent representations were made to employers whom it was considered were paying too low a rate. Even the Public Service Commissioner was included in this and, in 1941, a recommended salary scale was drawn up [6(1), p7, 1942]. The first salary survey was carried out in 1944 and has continued at regular intervals ever since.

This same period also saw the effects on employment of the Depression, followed by the Second World War. Considerable efforts were made throughout this time and, indeed, well into the 1950s to help members and chemists generally to find work. It is ironic that the Institute is now looking to similar efforts, although I would hope that the scale of the problem will not be so great this time.

Education is the third area where considerable progress has been made and again is an area where we are seeing renewed efforts today. Numerous comments and discussions can be found throughout the Journal with regard to teaching in schools. However, the Institute's most significant contribution has surely been in the training of laboratory technicians. For over twenty years, the Institute organised Laboratory Certificate examinations and was a prime mover in producing the replacement under the Technicians Certification Authority (National Certificate in Science and later NZCS). Both the Institute's certificate and Associateship of the NZIC were recognised by the Public Service as suitable qualifications for progression to higher grades (10, p4, 1946).

Developments in Chemistry

As previously noted, the early issues of the Journal are full of indications of the application of chemistry to the requirements of our developing country. Another rather fascinating aspect is the development of chemistry itself and, in particular, the development of various chemical techniques. Thus, in volume 1, there is a description of a new type of photo-cell, which appeared to have some potential for colorimetric measurements (p50). In volume 3, a review on water purification describes a recent development "by passing the water through beds of a raw material allied to the synthetic resins" (p64). Also in this issue there is a description of what must surely be the early AA (atomising a solution into an acetylene flame and photographically recording the resulting emission spectrum, p98). Some years later, Stan Brooker was prompted to comment in an editorial on the trend in America towards "the use of machines which require only the turning of a few knobs and the reading of a dial to obtain an analytical result" (12, p31, 1948). One wonders what his opinion was of the "video on every instrument" approach?

"The wheel turns"

It has already been illustrated that some problems do not seem to change much with time. Brian Halton's guest editorial in this issue echoes some further concerns of many years ago:

(3, p30, 1938) — concern over some phrases of "modern" advertising, such as "chemically pure ingredients" and a well-known beverage which was "tannin-free".

(3, p118, 1938) — "it is time for considerable improvement of the standard of scientific journalism in our newspapers". On the same page concern was also expressed about "the growing worship in New Zealand of diet fads".

A more serious matter was referred to by the President in 1936, with regard to the "waning prices in the overseas markets" and the need for greater efforts in applied research (1, p36, 1936).

And a note on the far-sighted speaker who, with regard to the development of the glass industry, was "not very optimistic about the future of canned beer'! (3, p33, 1938).

I conclude this section with a question for the "Brains Trust". What on earth were/are the elements glucinum, celtium, columbium and niton? In a 1938 British Standard these names were declared obsolete (3, p111, 1938).

Conclusion

I have concentrated on the early years of the Journal in this review. This is in no way to detract from the efforts of later times. I simply felt that the interest was likely to be greater with the lengthening of time.

Much more could have been written but, as I indicated previously, much of this was done in 1981. I hope that readers will take the time to look back to that issue to read the recollections of editors *et al.* They have given much to the Institute and, for that, we thank them.

**Footnote: Some of the purists amongst us may point out that the title *Chemistry in New Zealand* was not introduced until 1967. I plead poetic licence!

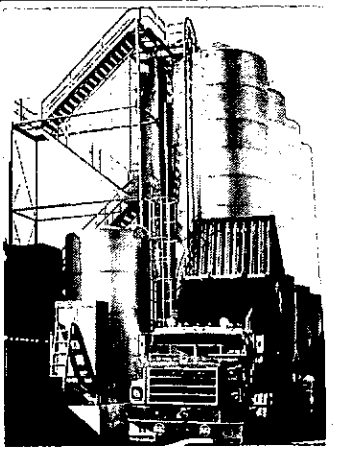
ICI & THE ICI PRIZE

The ICI Prize is sponsored by ICI New Zealand Limited, and consists of a medallion and a monetary award (currently $500). The prize is awarded annually to a member of the Institute who, in the opinion of Council, has made a significant contribution to some branch of chemical science, the contribution being judged by research work published during the five years immediately preceeding 30th April in the year of the award.

The most recent recipient of the ICI prize is Dr Bill Denny of the Cancer Research Laboratories, University of Auckland. In 1985, the prize was awarded to Dr Jim Coxon, whose research is summarised elsewhere in this issue. To these two names can be added a list of thirty six others, dating back to 1949 when the prize was first awarded to the late L.H. Briggs.

The ICI Prize has the longest history of any of the Institute's current awards, and we are happy to acknowledge the continuing support of ICI New Zealand in this important area of our activities.

ICI New Zealand Corporate Research Laboratory scientist Michael Jones (left) and technical officer David Jacobson, at work on a research project in the laboratory.



Storage silos installed at the Avondale production site of ICI New Zealand's Chemical Group as part of a $2 million PVC Dry Blending and Compounding Plant.

ICI New Zealand Limited

ICI New Zealand Limited was incorporated as Imperial Chemical Industries (NZ) Limited in 1935, and last year celebrated its fiftieth anniversary. In 1940 the Company was enlarged considerably and began trading in its own right and also about that time the character of the Company began to change to meet the expanding needs of New Zealand industry. The first local manufacturing operations were established for zip fasteners in 1946. In 1949, the local formulation of agricultural chemicals began, signifying the first major developments in the Company's association with agriculture.

From that relatively small beginning in 1935 with capital of only £100, the ICI New Zealand Group today has total assets of $200 million and sales in the 1984/85 financial year of $288 million. The Group provides employment for 1600 people, both in New Zealand and Fiji.

The businesses of ICI New Zealand are diverse, with the Group consisting of six operating divisions, two subsidiaries and two associate companies. These businesses are involved in the manufacture and sale of industrial chemicals and explosives, synthetic resins, pharmaceuticals, healthcare products, plastics, dyestuffs, agricultural chemicals, animal remedies and vaccines, veterinary pharmaceuticals, plastic pipes, polythene films and packaging, industrial and domestic paints and wall coverings.

More than $700 million is spent worldwide by ICI each year in the search for new products and processes, through research into new areas of science and technology and the further development of existing products. ICI New Zealand research is centred on the Corporate Research Laboratory at Seaview — a purpose-built facility opened in 1985 — and at the laboratories of Coopers Animal Health NZ Limited, Dulux Division and the associate company New Zealand Pharmaceuticals Limited.

Coopers NZ, one of the largest private research groups in New Zealand is involved in research and development of vaccines and products concerned with animal health. Research is carried out by New Zealand Pharmaceuticals in support of their manufacture and export of fine biochemicals and pharmaceutical intermediates derived from processing by-products of the meat and dairy industries.

In the Corporate research area projects come from a wide range of sources, many emphasising the use and development of natural resourses. Significant efforts have been and continue to be directed towards a study of uses for components of the heavy gasoline stream from the New Zealand Synthetic Fuel Corporation's synthetic gasoline plant at Motunui. The component of principal interest is durene which could be used to manufacture a number of specialty chemicals and high performance polymers.

ICI New Zealand scientists are exploring as a joint venture with another company, the manufacture of agar from New Zealand's natural abundance of red seaweed. Agar is a powerful gelling agent used in food products and microbiology.

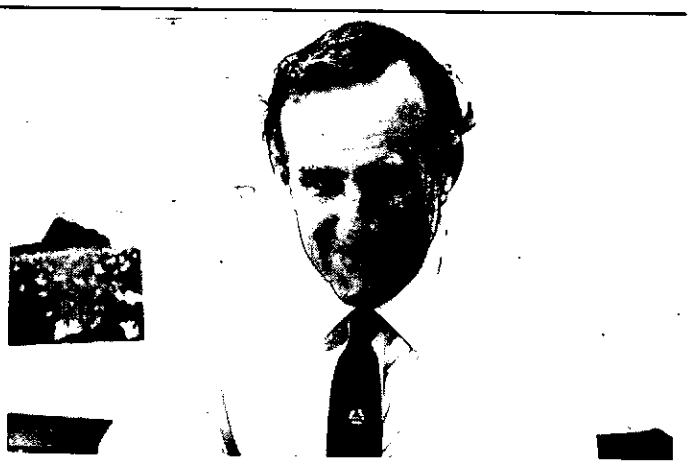
ICI Technology is involved in the development of two alternative fuels — 'Diesanol', an ICI-patented fuel consisting of methanol and a chemical ignition improver; and the conversion of tallow to Tallow Methyl Ester to produce an alternative fuel to extend diesel.

The Corporate Research Laboratory is working on timber preservatives with the Forestry Research Institute in Rotorua. New biocides developed by ICI in the United Kingdom are being tested in New Zealand in advance of the increased harvest of timber due in the 1990s. The laboratory is also involved in crop residue analysis for the development of new agricultural chemicals and among the technical support projects within the ICI New Zealand Group are the development of new vaccines and new vaccine processes for Coopers Animal Health NZ Limited.

Rearrangement Mechanisms Probed by Modern Spectroscopic Methods and Deuterium Labelling Studies

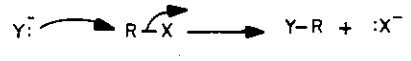
James M. Coxon

University of Canterbury, Christchurch, New Zealand



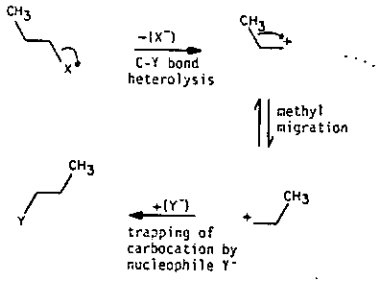
James M Coxon, after graduating PhD in Chemistry from the University of Canterbury in 1965, gained postdoctoral experience at the University of Southampton. He joined the staff at Canterbury in 1967 where he is now Reader in Organic Chemistry. Jim was the 1985 recipient of the ICI prize awarded by the Institute. His current research interests include molecular rearrangements, the topic of this article, photochemical reactions and π-facial stereoselection in cycloaddition reactions. Collaborative studies with the University of Florida have resulted in his recent appointment as Adjunct Professor of Chemistry at that University.

The development of mechanistic concepts in organic chemistry coincided with the need to understand the direction of electron flow in reaction processes. The use of arrows as a form of electronic bookkeeping dates from early attempts to rationalise reaction chemistry. When the arrow contains a symmetrical head, as it does for the nucleophilic displacement shown in Scheme 1, the reaction involves movement of a pair of electrons to the atom where the arrow points and from the molecular orbital indicated. This contrasts with a single-headed arrow which represents the movement of a single electron and finds most use in thermal and photochemical reactions.



Scheme 1: A nucleophilic displacement reaction.

We have been concerned with the study of an apparently very simple process, namely the migration of a carbon atom to an adjacent site in a molecule. This process, represented for a methyl group in Scheme 2, is of fundamental importance in both organic chemistry and biochemistry. Alkyl and methyl

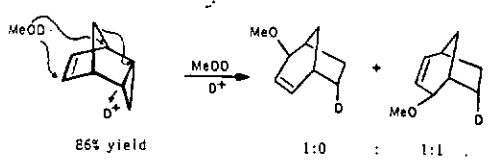


Scheme 2: Schematic representation of methyl migration.

migration is most commonly encountered in systems where electron deficient carbon atoms, called carbocations, are generated by heterolysis of a C-X bond, and is well represented by the use of double-headed arrows. Several processes in the scheme require these arrows; for example, the removal of leaving group X when the two electrons associated with its initial σ-bond to carbon depart with the leaving group. The migration of the carbon atom is also defined by an arrow. The migration occurs to the newly created carbocation centre and creates a carbocation centre at the carbon from which the migrating carbon has departed. This carbocation can be trapped by any nucleophile in solution as shown in the final step of the scheme.

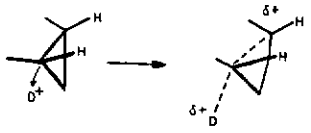
Our research in recent years has concentrated on three aspects of this reaction sequence. The first concerns the detailed mechanism whereby an alkyl group migrates. The second, a study of carbocations in media where they exist on a time scale long enough to allow observation by modern nuclear magnetic resonance (NMR) spectroscopic methods and, thirdly, the importance of the leaving group in dictating the course of the reaction. An understanding of all three aspects of rearrangement is important since they are each fundamental and play a central role in understanding the chemistry of organic rearrangements.

I will illustrate each aspect with an experimental study and indicate the importance of each study to the fundamental process of molecular rearrangement. The first study[1] concerns the stereochemistry of deuteration and, by implication, protonation of tricyclo[3.2.1.$0^{2,4}$]octene in acidic-methanol in a reaction which relieves the strain of the tricyclic molecule (Scheme 3). The reaction exhibits a small memory effect on the



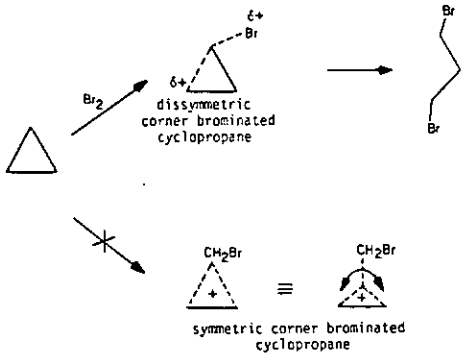
Scheme 3: Reaction of tricyclo [3.2.1.$0^{2,4}$] octene with methanol d_1, and deuteron.

site of nucleophilic attack. Modern NMR techniques allow the configuration of the incorporated deuterium in the products to be established and the results show that the proton (deuteron) attacks exclusively at the corner of the cyclopropane ring and not at the edge, indicating an importance for unsymmetric distortion of the cyclopropane ring in rupture (Scheme 4). An



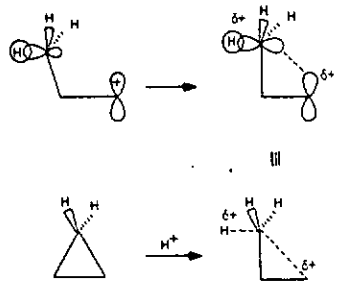
Scheme 4: Corner attack at a cyclopropane.

unsymmetric pathway[2] is also observed in the reaction of cyclopropane with bromine[3] such that the chemistry cannot be accounted for if a symmetric and rapidly rotating corner brominated species were involved (Scheme 5).



