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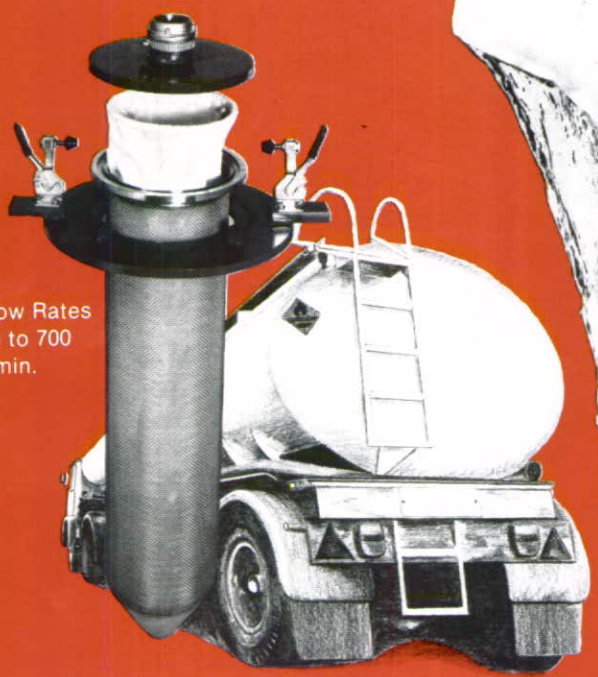

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Involvement breeds interest

The New Zealand Institute of Chemistry, together with many other professional bodies, relies heavily on voluntary and upaid labour to carry out the duties of its committees, sub-committees, working parties and specialist groups.

Many of the officers of the institute who are elected to various positions, remain in the forefront of the institutes' activities for many years often changing hats. But the fact remains that only a minority of the institute membership, which now stands at 1534, chooses to play a role in the running of its affairs. Most of these volunteers are drawn from universities, government laboratories and research associations with a disproportionate contribution from industry.

Why this is so, is always of concern to the NZIC and efforts are constantly being made to attract and involve more industrial members.

The typical industrial member actively resists involvement often citing pressure of work as the reason for non-participation. It is a fact that to be engaged in institute activities one needs a sympathetic management and both the editor of this journal and the writer have been fortunate in this respect.

There is scope, however, within the many facets of the NZIC for involvement by industrial members without too heavy a committment. For instance one can cite the editorial committee of this journal, branch committees, specialist groups and the various sub-committees of council. The organising group responsible for Chemical Processes in New Zealand is now starting work on Volume Two of this work and information from industrial members on New Zealand processes not covered in the first edition is urgently required.

The oft heard cry of what is in it for me can only be answered by suggesting that small initial involvements can prove surprisingly interesting and satisfying.

Taking part in the institutes' activities is of benefit to the industrial member by establishing contact with other members, obtaining general knowledge about the chemical industry and becoming aware of current research topics and the facilities available in the various institutions throughout the country.

In keeping with the philosophy of attracting more industrial members, the publications committee is now considering entering into a more permanent agreement with the current publisher who has some radical ideas on how to up-date and improve the image of the journal. If members have ideas on which direction the journal should move, perhaps in providing economic information, company profiles or a forum for technical questions then please communicate with the editor. We are all striving to improve the professional image of the institute and it needs the contributions of many more of its members.

Laurence Eyres

Polemics from the pulpit — Peroration

The word is going round the clubs that we are relinquishing the editorial throne. We admit that we have not been unmindful of the assassination attempt in Rome, but we are also aware that too much can spoil the flavour and it is better for the journal that we hand over before we "load with sparkless ashes the unlamented urn"[1].

We are strengthened in this resolve by the knowledge that the task is being taken up by Dr Tony Herd, of whose kindly help we cannot speak too highly. We are sure that he will serve "the magazine" and the profession of chemistry well; we are also sure that he will work in with our publisher, the Magazine Factory, in continuing to improve the NZIC's official organ.

Lester Stonyer, who has had previous experience with the journal in Wellington, takes Tony's place as associate editor and we have confidence in his power to assist. If the Lord spares us, we ourselves may continue in a minor role and readers may be hearing from us in our quest for news. Dr Joyce Waters will be carrying on with the book reviews and most of the members of the present committee will be still with us.