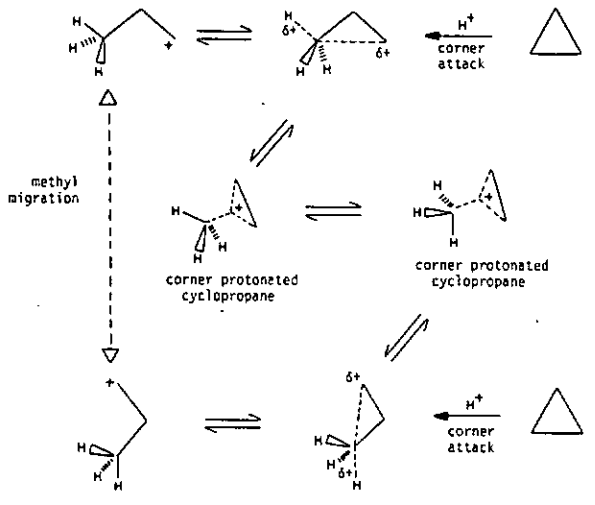
Scheme 5: Reaction pathway for reaction of cyclopropane with bromine.

From these results it is reasonable to conclude that under suitable conditions in an alkyl or methyl migration a hydrogen on the methyl or alkyl group may become involved with the carbocation centre as the reaction proceeds (Scheme 6). A



Scheme 6: Schematic representation of C-H involvement in rearrangement and the parallel with cyclopropane ring opening.

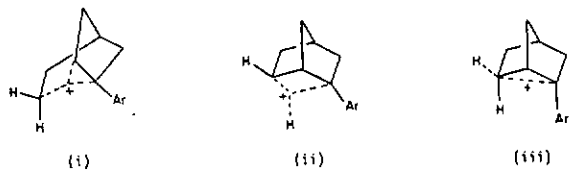
study of proton addition to cyclopropane by the "law of microscopic reversibility" can, by implication, afford information on the involvement of a carbocation centre with an adjacent alkyl group. The interrelationship of corner-attack, corner-protonated cyclopropane and methyl migration are shown in Scheme 7 and, while this simplified scheme[4] is complex, it does not include information on the various Walsh cyclopropane molecular orbitals involved with the hydrogen 1s orbital in the reaction, or on the less likely possibility of edge-protonation[4].



Scheme 7:
Methyl migration and the meaning of the arrow in. 

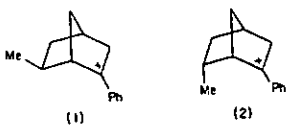
The symmetrical corner-protonated cyclopropane shown in Scheme 7 is the parent structure of the now famous non-classical norbornyl cation and brings us to the second set of experiments, namely, the study of carbocations in super-acid media where, for the aryl cations, three mechanisms of proximate bond involvment are possible (Scheme 8):

1. carbon-carbon σ-bond
2. γ-carbon-hydrogen σ-bond with retention
3. γ-carbon-hydrogen σ-bond with inversion.

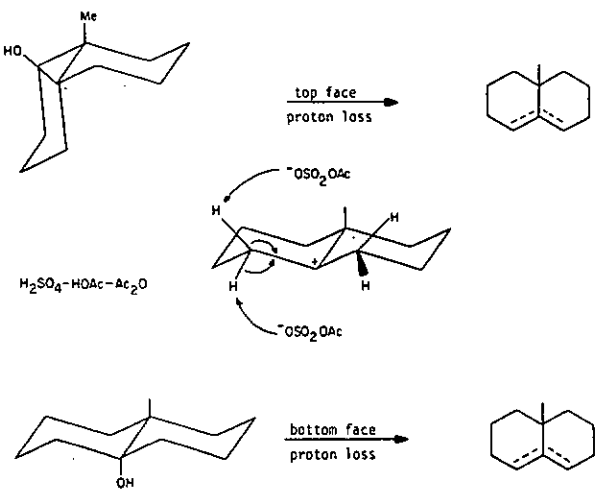


Scheme 8: Proximate σ-bond involvement with the carbocation centre.

It is important to explore the extent to which each of these mechanisms facilitates charge delocalisation at a carbocarbon centre since correlation of the NMR spectra[5-9] of a series of 2-arylnorbornyl cations is one of the few remaining enigmas in the "non-classical norbornyl ion problem."[10] We have commented[5] that the chemical shift of C2 in (1) is upfield of the position of the same carbon in the corresponding *endo* analogue (2) and we have suggested that this could be considered as evidence of greater participation of the proximate lobe of the C6-*exo*-methyl σ-bond than the C6-*exo*-hydrogen with the C2 centre.

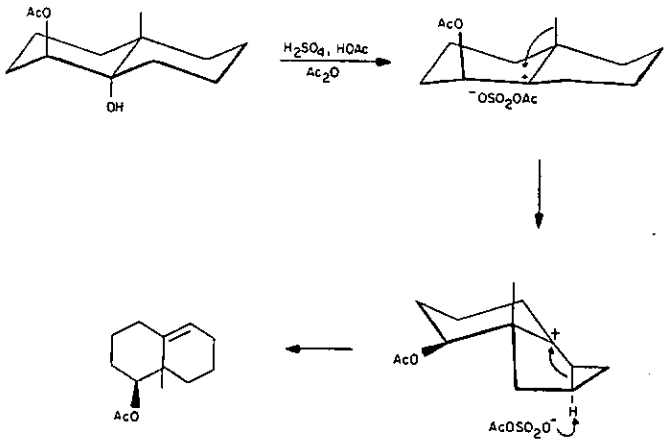


The third study has concerned the importance of a departing anion and, in particular, the stereospecificity of proton loss in the reaction of decalols with acid. Deuterium labelling has again been used to probe the reactions shown in Scheme 9 where, at least superficially, a common carbocation intermediate is involved. However, for these two reactions the departing anion ($^-OSO_2OAc$) is found to be responsible for abstracting an adjacent proton and this process occurs on the same face of the molecule as the leaving group was bound, thereby differentiating each reaction[11]. The stereospecific loss of a proton from each substrate is considered to result from the



Scheme 9: Stereoselective proton loss in reaction of decalols with acid.

departing anion acting as a base in the removal of the adjacent *syn*-proton. The results are determined by labelling the appropriate hydrogens (top and bottom face) with deuterium and measuring the extent of hydrogen deuterium loss in the reaction. Furthermore, this study provided a measure of the rate of conformational change of the various carbocation conformers relative to proton loss. In a more complex example[12-14] which involves molecular rearrangement (Scheme 10) the departing anion stereospecifically removes a proton three carbons away and this is thought to be the first example of a



Scheme 10: Stereospecific 1,3-*syn*-elimination occurring with molecular rearrangement.

stereospecific 1,3-*syn*-elimination occurring with molecular rearrangement.

Each of these studies not only details our present understanding of a doubled headed arrow in describing molecular rearrangement but has a place in establishing and satisfying a search for elegance and detail in the chemistry of not only simple organic molecules but of many complex rearrangements that occur in biological systems.

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Primary Kinetic Isotope Effects in Organic Chemistry

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Originally, chemists thought that isotopes of the same element had identical chemical and physical properties. This belief was no doubt strengthened by the fact that the first isotopically pure elements obtained were those of the radioactive series — for example, lead. As we shall see later, any differences in chemical properties in the isotopes of these elements are minute indeed.

It was not until 1932 that a heavy isotope of hydrogen was discovered[1]. A little later, Cremer, Polanyi[2], Eyring and Sherman[3] challenged conventional beliefs by theoretically predicting that hydrogen and deuterium should, due to a difference in zero point energies, react at different rates. A more complete theoretical treatment of isotope effects was formulated by Urey[4], Bigeleisen and Meyer[5] after the Second World War, and it is interesting to note that, apart from minor refinements, these papers contain in essence, the theory which is generally accepted today.

An idea of the importance of the use of kinetic isotope effects in organic chemistry can be obtained from the number of papers and reviews[6-12] published to date. Hence, for brevity, this review will only examine the isotope effects of the C-L bond, L being one of the hydrogen isotopes, although much of what will be stated is applicable to other isotope systems.

Isotope effects can be subdivided into two classes:

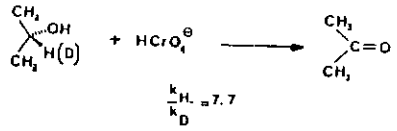
a) Equilibrium isotope effects, where the difference in reactivity between the two isotopic species arises due to differences in their polarisability and inductive powers e.g.

$$H^{12}CN + K^{13}CN_{(aq.)} \rightleftharpoons H^{13}CN + K^{12}CN_{(aq.)}$$

$$K_{298} = 1.026 \pm .002^{13}$$

b) Kinetic isotope effects, which can be divided into primary and secondary kinetic isotope effects.

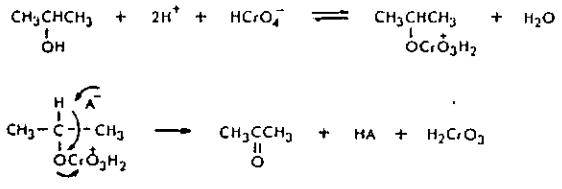
For a primary isotope effect to be observed, the bond to the isotopically labelled element is broken or formed during the rate determining step e.g.



$$\frac{k_H}{k_D} = 7.7$$

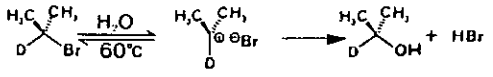
T(°C)	k_H/k_D
25	6.7 [14]
0	8.2 [15]

This oxidation has long been known to proceed by the mechanism shown[16].



Since isotopic bond cleavage only occurs in the product forming step k_2, the large isotope effect shows this step to be rate determining.

In contrast to this, if the bond to the isotopic label is not broken in a reaction a secondary kinetic isotope effect may be observed,



$$k_H/k_D = 1.07^{17}$$

Apart from noting that the maximum value for a primary isotope effect is much larger than that possible for a secondary isotope effect, no more will be said about the latter.

The Theory

The simplest kinetic isotope effect to examine is the dissociation of the species X-L, L being either H or D.

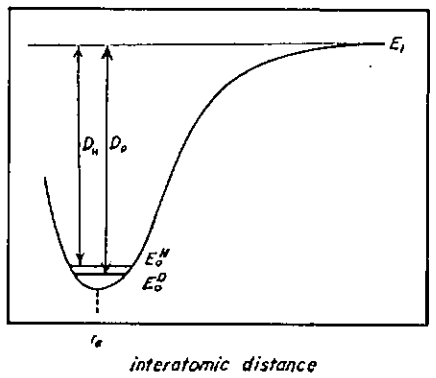


Figure 1. Morse curves relating potential energy and interatomic distance

Fig. 1 shows that the potential energy curve is unaffected by isotopic substitution. Since the interatomic and intermolecular forces are electrostatic in nature, they are therefore unaffected by the nuclear mass differences present in isotopes of the same element. The second observation is that the zero point energies of the two isotopically related molecules are different. If we consider the X-L system as a diatomic, harmonic oscillator, then solution of the Schrodinger equation yields

$E_{n\nu} = (n + \frac{1}{2})\, h\nu$, $n = 0,1,2$ ..... or $E_o = h\nu/2$ .....(1)

and

$= \frac{1}{2}\, (f/\mu)^{1/2}$ .....(2)

where ν is the oscillator frequency, f the force constant for the X-L bond, u the reduced mass ($1/\mu = 1/m_x + 1/m_L$) and E_o is the zero point energy of X-L.

Thus,

$$E_o + h/4\ (f/\mu)^{1/2}$$

Since the force constants in the protio and deutero molecule are identical, and $\mu_H = \frac{1}{2}\mu_D$ it is apparent that E_o^H is larger than E_o^D. In fact, we would predict $E_o^H/E_o^D = 2^{1/2}$. With H_2/D_2 dissociation, the experimentally observed values are $E_o^{H_2} = 25.9$ kJmol^{-1} and $E_o^{D_2}$ 18.4 kJmol^{-1}.[18] At room temperature, nearly all molecules (about 99%) are present in the zero point vibrational energy level. Hence, the difference in zero point energies will manifest itself as a difference in the dissociation energies D, the protio molecule having the lower enthalpy of activation and hence dissociating at a greater rate. Using the Arrhenius equation

$k = A \exp(-E/RT)$ ..... (3), we can obtain

$k_H/k_D = A_H/A_D \exp[(E_o^H - E_o^D)/RT]$ .....(4).

For proton transfer reactions e.g.:

$$X\text{-}L + Y \rightarrow [X \ldots L' \ldots Y] \rightarrow \text{products}$$

we have to take into account the zero point energies of the transition state (Fig.2).

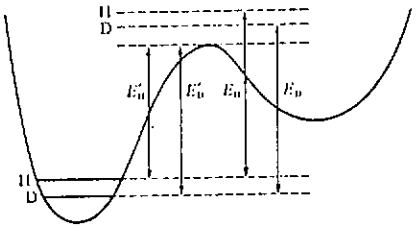


Figure 2. Hydrogen isotope effect for a proton transfer reaction

Thus, equation (4) is modified to yield

$$k_H/k_D = A_H/A_D \exp(\Delta E_o/RT) \quad \ldots\ldots\ldots\ldots \quad (5)$$

$$\Delta E_o = (E_o^H - E_o^D)_{\text{reactants}} - (E_o^H - E_o^D)_{\text{transition state}}$$

Here, as for the previous case, only the stretching frequencies for those bonds undergoing reaction are considered and we assume there is no involvement of the non-reacting bonds.

When the zero point energies in the transition state are equivalent, the maximum kinetic isotope effect will be observed — this corresponding to a difference in the zero point energies of the reactants only. In this instance, equation (5) reduces to equation (4) and, thus, by substituting in the various parameters, we can obtain an estimate of the maximum isotope effect (here, for a C-H bond cleavage, Fig.3).

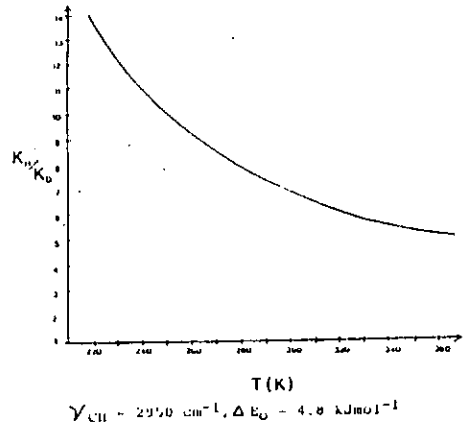


Figure 3. Maximum isotope effect for a C-H bond cleavage

While the assumption made in obtaining equation (5) has been found to be a good one, we have still neglected the bending vibrations (typically of the order of 1000cm^{-1}) and isotopic substitution effects on the translational and rotational motion. However, this equation does allow us to make the following qualitative statements:

1) The isotopically heavier molecule always has zero point energy.

2) The difference in zero point energies (and, hence, the kinetic isotope effect) is the largest for the hydrogen isotopes, and decreases with increasing atomic weight.

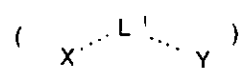
3) The kinetic isotope effect should be temperature dependent and an Arrhenius plot of log K_H/k_D against 1/T should produce a straight line.

4) As the force constant f decreases, the difference in zero point energies for the two isotopes decreases.

The shape of the transition state has also be shown to have an effect on the kinetic isotope effect. In the symmetric stretching of the transition state i.e.:

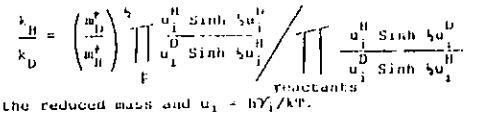
$$X \ldots f_1 \ldots L \ldots f_2 \ldots Y$$

if the force constants f_1 and f_2 are the same, then, essentially, L will be motionless. Thus, the symmetric stretching frequency becomes insensitive to the mass of the isotope L and a E_o of the order of 4.8 kJmol^{-1} arises from zero point energy differences in the reactants only. Hence, for a symmetrical transition state, a maximum kinetic isotope effect will be observed. With a non-symmetric transition state i.e. a product like (X.... L ..Y) or reactant like (X.. L ....Y) or a bent transition state



the isotope effect is reduced in magnitude as there is now a difference in zero point energies in the transition state.

As mentioned previously, the derivation of equation (5) requires many factors to be neglected. These can be readily incorporated in the final expression for the kinetic isotope effect by the use of transitional state theory. A rigorous derivation has been given elsewhere[19] so only the final expression will be presented (although in a slightly modified form).



This expression lends itself to computer simulation of kinetic isotope effects — such work having been performed by various groups[20-23]. One of the conclusions reached from these calculations is that for large primary effects, the zero point energy terms are dominant. Hence, under these conditions, equation (5) will give a good approximation to equation (6). However, it should be noted that, regardless of which equation is used the problem of choosing transition state parameters remains. As a detailed knowledge of the transition state is not available, educated guesses of force constants, geometry and vibrational frequencies for each bond must be calculated from equation (6) and are shown below (Fig.4), along with those from Fig.3 for comparison.

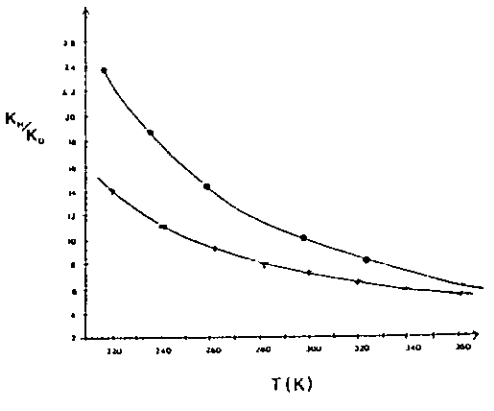


Figure 4. Maximum kinetic isotope effects

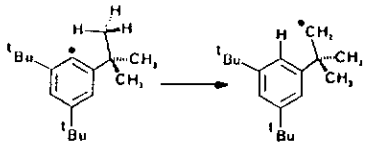
Table 1.

Isotopic forms	Maximum kinetic isotope effect (298°K)
H,D	18
H,T	60
$^{12}C,^{13}C$	1.25
$^{12}C,^{14}C$	1.5
$^{14}N,^{16}N$	1.25
$^{16}O,^{18}O$	1.19

Anomalous kinetic isotope effects

A large proportion of isotope effects have magnitudes less than the maxima predicted by theory, the implication being that, here, the transition states are unsymmetrical. However, a few reactions give rise to excessively large kinetic isotope effects,

e.g.:



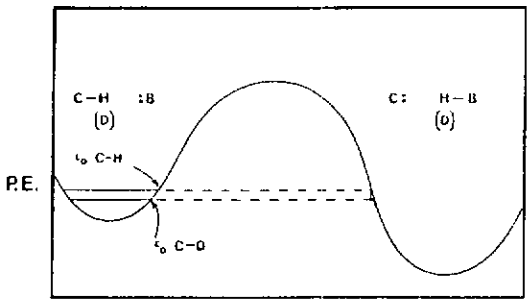
$k_H/k_D = 13{,}000\ (120°K)$[24]

(c.f. the calculated maximum of 260 at 120°K). It is generally accepted that quantum mechanical tunnelling is responsible for these anomalous results[25]. Two aspects of tunnelling result in a contribution ot the kinetic isotope effect:

1) Tunnelling is more significant for lighter isotopes than heavier isotopes. This arises from the uncertainty principle and the wave-particle duality of matter, i.e.

$\Delta x \Delta(mv_x) \sim h/2\pi$ and $\lambda_x = h/mv_x$, Δx being the uncertainty in position, (Δmv_x) the uncertainty in momentum. As the effective wavelength λx becomes larger (i.e. mass m smaller), clasical mechanics breaks down, and tunnelling becomes significant.

2) The higher energy levels of C-H mean the barrier is a little narrower for C-H than it is for C-D at the same vibrational quantum number. This implies that shorter reaction distances favour tunnelling as is indeed observed.



These aspects lead to a significant enhancement in the rate k_H/k_D. Low temperatures also increase the tunnelling contribution, since fewer molecules have sufficient energy to surmount the barrier by classical means. When tunnelling is suspected in an isotope effect, a tunnelling correctum factor r_H/r_D may be used to correct the results[25]. The presence of tunnelling has been found to give rise to the folowing deviations[26]:

1) Arrhenius plots of log k_H/k_D against 1/T will be curved.
2) The difference in activation energies $[\Delta E_a]^D_H$ (i.e. $E_a^D - E_a^H$) will be larger than the value appropriate for loss of zero point energy in going from reactants to the transition state.
3) The ratio of the pre-exponential factors A_H/A_D will be smaller than the classical minimum of 0.7[27].

However, curvature of the Arrhenius plot can arise from an internal mechanism[20] i.e.:

$$C\text{-}L + Y \underset{K_{-1}}{\overset{K_1}{\rightleftharpoons}} C \ldots\ldots L\text{-}Y \xrightarrow{K_2} \text{products},$$

and hence care is required in determining if tunnelling is present or not.

It is thus readily apparent that the kinetic isotope effect can be used to obtain information which would be otherwise inaccessible. It would be incorrect to state that this method is suitable for every mechanistic study a chemist wishes to undertake. Rather, it should be seen as one of the many powerful tools at the chemist's disposal.

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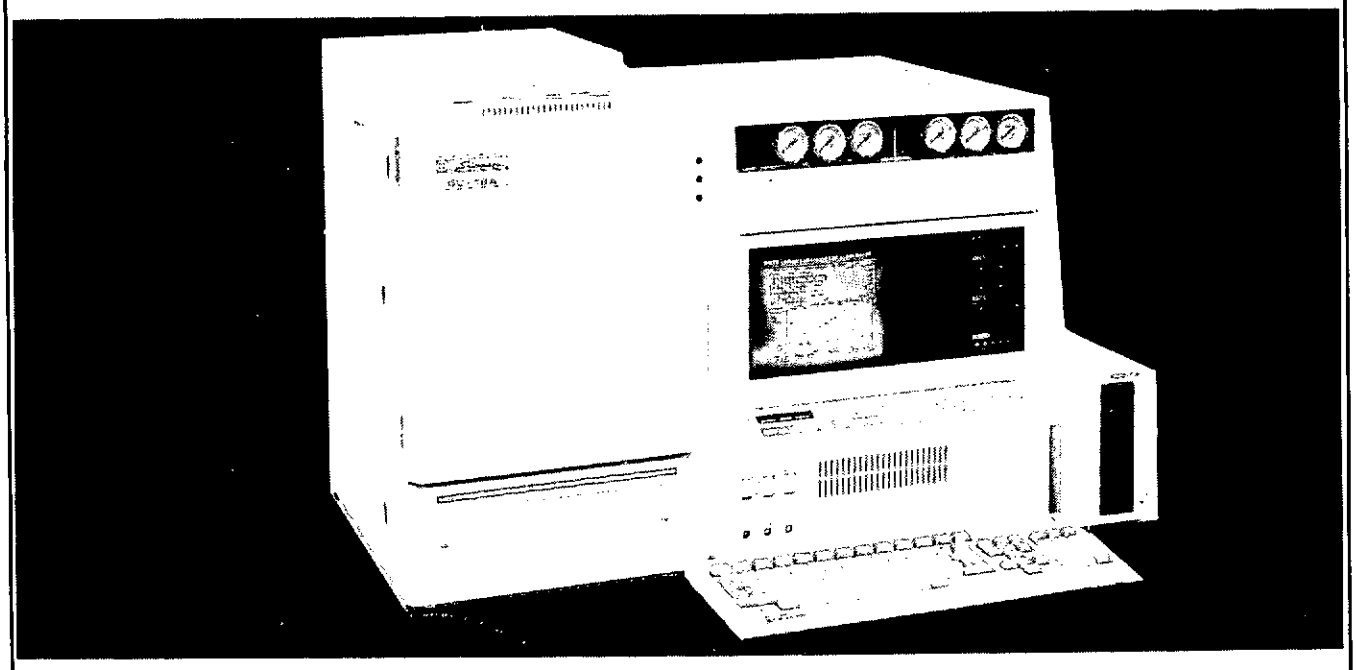

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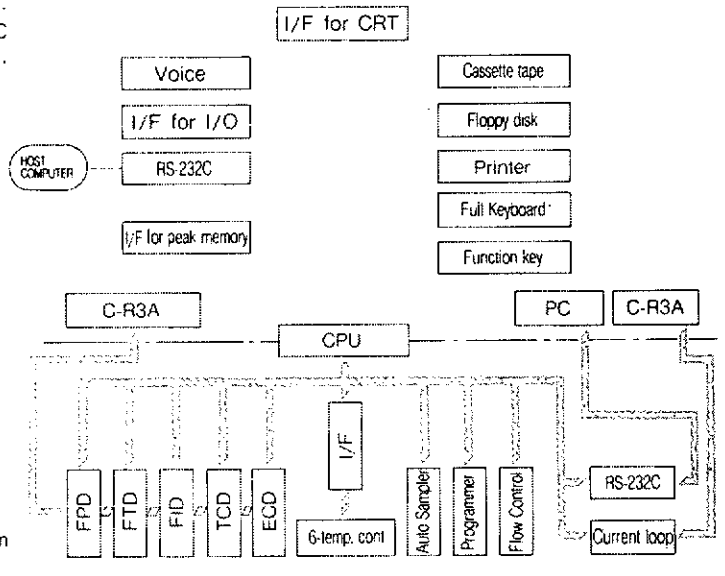

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FIFTY ORGANIC NAME REACTIONS

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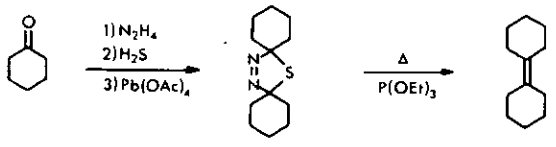
INTRODUCTION

It is standard practice in organic chemistry to refer to specific reactions, reagents or reaction sequences by the name of the chemist who discovered or developed them. Such names (e.g. Diels-Alder, Grignard, Wolff-Kishner etc.) more economically describe the reaction than an alternative lengthy worded description. This is acceptable to the practising chemist who has followed the literature, but is not so for non-specialist or beginning chemists, since the name itself gives no information about the reaction involved.

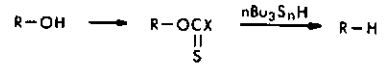
Whilst there exist several excellent compendia of name reactions[1-7], many new reactions have become included in the vocabulary of organic chemistry since the publication of these compendia. This article lists fifty name reactions which have been discovered in the last twenty-five years and which have been frequently referred to in the recent literature. For each, a brief description of the reaction is given along with a reference to a recent review or a key article. This list is not intended to be exhaustive, but aims rather to be general, with reactions from specialised areas of organic chemistry being excluded. It is hoped that this collection will be useful to beginning graduate students and non-synthetic organic chemists as a reference aid to following the organic literature.

THE REACTIONS

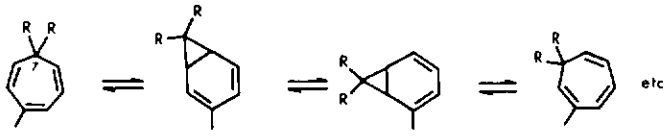
Barton Alkene Synthesis[8]: The preparation of substituted alkenes by double extrusion from an intermediate β-1,3,4-thiadiazoline. Particularly useful for the synthesis of highly hindered alkenes.



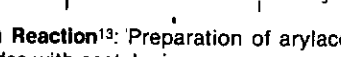
Barton-McCombie Reaction[9]: Deoxygenation of alcohols by conversion to thiocarbonyl derivatives and reaction with tributyltin hydride.



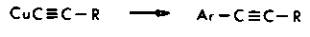
Berson-Willcott Rearrangement[10]: Circumambulatory migration of C7 in tropilidenes (cyclo-heptriene-norcaradiene valence pairs) by stepwise [1,5] sigmatropic rearrangements of the norcaradiene form.



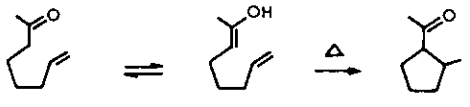
Brook Rearrangement[11,12]: Reactions of α-functionalised organosilicon compounds which involve migration of silicon from carbon to oxygen.



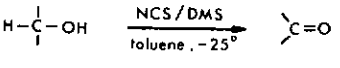
Castro(-Stevens) Reaction[13]: Preparation of arylacetylenes by coupling of aryl halides with acetylenic cuprous compounds.



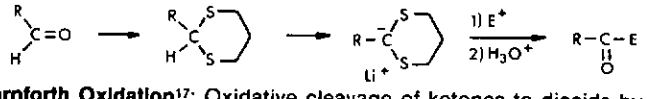
Conia Cyclisation[14]: Thermally induced intra-molecular cyclisation of unsaturated carbonyl compounds which occurs through an ene reaction of the corresponding enol.



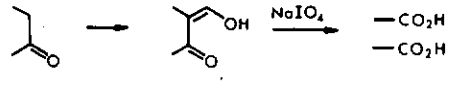
Corey(-Kim) Oxidation[15]: Mild procedure for the oxidation of alcohols to carbonyl compounds using N-chlorosuccinimide and dimethylsulfide in a solvent at low temperatures.



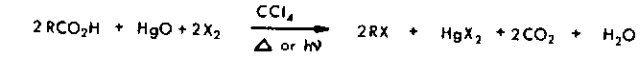
Corey-Seebach Procedure[16]: Conversion of aldehydes or acetals to 2-lithio-1,3-dithianes for use as acyl anion equivalents in reactions with electrophiles.



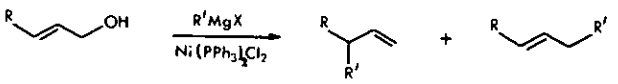
Cornforth Oxidation[17]: Oxidative cleavage of ketones to diacids by conversion to the α-hydroxymethylene derivative and reaction with sodium periodate.