We thank all these people; also Laurence Eyres, chairman of the publications committee, who handled a difficult situation caused by changes of publishers with skill and tact. John Rogers has also given much time recently. Finally Peter Reaves who helped give the magazine a lift and for which we received more than our fair share of credit.

Finally, our brethren and sisters, to all those who nobly assisted us; to those who have criticised us; whether we thought it justified or not; to those on the editorial committee who inspired us with their encouragement; to those involved in the too numerous changes in publishers which kept us awake o'nights.

And to Tony Herd who kept us on the rails and will follow us,

My benediction on you all!
Amen.

Stan Brooker

[1] *Shelley — Adonais*

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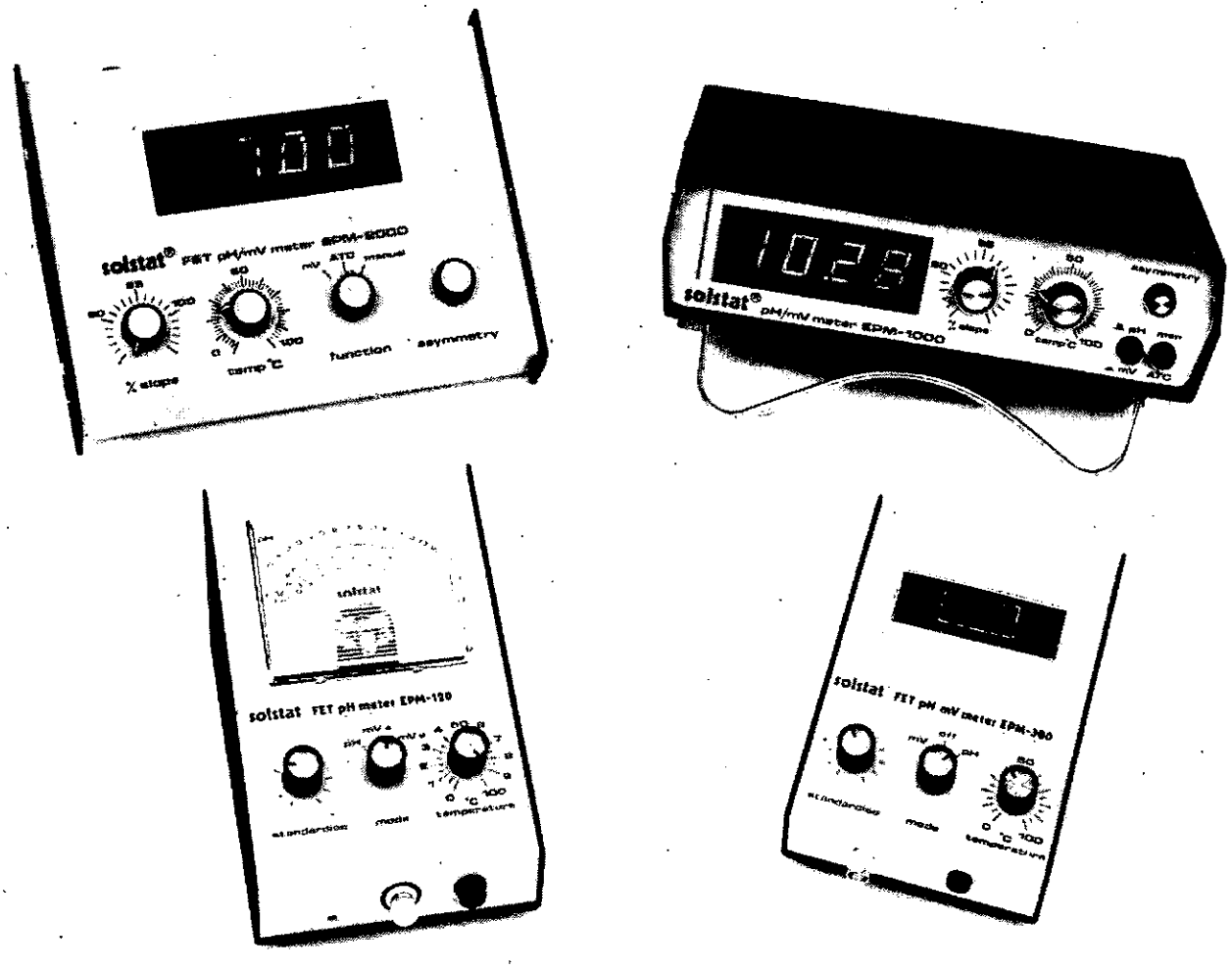