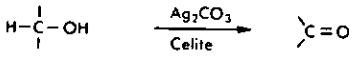
Cristol-Firth Reaction[18]: A modification of the Hunsdiecker reaction for halogenative decarboxylation using mercuric oxide and a halogen in carbon tetrachloride. Often photocatalysed.



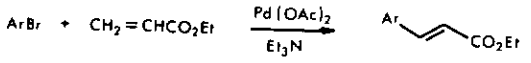
Felkin Alkylation[19]: Reductive alkylation (or hydrogenolysis) of allylic alcohols by Grignard reagents catalysed by $Ni(PPh_3)_2Cl_2$.



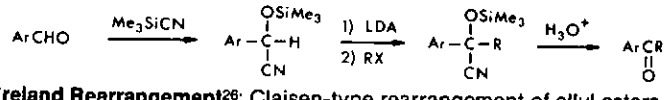
Fetizon Oxidation[20]: A mild procedure for the oxidation of alcohols to carbonyl compounds using silver carbonate and Celite (Fetizon reagent).



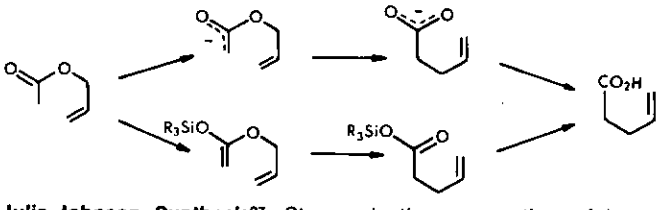
Heck Reaction[21,22]: Regio- and stereoselective alkylation or arylation of alkenes by reaction with organopalladium compounds generated from organic halides in the presence of catalytic quantities of palladium.



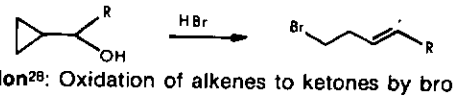
Hünig Reaction[23-25]: Umpolung-type C-alkylation of aromatic or α,β-unsaturated aldehydes through an intermediate cyanotrimethylsiloxy derivative.



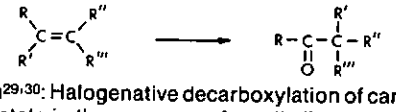
Ireland Rearrangement[26]: Claisen-type rearrangement of allyl esters, either as the enolate anion or the silylketene acetal, to γ,δ-unsaturated acids.



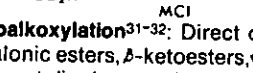
Julia-Johnson Synthesis[27]: Stereoselective preparation of homoallylic bromides from cyclopropyl carbinols.



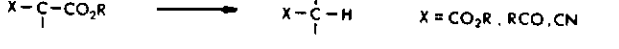
Kakis Reaction[28]: Oxidation of alkenes to ketones by bromine and silver nitrate.



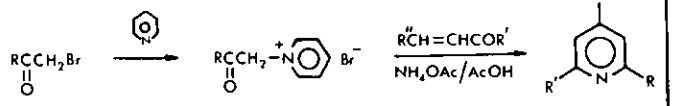
Kochi Reaction[29,30]: Halogenative decarboxylation of carboxylic acids by lead tetraacetate in the presence of an alkali metal halide.



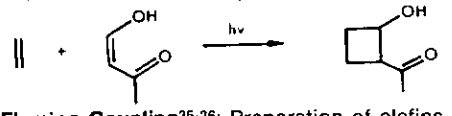
Krapcho Decarbalkoxylation[31-32]: Direct decarbalkoxylation of activated esters (malonic esters, β-ketoesters, α-cyanoesters) by an alkali metal halide in a wet dipolar aprotic solvent.



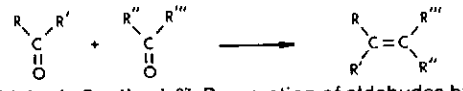
Kröhnke Pyridine Synthesis[33]: A versatile synthesis of substituted pyridines from acalkylpyridinium salts and α,β-unsaturated ketones by treatment with ammonium acetate - acetic acid.



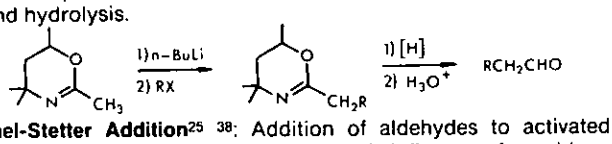
de Mayo Reaction[34]: Preparation of substituted cyclobutanols by [$\pi 2 + \pi 2$] cycloadditions of alkenes to (the enol form of) 1,3-dicarbonyl compounds. The products may undergo retro-aldol reaction to give 1,5-dicarbonyl compounds.



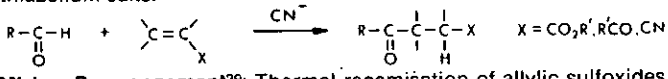
McMurry-Fleming Coupling[35,36]: Preparation of olefins by titanium-induced inter- or intramolecular reductive coupling of carbonyl compounds.



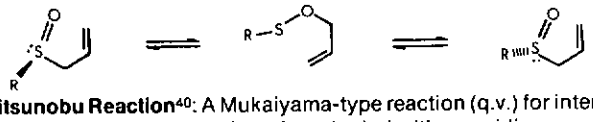
Meyers Aldehyde Synthesis[37]: Preparation of aldehydes by alkylation of the anion produced from dihydro-1,3-oxazines, followed by reduction and hydrolysis.



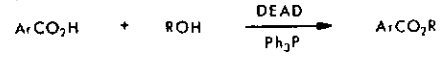
Michael-Stetter Addition[25 38]: Addition of aldehydes to activated alkenes in aprotic solvents under the catalytic influence of cyanide or thiazolium salts.



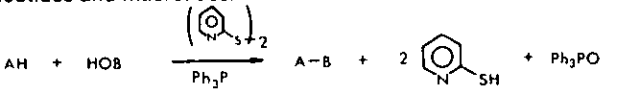
Mislow Rearrangement[39]: Thermal racemisation of allylic sulfoxides by a concerted, reversible [2,3] sigmatropic rearrangement involving intermediate sulfenates. Includes the conversion of allylic sulfenates to sulfoxides.



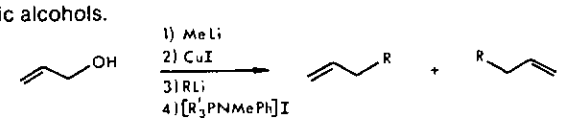
Mitsunobu Reaction[40]: A Mukaiyama-type reaction (q.v.) for inter- and intramolecular condensation of an alcohol with an acidic component using diethylazodicarboxylate and triphenylphosphine.



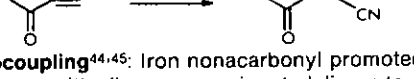
Mukaiyama Condensation[41]: Redox condensation under neutral conditions using a reagent mixture (e.g. di(2-pyridyl)disulfane-/triphenylphosphine) of which one component is oxidised and the other reduced. Has been used for the synthesis of esters, peptides, nucleotides and macrolides.



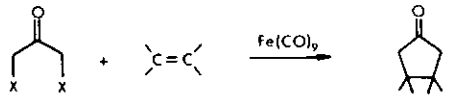
Murahashi Alkylation[42]: Four-step, one-pot reductive alkylation of allylic alcohols.



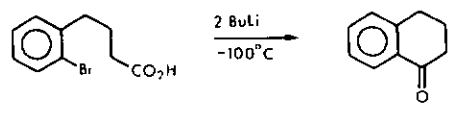
Nagata Hydrocyanation[43]: Conjugate addition of HCN to α,β-unsaturated carbonyl compounds by use of an alkyl aluminium cyanide.



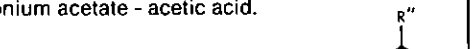
Noyori Cyclocoupling[44,45]: Iron nonacarbonyl promoted reaction of α,α'-dihaloketones with alkenes or conjugated dienes to produce cyclopentanones or 4-cycloheptenones, respectively.



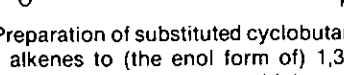
Parham Cyclisation[46,47]: Low temperature reaction of an ortho functionalised aryl lithium with an internal or external electrophile to produce a cyclic product.



Peterson Reaction[48]: Preparation of alkenes by addition of α-silyl carbanions to carbonyl compounds followed by elimination.



Pfitzner-Moffat Oxidation[49,50]: Mild procedure for the oxidation of alcohols to carbonyl compounds using dimethyl sulfoxide, dicyclohexyl carbodiimide and a proton source.



Rühlmann Reaction[51]: A modification of the acyloin condensation in which the intermediate enediolates are isolated as trimethylsilyl esters. The product bis-siloxy alkenes may be used as acyloin equivalents in a variety of transformations.

Sakurai Reaction[52]: Regiospecific reaction of allylsilanes with electrophiles.

Schöllkopf Reaction[53]: Addition of α-metalated isocyanides to polar multiple bonds. Many applications to heterocyclic synthesis.

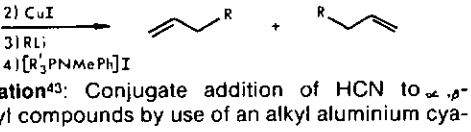
Schweizer Reaction[54]: Preparation of allyl amines by reaction between vinyltriphenyl (or tributyl) phosphonium salts, amines and carbonyl compounds.

Shapiro(-Heath) Reaction[55,56]: Conversion of a carbonyl compound to an alkene by treatment of the corresponding p-tosylhydrazone with an alkyl lithium.

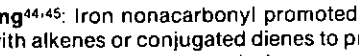
Sharpless Asymmetric Epoxidation[57]: Asymmetric epoxidation of allylic alcohols by t-butyl hydroperoxide in the presence of a metal catalyst directed by (+) or (-) diethyl tartrate.

Sharpless Oxyamination[58]: Vicinal *cis*-oxyamination of alkenes to β-amino alcohols using stoichiometric or catalytic alkylimido- or acylimido- trioxoosmium (VIII) reagents.

Skattebol Rearrangements[59,60]: Vinylcyclopropylidene to cyclopentenylidene carbenoid re-arrangement.



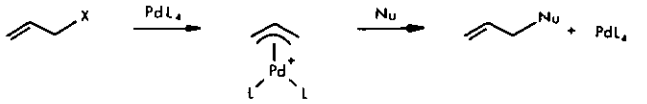
Swern Oxidation[61]: An extension of the Pfitzner-Moffat procedure (q.v.) applicable to hindered alcohols and which uses dimethyl sulfoxide activated by trifluoroacetic anhydride or oxalyl chloride.



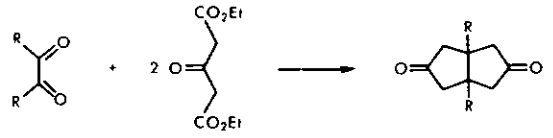
(Tanabe-) Eschenmoser Cleavage[62]: Grob-type fragmentation of α,β-unsaturated hydrazones to give acetylenic carbonyl compounds.

Trost Spiroannelation[63]: Conversion of acyclic or alicyclic carbonyl compounds to γ-disubstituted- or α-spiro-cyclobutanones, respectively, by treatment with diphenylsulphonium cyclopropylide or 1-lithiocyclopropyl phenyl sulfide.

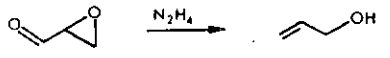
Tsuji-Trost Reaction[64]: Reaction of π-allylpalladium compounds with various nucleophiles (enolates, organometallics, amines, etc.) including the catalytic reaction.



Weiss Reaction[65]: Reaction of two equivalents of dimethyl 3-oxoglutarate with acyclic or alicyclic 1,2-dicarbonyl compounds to produce bicyclo[3.3.0]octane or [n.3.3]propellane derivatives, respectively.

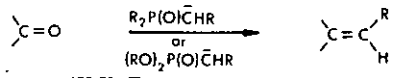


Wharton Reaction[66]: Reaction of α,β-epoxy ketones with hydrazine to give allylic alcohols. Useful in 1,3-transpositions of α,β-unsaturated ketones.

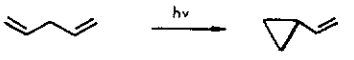


Witkop Photocyclisation[67,68]: Photochemically induced cyclisation of chloroacetamides N-substituted with an aryl-containing substituent to produce lactams of variable ring size.

(Wittig-)Horner Reactions[69-71]: Modifications of the Wittig reaction for conversion of aldehydes or ketones to olefins using phosphine oxide carbanions, phosphinate carbanions or (more commonly) phosphonate carbanions in place of the Wittig phosphonium ylides. Also called Horner-Emmons or Wadsworth-Emmons reactions.



Zimmermann reagent[72,73]: The di-π-methane rearrangement. Photochemical conversion of molecules containing two π systems bonded to a single saturated carbon to produce substituted cyclopropanes.



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COUNCIL NEWS

Dr B Halton presided at a telephone meeting of Standing Committee on 7 November 1986.

Honorary Fellowship

Dr T H Spurling, Division of Applied Organic Chemistry, CSIRO, Melbourne, the incoming President of the Royal Australian Chemical Institute, was elected an Honorary Fellow of the NZIC during his term of office.

NZIC-RACI Visiting Speaker Award

Dr R B Bucat, University of Western Australia, is expected to take part in NZIC's first National Chemistry Week, 15 to 21 August 1987 and also to give a plenary address during the NZIC/NZBS Annual Conference 24 to 28 August. Dr Bucat was awarded the RACI Chemical Education Medal in 1986 for his work as Supervising Editor of the Australian Academy of Science Textbook *Earth, Air, Fire and Water*, published in two volumes.

Chemical Education Trust

Acting on legal advice, Standing Committee has recommended that Council delete Rules 17.2.4 and 17.2.6 at its meeting in Wellington on 3 and 4 February 1987. Appropriate steps have been taken to circulate Council and Branch Committee members.

In terms of current practice, Rule 17.2.4 is considered rather restrictive. As Rule 17.2.6 appears to give the NZIC Council power to change the objectives of the Chemical Education Trust from time to time it would probably be void for uncertainty. If not, then certainly it would be unlikely to qualify for tax exemption as a charitable trust.

Furthermore, this rule is unusually restrictive on the general ability of the trustees to operate the trust at their discretion, in the usual way, to achieve the trust's objectives.

Currently, a copy of a draft of Deed of Trust is being studied by the Inland Revenue Department with a view to setting in train the procedure for obtaining IRD approval of the trust as a charitable trust with tax exemption of its own income and of gifts/donations to the trust by individuals/companies.

Subject to a favourable response from IRD it is hoped that an Appeal for contributions to the NZIC Chemical Education Trust can be launched in early 1987.

Overseas visitors

Dr Mary L Good, President of the American Chemical Society has been invited to visit other centres before or after ANZAAS in Palmerston North, 26 to 30 January 1987. As soon as details of Dr Good's plans are available they will be circulated to branches.

With the support of NZIC's Overseas Visitors' Fund, the Chromatography Specialist Group is planning meetings (probably in Christchurch, Wellington and Auckland) late in February for **Professor W Jennings** of the USA. He is one of the principals of J W Scientific, represented in New Zealand by Sci-Med.

Membership Committee

DR R J Furkert, Soil Bureau, Wellington, was elected to the Membership Committee by Standing Committee. Council expresses appreciation for his service to **Dr J H Garside**, Director, Telarc, Auckland, whose three-year appointment ends on 31 December 1986.

Chemists' Support Package

In an interview published in September in *Chemical and Engineering News*, **Dr Mary Good**, President-elect of ACS, said: "Some within ACS feel that the chemical industry is 'they' and that chemists are 'we' — Not true. The chemical industry and chemists are 'us'. One without the other is not a very viable entity. We are forever tied together. So chemists and the chemical society have as much responsibility for working with the chemical industry as the chemical industry has for working with chemists and the public to see that we have the right objectives."

Dr Good went on to discuss the changing relationship between chemists and the chemical industry with respect to restructuring, staff reductions and early retirement.

With the help of members with experience of being made redundant, the Auckland Branch at Council's request is putting together material designed to assist chemists faced with finding a new job. If you wish to contribute to this programme, please write to, or telephone, the General Secretary.

To avoid "re-inventing the wheel", material has been sought and obtained from Federated Farmers of New Zealand (Auckland Province) Inc. and the State Services Commission. *Rural Change — A Self-Help Guide to Meeting the Challenge of Change* is a booklet for farmers illustrated with "Edna" cartoons. Two chemical companies are amongst the five organisations which paid for it. Do you have any suggestions for sponsors of a NZIC equivalent?

J Rogers
Honorary General Secretary
November 1986.

HONOURS AND AWARDS

Honorary Fellowship to John Rogers

At the August meeting of Council, Dr John Rogers was one of the four people elected to Honorary Fellowship of the NZIC.

John has been Honorary General Secretary since 1980 and in this capacity has served the Institute extremely well. His history of service goes back much further than that, however. He was elected to the Associateship in 1946 and from 1947 to 1955 and from 1959 to 1966 served on the Otago committee, including periods of being Treasurer, Secretary and Chairman (1953). He also acted as Conference Secretary and Conference Chairman in other years. After moving to Auckland in 1966, he was Branch Chairman (1969/70) and Council Delegate, as well as seerving on the Auckland Committee. From 1965 to 1967 he was Foundation Chairman of the New Zealand Geochemical Group.

John's scientific career began in 1940 with an MSc (1st class hons) from Canterbury, under Hugh Parton, and culminated in a period as Director (1966-80) of the New Zealand Fertiliser Manufacturers' Research Association, in Auckland. His main research areas were in studies of minerals and mineral processing. He had periods of employment with various groups, including the Division of Industrial Chemistry, CSIRO, Melbourne (1941-45), Soil Bureau, DSIR, Wellington (1945-46), and the International Nickel Company of Canada, Ontario (1957-59). A period of lecturing in the School of Mines and Metallurgy saw the establishment of a Department of Mineral Dressing (1947-55), and he was also leader of the Geochemistry Section, New Zealand Geochemical Survey, DSIR, Otago (1959-66).

In 1949/50 John was chosen as one of the first New Zealand Fulbright Scholars and visited Canada as a Nuffield Scholar. In 1954, he was the NZIC's first recipient of the Easterfield Medal. From 1955 to 1957 he worked in the Ernest Oppenheimer Laboratory, Department of Colloid Science, University of Cambridge, and was awarded the PhD.

John's service to the scientific community goes much wider than the NZIC. He has been a member for many years of both the Australasian Institute of Mining and Metallurgy, and the American Institute of Mining, Metallurgical and Petroleum Engineers. In 1967 he was Chairman of the New Zealand Branch of AIMM, and represented New Zealand on the Council of this body from 1977 to 1980. In 1975 he was President of the New Zealand Branch of the Clean Air Society of Australia and New Zealand.

John's gardening and agricultural interests are represented by his membership of the New Zealand Institute of Agricultural Science and Fellowship of the Royal Horticultural Society, England. He was President of the Auckland Horticultural Council 1983/84, and has been a member of the Council of the Auckland Institute and Museum since 1969.

As the above notes show, John Rogers has had a distinguished career and has given an enormous amount of service to New Zealand science and the NZIC. In my capacity as Editor, I have found him to be a great source of encouragement and support over the past three years. His selfless dedication to everything that he does is an inspiration to us all.

Bruce W Graham

ICI PRIZE

The winner of the ICI Prize for 1986 is Dr W A (Bill) Denny, Deputy Director of the Cancer Research Laboratory, Auckland Division of the Cancer Society, Auckland.

Bill is a graduate of the University of Auckland, receiving his BSc, MSc, (1st class hons), then his PhD in 1969. He was also awarded the DSc earlier this year.

After completing his PhD, Bill held New Zealand, ICI, and Salters Postdoctoral Fellowships at Oxford. In 1972 he had a brief period as Visiting Lecturer at Caracas University in Venezuela, then returned to Auckland to become a Senior Research Fellow in the Cancer Laboratory. He was appointed to his present position in 1981, soon after spending two years overseas as Visiting Research Professor, Pomona College, California, and Visiting Professor, University of California, at San Diego. More recently Bill received a UICC ICRETT award which allowed him to spend a month in Zurich studying high field NMR techniques.

Bill is the author or co-author of 112 papers and 10 patents. The main goal of his work has been the development of compounds which will be selectively toxic to cancer cells and, thus, have potential as anti-tumour drugs.

An active member of the NZIC, Bill was Auckland Branch Chairman in 1984 and 1985, and is also a member of the Editorial Committee.

Easterfield Award 1986

The recipient of the Easterfield Award is **Dr Peter Steel**, a senior lecturer in Chemistry at the University of Canterbury. After graduating BSc (Hons, 1975) and PhD (1979) from the University of Canterbury, he was a tutor in Organic Chemistry at the University of Sydney (1979), then Post-Doctoral Fellow (1980) and Assistant Lecturer (1981) at the USTL, Montpellier, France. He joined the staff at Canterbury in 1982. His research interests include the study of carbocations rearrangements, stereoselective reactions and the coordination and organometallic chemistry of heterocyclic compounds.

Membership changes, 7 November 1987

Elections

Fellows HODSON Derek BSc (Hons) PhD (Manchester) MEd FRSC, Department of Education, University of Auckland (Senior Lecturer in Science Education); WILCOCK Robert John BSc (Hons) PhD (Cantuar), Water Quality Centre, Ministry of Works, Hamilton (Group Leader).

Members COULDWELL Margaret Claire BSc (Hons) PhD (Cantuar), New Zealand Dairy Research Institute, Palmerston North (Science Editor); KAILASAPATHY Kasipathy MSc (Ohihiro) PhD (Penn State), Department of Human Nutrition, University of Otago (Lecturer); SIMS Ritchie John MSc PhD (Auckland), AWA Ltd, Auckland (Product Specialist, Analytical Equipment); WEAVER Stephen Donald BSc (Hons, Birmingham) PhD (London), Department of Geology, University of Canterbury (Senior Lecturer).

Graduates to members HAVERKAMP Richard Gerard BSc (Hons, Wellington), New Business Division, Fletcher Challenge Ltd, Auckland, (Industrial Chemist); JACK Elizabeth Jane BSc (Hons, Wellington), at Wellington Girls' College (Teacher); SEVERN Wayne Bruce BSc (Hons, Wellington), Chemistry Department, Victoria University, Wellington (PhD student).

Graduates FRASER Christine Anne BSc, Chemistry Department, Victoria University, Wellington (Student); HICKLING Ian Neville MSc (Auckland), New Zealand Pharmaceuticals Ltd, Palmerston North (Research chemist); JEBSON Mrs Jennifer Mae BSc, Mana College, Porirua, Wellington (Teacher); LARKING Kaylene Anne BSc, Chemistry Department, Victoria University, Wellington (Student); PETERSEN Paul Martin BSc, Chemistry Department, Victoria University, Wellington (Student); RUSSELL Sarah Grace Gray BSc, Chemistry Department, Victoria University, Wellington (Student); RYAN Glenn Richard BSc, Chemistry Department, University of Auckland, (Hons student); SALTER David Mark MSc, Chemistry Department, University of Auckland (PhD student); WHITTINGTON Barry Ian BSc (Hons) Chemistry Department, University of Canterbury (PhD student); WILLIAMS Julian Peter MA (Cantuar), Chemistry Department, University of Auckland (PhD student); WILSON Louise Jane BSc, Chemistry Department, Victoria University, Wellington (Student).

Deaths S G BROOKER Honorary Fellow (Auckland); M M BURNS Honorary Fellow (Canterbury); S R GAY Honorary Fellow (Canterbury); A G HALE (Wellington); R J LANCASTER (Waikato).

Resignations R. Pickles, L J Thompson (Auckland).

GOVT DEPTS & RESEARCH INSTITUTES

MAF, Invermay

At the Animal Health Division of the Invermay Agricultural Research Centre a new $130,000 Hitachi 704 Clinical Analyser has been installed in the Diagnostic Chemistry Laboratory for work on production profiling. Research is also underway on the carotenoid-containing yellow fat which is a problem in Perendale sheep meat.

AIDD, DSIR

Les Boulton recently attended the 26th Annual Conference of the Australasian Corrosion Association held from 17-21 November in Adelaide, South Australia. He presented a paper in the Materials Performance Symposium entitled: "Atmospheric Corrosion Performance of Welded Stainless Steels." He also represented New Zealand at the ACA Council meeting held in conjunction with the conference.

Industrial Processing Division, DSIR

Roger Stanley, Biochemical Engineering Section, has taken study leave for 15 months. He will be looking at chromatographic and electrophoretic methods for the production of high purity proteins and polysaccharides in the Biochemical Development Section, Merck, Sharp & Dohme Research Laboratories, West Point, Pennsylvania.

Building Research Association

John Duncan presented a paper on the corrosion of metals in timber at the Australasian Corrosion Association conference in Adelaide.

Division of Horticulture & Processing, DSIR

Dr Ron Wrolstad from the Food Technology Dept, Oregon State University, is spending nine months with the Division. His research interest is the detection of adulteration of processed fruit products, especially the HPLC of naturally occurring pigments for fingerprinting non-adulterated products. At Mt Albert, he will be collaborating with DHP staff on studying pigments in New Zealand fruit juices. This is Dr Wrolstad's second sabbatical with DHP — his previous visit was 14 years ago.

Chemistry Division, DSIR, Gracefield

Mr J R (Bob) Sewell retired from the Chemistry Division on October 24 after 33 years of service in the DSIR. Bob was initially employed as a metallurgist by the DPL, but later spent most of his career as a physical chemist at CD.

Dr Ian Miller has formed a company, Carina Chemical Laboratories Ltd, which will specialise in the development of new chemical processes and carry out general industrial work. He has initially been given one year's leave of absence from the DSIR. **Dr Selwyn Yorke** accompanies him in this new venture. The company is wholly private and was inspired by Dr Miller's investigative activities in the durene field.

Dr Barry Dent has joined the Pharmaceuticals section of CD. Barry completed his PhD in Chemistry at VUW (with **Brian Halton**) and has subsequently had one year's post-doctoral work with **Professor D Clive** at Edmonton.

Chemistry Division, DSIR, Christchurch

Dr Michael Taylor has returned from a year's study leave at the Metropolitan Police Laboratory, London, where he worked on an instrumental approach to tool-mark comparisons.

Dr Richard Vanneort recently attended a meeting of Australian State and New Zealand Heads of Toxicology Sections in Brisbane and visited state laboratories in Brisbane and Sydney.

Soil Bureau, DSIR

Dr Benny Thong recently attended the XIIIth Congress of the International Society of Soil Science held in Hamburg, West Germany. En route to Hamburg, he also participated in a seminar on soil aggregate stability at the Institute for Irrigation and Salinity Research, Tatura, Victoria, Australia.

UNIVERSITY NEWS

Auckland

A new arrival in the department is **Dr Jan Coddington** who has been appointed to oversee the operation of the new high-field NMR. Her experience in this area has been gained over the last three years at the University of California in San Diego. She will also be lecturing in organic chemistry.

Professor Brian Davis is to spend 1987 at the University of California, Berkeley, working with **Professor Clayton Heathcock.**

Current visitors to the department are **Professor Harold Heine** from Bucknell University, Pennsylvania, and **Professor Quentin Petersen** from Central Michigan University.

Waikato

Visitors to the department in the latter half of 1987 have included **Professor R Birdwhistell** from the University of West Florida and **Dr Barry Newman** from the University of New South Wales, both distinguished workers in science education. **Dr Gene Strumila** from Nicolet Instruments in Canada gave a seminar on Fourier transform infrared and mass spectrometry. **Dr John Jeffries** (Postdoctoral Fellow at Auckland) gave a seminar on his Cambridge work on osmium carbonyl raft clusters. We were also very pleased to welcome from Auckland **Dr Ralph Cooney** who talked about his spectroscopic interests in energy chemistry, especially Raman work. **Dr Peter Healey** from Griffith University gave a seminar on the structural chemistry of coinage metal compounds and **Professor Arnis Kuksis** from the University of Toronto talked about plasma lipid profiles in health and disease.

We are pleased to congratulate **Mr Owen Curnow** who has gone to the University of Michigan to undertake studies towards a PhD on a Fulbright Scholarship. We also congratulate **Mr Rod Wallace** on the successful completion of a DPhil.

Professor Ken Mackay gave a paper at the Fifth International Conference on the Organometallic and Coordination Chemistry of Germanium, Tin and Lead, which was held at the University of Padua in September. He also attended a joint meeting on Coordination and Cluster Chemistry held between the Universities of Freiberg and Strasbourg.

Wellington

Professor James Duncan will be retiring at the end of this year or, at least, from the paid employment of the University. However, he is expected to remain active in his many activities, particularly the New Zealand Futures Trust, and will continue to have an office in the department. **Professor Neil Curtis** will be stepping down from his Chairmanship at the end of January and **Professor John Tomlinson** will be taking over this responsibility.

Dr Robin Speedy will be away on research and study leave during 1987 and will be working with **Professor Ludemann** in Regenberg, West Germany.

Recent arrivals in the department include **Dr A Stutz** who has come from Austria to work with **Professor Ferrier** and **Qi Lu** who has come from the Fu Dan University, Shanghai, in the People's Republic of China, to study for a PhD under the supervision of **Dr Brian Halton.**

Recent visitors to the department have included **Professor G Wilse Robinson** from Texas Technical University and **Professor Y Apeloig** from the Technion-Israel Institute of Technology.

Otago

Professor Arthur Campbell, having recovered from the Institute Conference, attended a Bureau meeting of the IUPAC, on 27-29 September in Oxford and the autumn meeting of the RSC in Bath 23-25 September.