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Tea and the rate of its infusion

Michael Spiro

(Department of Chemistry,
Imperial College of Science and Technology,
London SW7 2AY).

**Based on a paper given to the Beverage Symposium at the NZIC Golden Jubilee Conference in Auckland on August 27, 1981.*

Every day, around the world, several thousand million cups of tea are drunk. Why? First, it has a pleasant aroma which, in the case of black tea, is composed of over 300 different chemicals[1]. Second, the infusions of black tea possess an attractive appearance. Their briskness, brightness and colour are largely associated with the presence of the polyphenolic benzotropolones called theaflavins (TF). The TF content of the leaf, although only one to two percent by weight, is in fact a good indicator of the price that a given leaf fetches in the market place[2]. Third, we like the taste. Some 35 wt percent of tea leaf is highly soluble in water and a further 12 wt percent is slightly soluble[3]. The palatability of tea arises from a unique combination of many different water-soluble constituents, some of the main ones being a less firmly characterised group of polyphenolic proanthocyanidins named thearubigins (TR). Tea infusions also contain various minerals and B-vitamins[4] which add to their nutritional and therapeutic value.

Finally, let us recall William Cowper's poetic reference to "the cups that cheer but not inebriate"[5]. We find tea to be such an invigorating drink principally because the leaf contains some 4 wt percent caffeine[4]. Of course too much caffeine could kill, to be precise some 200 mg per kg body weight for humans[6]. From this I calculate that one would need to drink at least 100 cups of tea in quick succession to attain the mean level of toxicity.

One of my students once drank some 20 cups of tea within 1½ hours and then felt quite strange and lightheaded. Although he had lost some of his powers of dexterity he went out and walked the effect off[7]. This is obviously an extreme example: the stimulant effect of caffeine imbibed in normal tea-drinking is beneficial and enjoyable and leaves no subsequent hangover. Indeed, taken in tea the pharmacological action of caffeine appears to be modified (probably by interaction with the various polyphenols) so as to reduce any harmful side-effects[4].

Although much work has been done on the various chemicals contained in leaf tea, it is quite surprising how little is known about the rate of their infusion. Some years ago we therefore began to carry out a series of kinetic experiments on the extraction of three of the most important constituents — TF, TR and caffeine — from a Northern Assam black tea called Koomsong. A sieved fraction of leaf was used since the rate depends on surface area and hence on leaf size.

The experiments were very simple[8]. The reaction vessel was a thermostatted conical flask into which we placed 200 cm^3 distilled water. A suitable amount of leaf (2 to 8 g) was then weighed into a stainless steel holder device and this was lowered into the flask just above the water level. When the holder device was activated it released all the tea leaf into the water. The resulting suspension was well agitated with a magnetic stirrer bar. At various times, samples of solution were removed with a syringe fitted with a hypodermic needle to exclude tea leaves.

The TF and TR were separated by solvent extraction with iso-butylmethylketone according to the scheme of Roberts and Smith[9,10] and then analysed spectrophotometrically. The caffeine in the samples was separated from most of the other tea constituents by passage through microchromatographic tubes filled with pre-swelled polyamide CC6[11]; this was followed by solvent extraction with chloroform and spectrophotometric analysis[8].

The results yielded curves of the type shown in Fig. 1. The concentration (c) of the extracted constituent is seen to rise rapidly at the beginning and then to approach asymptotically a limiting equilibrium concentration (c_∞). The general shapes of these curves closely resemble those in the few other studies published [12].