Professor Brian Robinson has been on leave since late August visiting laboratories in the USA, UK and Europe. He is currently at the University of British Columbia working with **Professor Bill Cullen. Mr Vivian Alexander** attended the Seventh International Conference on Alcohol Fuels held in Paris 20-23 October.

Dr Keith Hunter has been invited to join a group set up by the International Council of Scientific Unions to report to ICSU's Scientific Committee on Oceanic Research on "The role of phase transfer processes in the cycling of trace metals in estuaries". He has also been invited to participate in a CHEMRAWN IV conference on Modern Chemistry and Chemical Technology applied to the ocean and its resources to be held in Colorado in October 1987.

Dr Simon Mitchell has taken up a postdoctoral position in the Chemistry Department. His PhD work was with **Professor Bob Gillard** at University College, Cardiff, and he will be working with **Dr Lyall Hanton** on diazacyclophane mixed valence complexes of platinum. **Gordon Miskelly** has completed his PhD studies with **Professor David Buckingham** and has gone to a postdoctoral position with **Professor Nathan Lewis** at Stanford University.

In the Human Nutrition Department, **Dr Peter Nottingham** from the Meat Industry Research Institute at Ruakura was the 1986 Visiting Lecturer in Food Science. He gave a series of lectures and a seminar entitled "Meat Research at MIRINZ".

Dr Peter Barber of the Textiles Department has been appointed to the executive of the Research Institute for Textile Services and **Dr Ian Weatherall** has been appointed to the New Zealand Textile Industry Training Board.

OBITUARY

Stanley George Brooker 1911-1986
BSc, MSc.

The sudden death of Stanley George Brooker on October 22, a few weeks after his 75th birthday, saw the passing of one of the outstanding industrial chemists of New Zealand. His contribution to the promotion of science in this country was possibly unequalled by any other current member of the Institute and few possessed such a comprehensive overview of industrial chemistry. His untimely loss will be sadly felt by his many friends and colleagues.

Born in Christchurch in 1911, "Stan" Brooker received his education at Christchurch Boys' High School and at Victoria University College where, as a part time student, he graduated BSc in 1932 and MSc with Honours in Chemistry in 1933. He worked in the Chemical Laboratory of the Department of Agriculture from 1930 to 1935 and then spent a year at Auckland University College carrying out research with Professor P F Worley. Worley was instrumental in securing a position for Stan in 1936 at Abels Limited where, for the next 40 years, Stan held the position of Chief Chemist. In this time he became a leading authority on the chemistry of fats and oils, and was responsible for building up an analytical laboratory of high repute. From 1959 until 1956 he held a similar position with the associate company, Eta Foods Limited. Following his retirement in 1976, Stan became a consultant in food technology and in 1980 was appointed Honorary Lecturer in Chemistry at the University of Auckland. In recent years, he had been Seminar Organiser for the Centre for Continuing Education in the fields of biotechnology, packaging and forensic science.

Because of the nature of private firms, Stan's work at Abels Limited provided only limited scope for the publication of original papers. Important work that could not be published included the lengthy development of a major process for fractionating fats. Nevertheless, he had a substantial list of publications to his credit including papers of both an applied and academic nature as well as reviews. Stan displayed an intense interest in general academic aspects of chemistry and especially in the field of edible fats. He was the co-author of a book on New Zealand medicinal plants and, with his co-authors, had completed a manuscript of a further book on the economic uses of native plants.

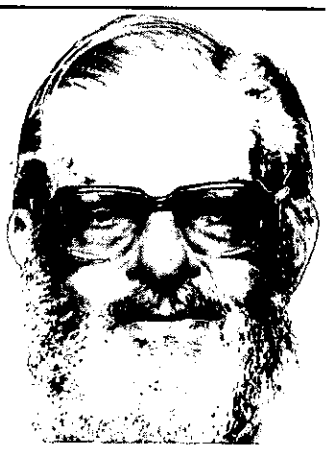
Stan had many professional interests and made numerous contributions to professional bodies. He was elected an Honorary Fellow of the New Zealand Institute of Chemistry in 1976, had been its President in 1963 to 1964, Auckland Branch Chairman from 1949 to 1951 and, prior to that, Secretary-Treasurer of the Branch. In addition to serving the Institute as its Honorary Librarian for many years, he had been Editor of the Journal of the NZIC on two occasions, from 1949 to 1953 and from 1979 to 1981. His pithy editorials were a feature of the latter appointment.

He was the first Honorary Fellow of the New Zealand Institute of Food Science and Technology and, as a founder member, served this body as Chairman of the Auckland Branch (1966), Council Member (1967 to 1975), and National President (1971 to 1973). He was the Institute's J C Andrews Award Lecturer in 1970.

Stan devoted many hours to the Auckland Institute and Museum. He was President from 1964 to 1967, Vice-President from 1967 to 1976, Chairman of the Museum Committee from 1961 to 1964, and a Council Member for over 25 years. Following his retirement he spent time as Honorary Assistant in the Institute's library and as a volunteer guide for the Museum. He was the Institute's representative on the Council of the Royal Society of New Zealand (1956 to 1966) a member of the National Committee for Chemistry (1965 to 1970), and National Representative on the Oils and Fats Subcommittee of IUPAC (1969 to 1976). He was also a member of the Society of Chemical Industry, The Chemical Society, (London), American Chemical Society, and the American Institute of Food Technology. As a result of his international reputation, he has been honoured by Emeritus Membership of the American Oil Chemists Society.

Stan made significant contributions as a correspondent and an editor. Between 1955 and 1970 he was an invited correspondent to the SCI in London and many New Zealand chemists looked forward to his column in "blue bits". In addition to his editorship of the NZIC Journal he was also Consulting Editor for Food Technology in New Zealand from 1966 to 1978.

An avid attender of conferences himself, he served on the organising committees of a number of scientific conferences. This included his positions as Honorary Secretary of the NZ Science Congress of 1954 and Chairman of the Food and Nutrition Section of the 1979 ANZAAS meeting. In 1980, wishing to publicise the fact that 37% of New Zealand's exports are fat in some form or another, he conceived the idea of an International Conference on Fats and Oils. He was Chairman of this most successful conference which was held in 1983. Arising out of his chairmanship was an invitation to visit the Institute of Fat Research in Munster, Germany, in 1984. He had made two extensive trips abroad in 1956 and 1969. On the latter trip he had been New Zealand representative for the 1960 Council meeting of IUPAC in Italy.



Stan was in great demand as a public speaker. As a lecturer he excelled, liberally spicing his skilful presentation with a fund of jokes and tall stories. A man of boundless energy and activity he still made time for many interests. He acted as a Lay Reader for the Methodist Church for many years and was active in many church actvities. He set aside one morning of every week to act as a volunteer reader for the Blind Institute. He was a man with a broad sense of humour who was immensely popular with his fellowmen and who saw it as his duty to contribute to others where he could. The daily quote on his desk diary on the day of his death could well be his epitaph.

"Always choose a busy man when you want a job well done — the others haven't time."

Stan is survived by his wife Nance, three sons, a daughter and a number of grandchildren.
(R C Cambie)

BRANCH NEWS

Otago

Dr Keith Hunter spoke to the Branch about "Getting up the creek with oceanography" on September 11.

Hamish Love of Dunstan High School was the winner of the Analytical Competition for 1986. The task was to analyse samples of pure and impure sodium carbonate by acid titration. 21 entries were received and those highly commended were **Greg Hope** of East Otago High School, **Jeremy Martin** of Dunstan High School and **W K Lee** of Waitaki Boys' High School.

Manawatu

At the AGM, held in the New Zealand Dairy Research Institute Seminar Room on October 13, **Dr Joyce Waters**, (Department of Chemistry and Biochemistry, Massey University) was elected chairman of the branch for 1987. Also elected were **Drs Alistair MacGibbon** (Secretary), **Julian Lee** (Treasurer), **Ken Whittle** (Council Delegate), and **Cecil Johnson** (Branch Editor). The new Manawatu Branch committee includes **Messrs Neil Blazey** and **Denis Body** and **Drs Eric Ainscough, Margaret Brimble** and **Dave Newstead** (Immediate Past Chairman). Area representatives elected were **Messrs Ted Fletcher** (Hawkes Bay) and **Dave Wills** (Taranaki).

After the AGM, Dr Newstead presented the Chairman's address entitled "The use of phosphates in dairy food systems — from chemistry to industrial alchemy". He described the various forms of phosphates that are used in the food industry and the reasons for their presence in a wide variety of products. In a number of impressive demonstrations, he used milk as a substrate to illustrate the effect of interactions of various polyphosphates with polymers (proteins) and essential cations.

The Otago Science Teachers Association has elected **Richard Tapper** and **Murray Vickers** as Vice-president and Secretary, respectively.

Waikato

The Waikato Branch AGM was held on October 15. As has been the case in past years, a wine and cheese function preceded the well attended meeting. A spirited discussion of Institute affairs followed the formal part of the meeting
The principal office holders elected for next year were **Dr Rex Gallagher** (Chairman), **Dr Philip Poole** (Secretary), **Dr Everit Payne** (Treasurer), **Professor Ken Mackay** (Delegate) and **Dr Max Sutton** (Branch Editor).

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SGE also provides a range of accessories to increase the capability of the gas chromatograph to handle multidimensional and capillary chromatography. These accessories provide an excellent aid for the interpretation of complex programs.

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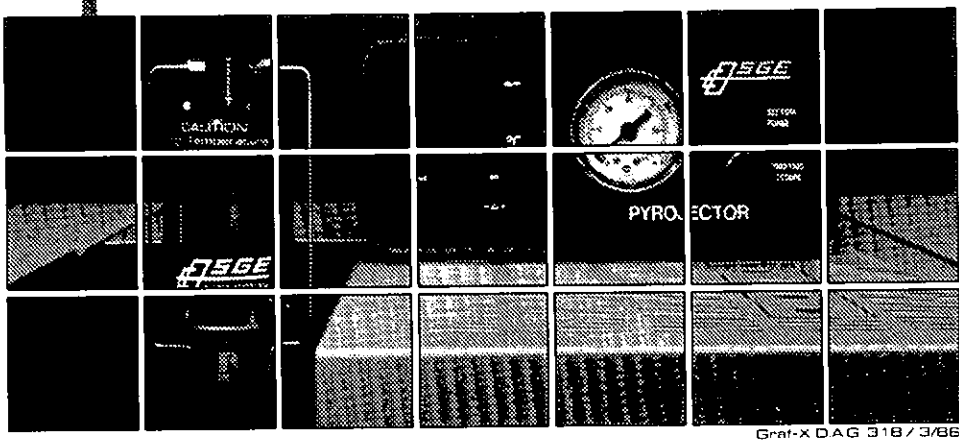

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Flow Injection Analysis is the fastest and most effective method for routine analyses of ions in water, soil, fertilizers and beverages, for example analyses of NO_2, NO_3, PO_4^{3-}, NH_4^+, SO_2 and CO_2.

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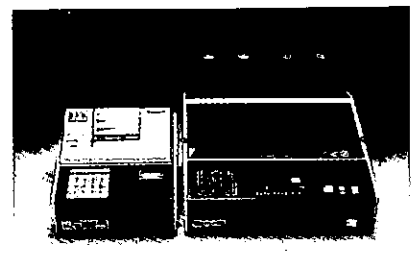

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WILTONS

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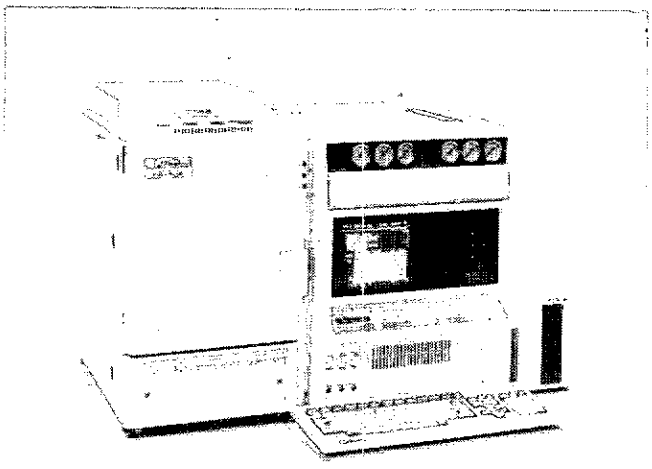
PRODUCT NEWS



NEW OXYGEN ANALYSER FOR FOOD CONTAMINATION APPLICATIONS

The new model 340FBS analyser from Teledyne Analytical features a unique sampling adaptor allowing quick, easy detection of oxygen contamination in sealed food packages.

Shelf-life and freshness of food products is often maintained by packaging in an inert gas. The 340 FBS is a quick and simple method of performing these spot checks which many food packagers do to check for air contamination which could result in premature quality loss and spoilage.

This light weight, portable multi-range percent oxygen analyser includes a specially designed sampling adaptor that allows gas sampling of a variety of flexible and semi-flexible sealed food packages. The sampling system incorporates an integral syringe and needle which is activated by pulling a trigger. This mechanism can be operated with one hand.

The model 340FBS offers many benefits, some of which are:

*AC — dry cell battery — and rechargeable NiCad battery-powered versions
*Quick detection of oxygen contamination
*Prevention of food spoilage and extended shelf-life
*Simple operation, making spot-checking easy
*Ability to sample a variety of food packages.

Teledyne Analytical is represented in New Zealand by Wilton Instrument Division, Salmond Smith Biolab Ltd.

For further information please circle no. 27 on reader reply card.

NEW DIODE ARRAY DETECTOR FOR HPLC

Now available through Alphatech, the Waters 990 photodiode array detector combines a powerful optics unit, a standalone NEC APC III personal computer (IBM compatible) and an exclusive Waters software package to provide a new level of sophistication in UV-visible HPLC detection.

The 990 detector unit houses the 512-diode array which allows simultaneous monitoring of any wavelength range between 190 and 600nm. The resolution is an impressive 1.3nm and the sensitivity compares well with conventional UV detectors, in contrast to other diode array detectors.

The NEC APC III offers a significant advantage over other comparably priced personal computers, with brilliantly clear high resolution colour graphics (640 x 400 pixels) to make the most of spectrochromatographic data.

The elegant but simple software package is menu-driven and offers the chromatographer sophisticated, useful presentation of data, obtainable in seconds.

Specialised processing modes include: spectrum analysis and index; total wavelength chromatogram with contour plot; chromatogram and spectrum analysis; 3D display (from four angles); and contour plot.

All modes are designed to provide the chromatographer with maximum information about the sample, by extensive use of split screen and overlay functions. This product seriously addresses the problems of peak purity and peak identification in HPLC. It is the definitive absorbance detector.

For further information please circle no. 30 on reader reply card.

CHLORINE ANALYSER FROM HACH

Hach's new chlorine analyser, Model CL17, is a low cost, low maintenance microprocessor-controlled unit designed with today's high performance, high volume water treatment operations in mind. The analyser uses the DPD colorimetric method to measure free or total residual chlorine, from 0-5 mg/L. Chlorine concentration is displayed on the front panel 3-digit LED readout.

Every two minutes a complete analysis is performed on the CL17 analyser. The instrument is designed to operate unattended for 30 days between chemical reagent replacements. With self-test diagnostics, an alarm signal will be triggered if analyser problems are detected. The instrument case is designed to meet NEMA type 12 industrial closure requirements and has a clear plastic front cover to allow the operator a full view of the analyser components.

Hach is represented in New Zealand by Wilton Instrument Division, Salmond Smith Biolab Ltd.

For further information please circle no. 28 on reader reply card.

NEW ECONOMICAL ANALOGUE/DIGITAL INTERFACE

Alphatech Systems can assist you to interface any laboratory instrument that lacks an RS232 port but has a recorder outlet, into a computer.

The XA232 is a low cost analogue/digital to computer interface produced by TPS Pty Ltd. It supports four channels of analogue input data, as well as providing four channels of digital output control, allowing the monitoring of four different instruments while controlling four different on/off functions in a laboratory experiment or plant process.

The XA232 can accept commands from the host computer while simultaneously transmitting data to and from the instruments. Use of the popular RS232 computer interface standard enables the unit to be used with any personal or mainframe computer system.

It is user friendly too! Just type in HELP and a screen full of information is sent back showing you how to set up the system and what commands the XA232 will understand and accept.

All this adds up to allowing you to automate the data collection and control functions in your laboratory, process plant, etc even though your instruments do not have an RS232 port, *and* for only around $1300.

For further information please circle no. 29 on reader reply card.

ALPHATECH ACQUIRES LAMBDA SCIENTIFIC SYSTEMS LTD

Alphatech Systems announce the acquisition of Lambda Scientific Systems Ltd with its agencies and ongoing business. Substantial stocks of Hanna pH, conductivity and oxygen meters, and thermohygrometers, and a range of electrodes and sensors are available.

For service facilities and applications assistance, contact John O'Neill at Alphatech Systems.

INDUSTRIAL NEWS

New Zealand Aluminium Smelters at Tiwai has recently installed a Seimens D500 x-ray diffraction apparatus complete with a model 300 x-ray fluorimeter.

The NZIC has an inside line in the most powerful political party in the land — Tim's Team! **Roger Keen**, who works for Mobil Oil, has been elected to the Waitemata City Council in the local body elections.

Roger's involvement in local body politics started when Mayor Tim Shadbolt called for volunteers to join his campaign. Roger felt that he could make a significant contribution to the running of the city and, now elected, he is on four of the council committees: works, planning, general purposes and inter-council.

Roger's comments on chemistry in Waitemata are that there is little chemical industry in the area, but some worries about transport and spillages. The city maintains a small laboratory facility. He feels that some scientific representation on the council is an advantage, with legislation such as the Clean Air Act and Dangerous Goods regulations becoming increasingly important.

Tom Hackney of Oregon Paints has recently returned from the USA. He visited Major Paints in Los Angeles to look at their laboratories and the computerisation of laboratory facilities and production equipment. He also attended the exhibition of the Federation of Societies for Coating Technology in Atlanta.

PRODUCT NEWS

NEW GC RANGE FROM SHIMADZU

Shimadzu announce the release of their new top-of-the-range gas chromatographs, the GC-15A/16A series, featuring keyboard operation through menu-driven dialogue with the built-in colour CRT.

Standard hardware includes a dual-injector, dual detector, dual-carrier flow system, a multi-ramp temperature-programmable two-door oven, battery backup of parameter files, a modular injection system, and a full range of detectors. As with the GC-9A series, up to four detectors can be fitted simultaneously.

Options include a variety of injectors, for capillary columns, an auto injector, an automated headspace analyser, real-time CRT chromatogram display with baseline correction, synthesised voice instructions, and a graphics printer.

Interfaces are available for bilateral communication with the well-known C-R3A Integrator or with an external computer, and the GC-16A features a full keyboard and floppy disc drive for storage of chromatograms and operating conditions.

Shimadzu has also introduced the GC-12A, an intermediate-priced model based upon the well-proven GC-9A, but with a simplified, non-microprocessor control system and single temperature-ramp system. Detectors are of the same design and sensitivity as the GC-9A, with analogue output to a chart recorder or integrator.

The new automated headspace analyser, the HSS-2A, can be used with the GC-9A or the GC-15A/16A gas chromatographs. Up to 20ml of sample is placed in a vial, sealed, and placed in a carousel with a capacity of 40 vials. Each vial is moved in turn to a variable heated zone (40 to 150°C), sampled by a heated gas-tight syringe, and transferred to the septum of the gas chromatograph. Various parameters may be selected, such as sample injection volume, number of injections, and temperature programmes.

With these additions to the Shimazdu family, they can now reasonably claim to offer the most comprehensive range of gas chromatographs ever seen in this country, with models to suit every demand, from basic quality control units to the most demanding research application. Every instrument has been subjected to their scrupulous quality control, which has resulted in a reliability second to none.

Shimadzu are represented in New Zealand by AWA New Zealand Ltd.

For further information please circle no. 22 on reader reply card.

NEW RATIO TURBIDIMETER

Hach has announced the introduction of a new laboratory Ratio Turbidimeter — the Ratio/XR Turbidimeter. This new model provides extended range capability with a 0 to 2000 NTU range and greater sensitivity to low turbidities.

The Ratio/XR Turbidimeter offers four operating ranges measuring 0-2, 0-200, 0-2000 NTUs. Resolution to the nearest 0.001 NTU permits accurate measurement of ultrapure solutions. A multiplier code allows measurement in alternate nephelometric units, such as nephelos, EBC and haze. The Ratio/XR also includes a recorder output and sample compartment air purge system.

Hach is represented in New Zealand by Wilton Instruments Division, Salmond Smith Biolab Ltd.

For further information please circle no. 23 on reader reply card.

FOUR NEW HPLC DETECTORS FROM SHIMADZU

Shimadzu Corporation are pleased to announce the international release of four new detectors for HPLC. First, the RID-6A differential refractive index detector, featuring high stability, low noise and excellent reproducibility from the temperature-controlled and constant lamp intensity feedback circuit. Automatic filling of the reference cell by push-button control, warning indicators for light-source deterioration, presence of bubbles, and cell contamination, are all standard.

Secondly, there is the L-ECD-6A electrochemical detector, based on a novel cell design with a disposable glassy-carbon plate electrode, utilising Shimadzu's optical polishing techniques. This results in greater ease of operation and greater productivity because of the elimination of electrode-polishing prob-lems.

Thirdly, the RF-535 fluorescence monitor with a high-intensity xenon lamp (150W) and large-aperture concave holographic-grating dual monochromators covering the range 20 to 650nm. Stability is assured by monitoring of the excitation beam intensity, and detection is by a photomultiplier, for high sensitivity.

Also released is a low-cost fluorescence monitor, the FLD-6A, based on a mercury lamp with an optimum intensity of 350nm, and suitable for fluorescence in the 450 to 800nm range. As an amino acid detector, the unit will perform with the same sensitivity as the RF-535.

All detectors can be used with any make of HPLC system but, when coupled to a Shimadzu LC-6 HPLC system with SCL-6A controller, feature autozero, polarity change, and status monitoring.

Shimadzu have also introduced a chemical reaction oven for HPLC post-column derivatisation, the CRB-6A, with temperature control from 15°C above ambient to 150°C. A temperature safety limit switch and solvent leak detector are standard.

For further information please circle no. 24 on reader reply card.

IBM-BASED CHROMATOGRAPHY DATA STATION

Alphatech offer the Waters 820 chromatography data station, which combines the IBM PC AT or XT (or equivalent) with Waters WIRC software and the system interface module (SIM) to provide fast, flexible and easy-to-use chromatographic data management. Data can be collected from up to four chromatographs, each with up to four detector channels, providing extensive data handling and storage at a lower cost per channel than conventional integrator systems.

The 820 uses a mouse and pull-down menus, dialogue boxes and WIRC-sheets to select operations quickly, ask for help, expand and reprocess chromatograms, or perform other processing functions in seconds. High resolution graphics allow clear visualisation of the smallest chromatographic details.

Sample reports can be customised or results can be transferred directly to other programmes such as Lotus 123 or RS/I. The 820 system can be linked to most other computers, including mainframes and the Waters 840 data and chromatography control station.

For further information please circle no. 26 on reader reply card.

DIGITAL AIR VELOCITY METER

A microprocessor-based air flow meter for the measurement of low velocity air flow applications has been added to the extensive line of SKC instruments offered by Northrop. Uses for the meter include air flow measurement in fume hoods, spray booths, duct work for air handling, filter banks and clean rooms.

The instrument provides an LED digital display and an automatic averaging feature for taking up to 125 readings of either air flow or air temperature. It offers high performance at a price comparable with conventional analogue meters. Capability includes an air velocity range of 0.1 to 10 m/sec and a temperature range of 32 to 158°C; change from metric to imperial units comes at the touch of a button.

Northrop also offers an enhanced model for those applications which require printing capability and computer communications.

For further information please circle no. 25 on reader reply card.

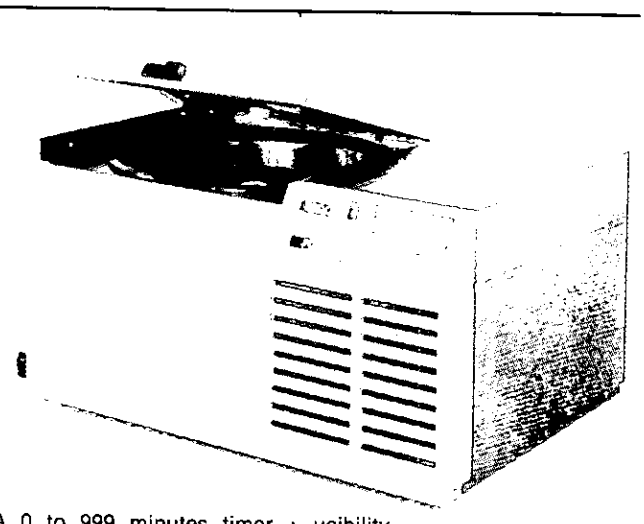
Cover Story: THEN THERE WERE TWO

Now joining the highly successful Mistral 3000 refrigerated bench-top centrifuge is the new non-refrigerated Mistral 3000E.

Like its famous counterpart, the 3000E is ultra quiet, with brushless induction drive motor, automatic rotor recognition and instantaneous "g" force readout.

All of which makes the Mistral series the most reliable and easy to use general purpose bench top centrifuge available anywhere in the world. For spinning a maximum load of up to 3 litres in safe, sealed buckets at the highest "g" force/volume combination of any bench-top instrument, the choice is yours: full refrigeration or new ambient temperature centrifugation.

The Mistral 3000 series' range of accessories includes approved sealed buckets, tube adaptors for most popular tube sizes and a selection of swing-out and fixed angle rotors. There's even a purpose built trolley for convenient stowaway or for free-standing use.



MISTRAL 3000E: NON- REFRIGERATED BENCH—TOP CENTRIFUGE

The Mistral 3000E is a non-refrigerated centrifuge with 3 litre capacity for bench top or trolley operation. With angle rotors the maximum RCF is 6030g at 6000 rpm. Using the 4 x 750ml windshielded rotor, it can spin 3 litres in a sealed condition to over 3000g.

The Mistral 3000E will accept all rotors available for the Mistral 3000 to the same maximum speed capacities.

Microprocessor Controls ensure precise, accurate measurements and simplicity of use. The well-designed control up all parameters, and the bright, easy to read LED display enables all parameters of a given run to be accurately reproduced.

The brushless 0.5 h.p. Induction Motor means no carbon brushes to change and gives long life reliability, quiet and smooth operation, together with fast acceleration and accurate speed control — even at low speeds.

10 programmable rates of braking are provided, including brake-off — an essential feature when centrifuging particles that might easily be re-suspended by violent braking effects.

A 0 to 999 minutes timer includes a "hold" mode, if timed run is not required.

A built-in detector enables the microprocessor to identify the rotor in use as soon as it begins to rotate. This enables the operator to obtain a direct RCF reading at any time during the run, and also means that the instrument will not allow speeds greater than that allowed for the rotor type.

Details of the last run can be retained in the memory of the instrument, even when the power is turned off, and ensures greater run-to-run reproducibility.

The Mistral 3000E fully complies with all the specifications laid down in BS4402:1982. Safety features include: lid interlock; rotor imbalance detection and protection system; heavy duty steel guarding; and counterbalanced lid.

The Mistral range of centrifuges is distributed in New Zealand by Kempthorne Medical Supplies Ltd.

For further information please circle no. 18 on reader reply card.

IKA DISTILLING UNITS

The IKA-Aquamat 3000 takes up very little bench space and is able to produce 4.5L of distillate/-hour.

The mono-distillate produced is free of soluble salts. It complies with the regulations of the German Pharmacopoeia DAB 8 for "aqua purificata", and is pyrogen-free.

The unit is readily dismantled by traversing the clamp of the conventional snap closure.

To prevent fine water drops from being carried over with the distillate, the vapour feedpipe has flow baffle plates. This makes the specially low and practical design possible. The automatic level control is fixed to the side of the unit and replaces the evaporated water with pre-heated cooling water.

For descaling the instrument, a special intake is provided with a funnel for adding cleaning liquid.

The stainless steel tubular heating element incorporates a capillary tube temperature sensor. Should anything go wrong, e.g. if no cooling water flows in or there is insufficient water in the reservoir, the temperature sensor switches off the energy supply at approximately

For further information please circle no. 21 on reader reply card.

NEW SPECTROPHOTOMETER FROM SHIMADZU

Shimadzu Corporation has released the double-beam UV/-VIS spectrophotometer, UV-265 series, available through AWA.

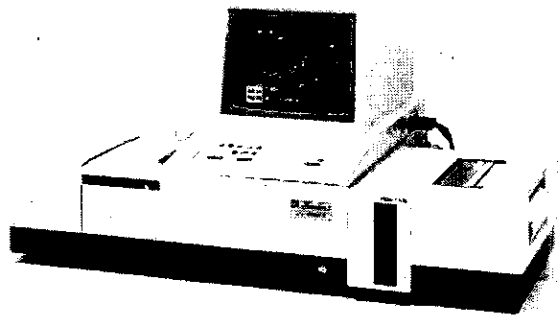
The models UV-265, UV-265 FS, and UV-265 FW all have a 12-inch CRT for display of operational parameters, calibration curves, and measured data, as well as a thermal printer/plotter using A4-width paper. Spectral band width is selectable in ten steps from 0.1 to 5.0nm, and the photometric range is from -3.000 to +3.999 Abs.

Models UV-265 FS and UV-265 FW also have, respectively, one and two 5¼-inch floppy disk drives. Each 1.2MB disk can store up to 75 spectra, or up to 202 sets of instrument parameters, including calibration curves, or any mixture of spectra and parameters.

A wide variety of data processing functions is provided, such as arithmetic calculations between spectra, measurement of derivative spectra, multi wavelength measurement calculation of spectral area, recording of rates of change against time, peak wavelength detection and wavelength programming.

A full range of accessories is available, including autosamplers and temperature-controlled cell holders.

For further information please circle no. 20 on reader reply card.



SAMPLING TUBE FOR ETHYLENE OXIDE, FROM SKC

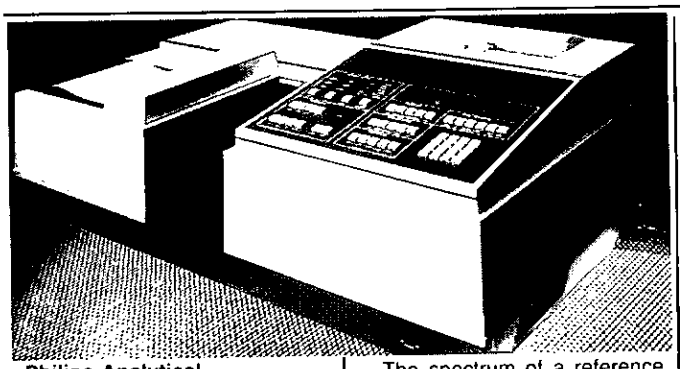
Northrop introduce a new air sample tube from SKC Inc for the collection and subsequent analysis of ethylene oxide (EtO). A significant advance in the collection of this toxic chemical, the new tube is highly accurate and suitable for time-weighted average as well as short term or peak exposures. The method is specific for EtO and other chemicals do not interfere.

A known volume of air is pulled through the tube containing a specially prepared sorbent. Following the collection period, the sample tube is taken to the laboratory where the collected EtO is derivatised and then analysed by gas chromatography using electron capture detection.

The EtO collector is capable of detecting very low levels of contaminant and includes a back-up section to assure hazard entrapment. Only one tube is needed to monitor over an eight-hour exposure period, and suffient sample is collected to permit repetitive or verification analysis. Like other SKC sampling tubes, the EtO collector conforms to all OSHA and NIOSH regulations.

For further information please circle no. 19 on reader reply card.

PRODUCT NEWS



Philips Analytical Introduces New IR Spectrophotometer

Philips Analytical has announced a new version of its successful PU 9500 series of ratio-recording infrared spectrophotometers. The instrument incorporates a new spectral subtraction accessory which simplifies the analysis of a wide range of difficult samples.

For example materials that need to be handled by use of reflectance accessories such as ATR, MIR or specular reflectance can produce far better results if the new spectral subtraction unit is employed. The spectrum of the particular reflectance accessory is stored in memory and then subtracted from the spectrum of the sample plus accessory. Any basline effects due to the reflectance accessory are removed.

The spectrum of a reference sample, such as a solvent, can be stored in digital memory and subsequently automatically subtracted from the spectrum of a sample dissolved in the solvent.

The first work carried out in Philips Analytical's Cambridge laboratories using the new Pu 9500 was the quantitative analysis of additives in oils. Subtraction on the base oil gave much greater accuracy to the final answers which were produced in concentration using the Quant accessory with built-in printer.

These spectral subtraction techniques are normally carried out using a separate data station, so major cost savings can be achieved using this accessory.

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

New Data Station Announced By Philips Analytical

In a significant move towards greater professionalism and productivity in the laboratory, Philips Analytical has launced its new data station and the first in an associated series of integrated data systems — for infrared spectroscopy.

The company has adopted as its data station the industry standard IBM PC environment which offers customers the reassurance of having support and room to grow, rather than the uncertainty of being locked into the dedicated computer products of other analytical instrumentation manufacturers.

An immediate benefit is that users can take full advantage of an immense range of business software, including Symphony, Framework, Lotus 123 and Wordstar, in order to improve the administration and presentation of their day to day laboratory workload.

The new infrared data systems, which are based on Philips Analytical's SP3 and PU 9500 Series of ratio recording spectrophotometers, offer high resolution colour graphics, fantastic speed from the 8087 maths coprocessor, and a minimum of 256 kbytes of memory. They therefore provide the ultimate in accuracy, ease of use and versatility.

PU 9500s are capable of wavenumber and transmission repeatabilities of the highest order and are controlled fully and without compromise by the data station, via a bidirectional RS232C interface. The high quality, low cost SP3 range can be controlled through a simple interface which provides remote start and stop and commands scans between wavenumber limits. More complete RS232C control is also possible.

Comprehensive infrared software, available in high resolution colour or monochrome, offers the analyst extensive facilities including spectrum storage on dual floppy disc drives, co-addition to improve signal-to-noise ratio, derivative spectroscopy, quantitative analysis, spectral subtraction and a superb library search programme with proven reliability.

Two Philips Analytical UV/Visible spectroscopy data systems will be released shortly, combining either the PU 8600 single beam or PU 8800 double beam scanning spectrophotometers with the data station. Powerful new software packages for each system open up outstanding control and data manipulation possibilities.

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

New Chemistry Courses at ATI

Despite severe restrictions on facilities, the Chemistry Department at the Auckland Technical Institute will, in 1987, introduce additional courses catering for specific industry groups.

Royal Society of Chemistry Certificate in Analytical Chemistry

The Auckland Technical Institute has recently been granted permission "in principle" to run a course in advanced analytical chemistry leading to a Certificate from the Royal Society of Chemistry.

The course will be a post-NZCS certificate with the AAVA paper 5156 (Chemistry 5D1, Analytical Chemistry) as a prerequisite. Applicants holding other qualifications (such as BSc) may also be eligible.

Student assessment may be moderated by the RSC and it is hoped that students who satisfactorily complete the course and generally fulfil the general educational and professional regulations of the Society will be eligible for admission as Licentiates of the Royal Society of Chemistry (LRSC).

Details of the course structure are yet to be finalised but Mr Herd, who will be responsible for the course, is hopeful that the proposed syllabus will meet with the RSC's approval without major modification. The New Zealand Certificate in Science appears to place much more stress on practical analytical chemistry than corresponding UK courses. Since much of the material contained in the RSC certificates run by UK institutes has already been covered within the NZCS, a rather different approach has been suggested. The eight hour per week/forty-eight week (four term) course is divided into three parts.

Recent developments in analytical chemistry and techniques not covered in Chemistry 5D1 will be dealt with in Section A.

Section B will look at the analytical chemistry requirements of various industries.

Section C is designed as an analytical project, carried out over the fourth and final term of the course. It is hoped that students will choose topics relevant to their employment so that some time and guidance will be available at work if necessary.

Assuming that negotiations with the RSC are satisfactorily completed in the near future, it is hoped to start the course early in 1987. Current plans are to run four hours in the afternoon and four hours in the evening on one day per week. Because of the heavy emphasis on instrumental analysis, class numbers will have to be limited to a maximum of 12.

Cosmetic and manufacturing chemistry course

In the coming year, the Auckland Technical Institute (ATI), Chemistry Department in collaboration with the New Zealand Society of Cosmetic Chemists (NZSCC) will be offering a course in cosmetic chemistry. The course will lead to a diploma issued by the NZSCC.

The need for the course grew out of a realisation that industry is facing a shortage of chemists with expertise in the formulations field. This was being felt particularly strongly in the cosmetics and health products area. It was therefore decided to run a course in cosmetic and manufacturing chemistry in collaboration with the NZSCC.

It is intended that the students entering the course will be qualified in chemistry (either NZSC or degree) and be employed in the field of cosmetic or toiletry manufacture. The subject matter may also have appeal to those in home products or the pharmaceutical manufacturing industry.

The course will involve two hours a week of lectures and three hours a week of laboratory work, probably Tuesday 2.30 to 7.30pm. It is planned to include several site visits to illustrate aspects of the course.

NZCE Chemical Engineering and Metallurgy

The Authority for Advanced Vocational Awards (AAVA) will introduce this course in 1987, most likely as a block course run at the Auckland Technical Institute. While metallurgy existed as an NZCS option before 1987, Chemical Engineering is a new option that has attracted great interest from potential employers.

The course structure includes materials engineering, process engineering and process calculations at stage 4 level, these subjects being common to both options. Stage 5 provides the specialist divergence for either chemical engineering or metallurgy choices.

For further details on any of the above, contact Neil Edmonds, Tony Herd, or Roger Whiting, at ATI, phone 773-570.

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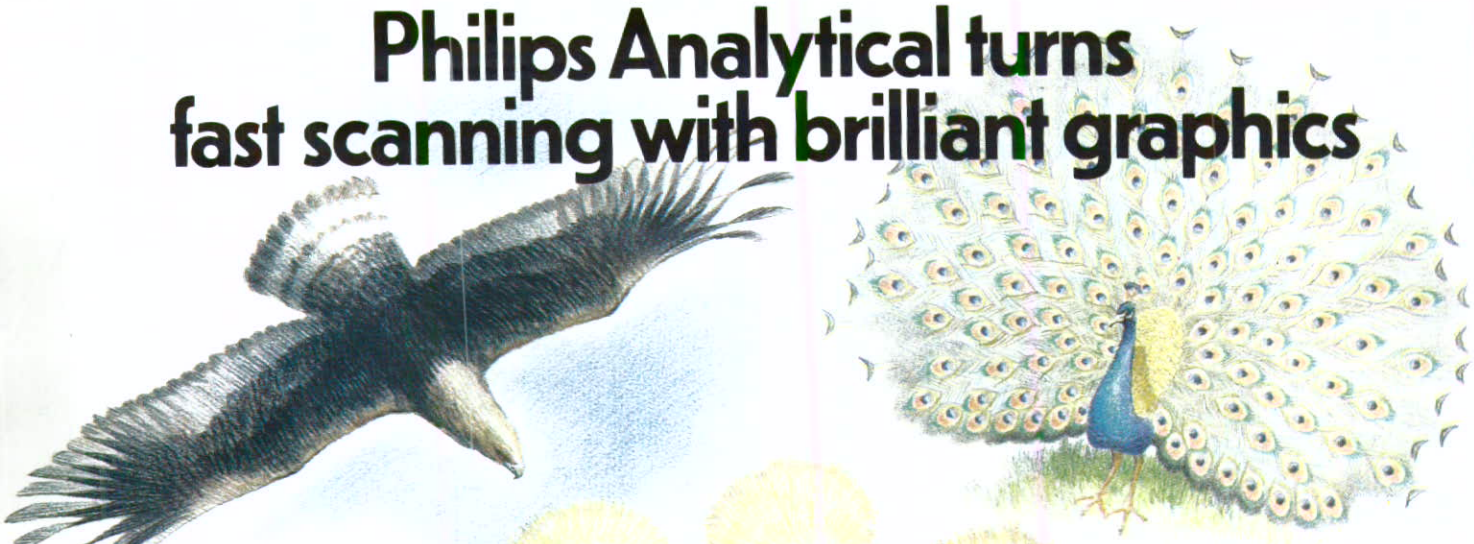

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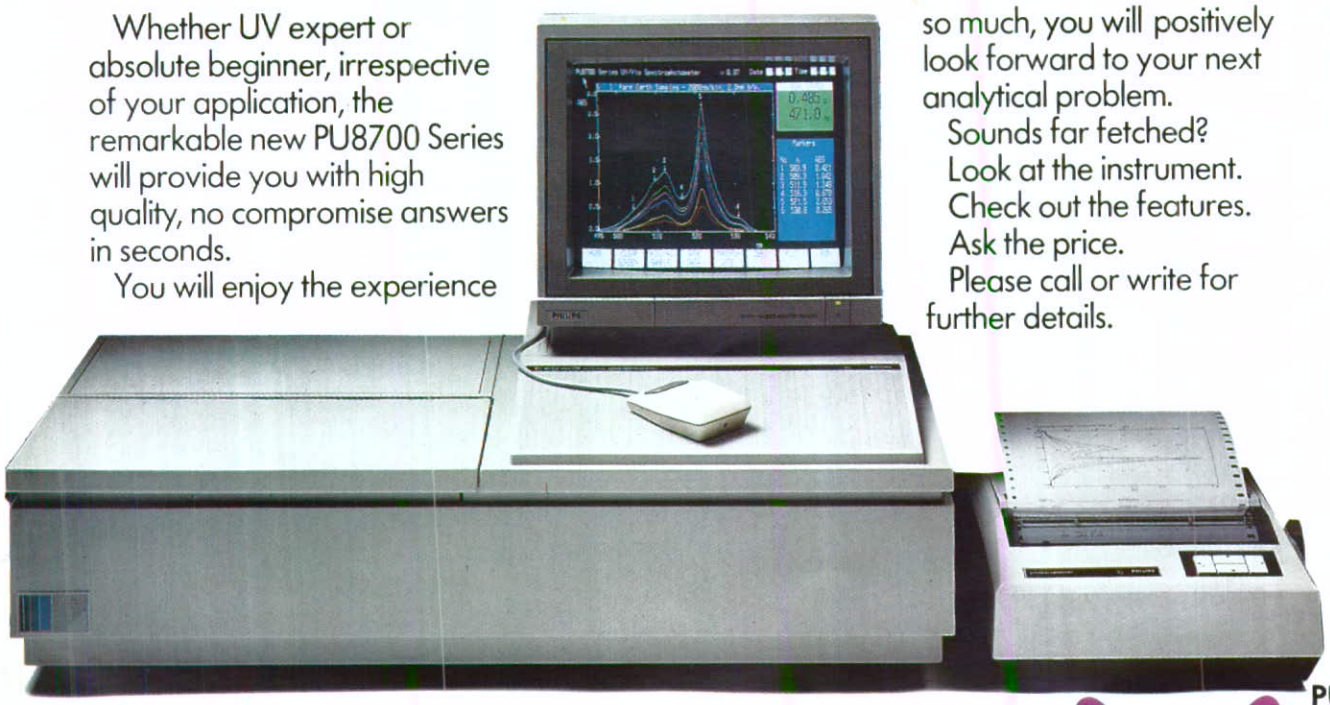

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

R = Rep To Call

L = Literature Only

Classification Data

Indicate total employed:

☐ Under 20 ☐ 20-49 ☐ 50-99

☐ 100-199 ☐ 200-499 ☐ 500 +

What is your organisation's principal activity:

.....

What is your principal classification?

- ☐ **MANUFACTURER**
- ☐ **SUPPLIER CHEMICALS**
- ☐ **SUPPLIER INSTRUMENTS**
- ☐ **SUPPLIER LAB. EQUIPMENT**
- ☐ **RESEARCH**
- ☐ **OTHER**

SPECIFY

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