The next step has been taken only recently[13,14]: the derivation of a quantitative relationship between concentration and time and the calculation of an infusion rate constant. For this we require a simple physical model of the infusion process. Let us suppose that the volume of water used is V and that into it is dropped a mass w of leaf. Let the leaf possess a weight fraction x_o of a particular constituent (say, caffeine). Then at any given time t, the solution will contain an amount cV of

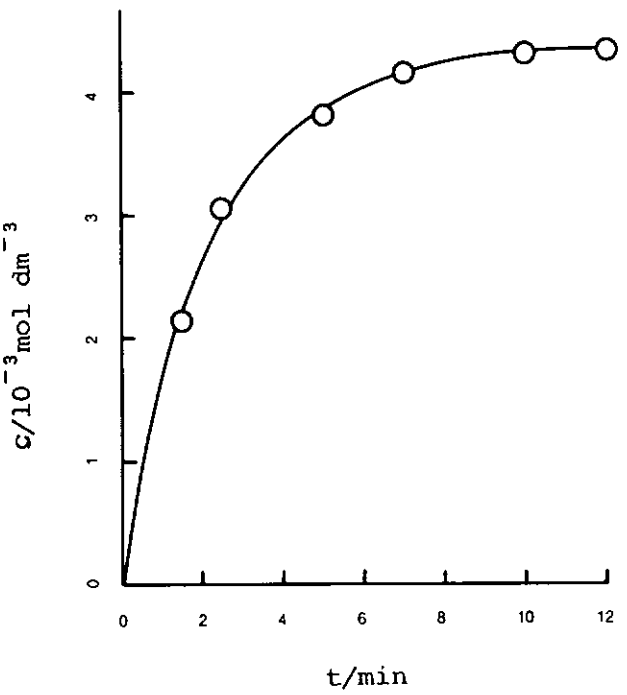

Fig 1. Plot of caffeine concentration against time for an infusion run with 4 g leaf in 200 cm^3 water at 80°C.

caffeine while the amount in the leaf will have decreased to $wx_o - cV$.

We now make the simplest possible kinetic assumptions, namely that the rate at which caffeine leaves the leaf is proportional to the average concentration of caffeine inside the leaf, and that the rate at which caffeine is reabsorbed into the leaf (the back reaction) is proportional to the concentration of caffeine in the solution. Thus:

$$\frac{dc}{dt} = k_f\left(\frac{wx_o - cV}{w}\right) - k_b c$$

$$= k_f x_o - c\left(\frac{k_f V}{w} + k_b\right)$$

$$= k'_f - k'_b c \qquad (1)$$

The various k parameters are rate constants that incorporate the area of the leaf/solution interface. At equilibrium $c = c_\infty$ and $dc/dt = 0$. It follows that $k'_f = k'_b c_\infty$, and that: $dc/dt = k'_b (c_\infty - c)$ Integration between the limits $t = 0, c = 0$ and $t = t, c = c$ gives

$$\ln\left(\frac{c_\infty}{c_\infty - c}\right) = k'_b t = k_{obs} t \qquad (2)$$

It should be added that the simple two-phase model employed has not allowed for the fact that, on immersion, tea leaf takes up water and swells until its mass is some 3½ times its original value. Provided the swelling process is fast, it can be shown [14] that equation (2) still applies although k_{obs} then has a different significance.

Equation (2) fitted the experimental results well and good straight lines were obtained when the left-hand function was plotted against time[14]. The values of k_{obs} calculated from the slopes are listed in Table 1. It is significant that these are the first rate constants available for the extraction of individual constituents from a specific type of tea leaf.

Two points strike one immediately:

(1) For any given constituent, the temperature coefficient of k_{obs} is very small and the Arrhenius activation energies are only a few kilojoules per mol. This is a most unexpected conclusion in view of the emphasis placed in cooking manuals on the need to brew tea with water as close to boiling as possible[15]. Clearly the reason for this instruction is not a kinetic one and we believe that it may have a thermodynamic origin[8].

(2) At any given temperature, the rate constants for the three constituents are surprisingly similar. This fact, coupled with the low temperature coefficients, suggests that tea brewing may be dependent on a diffusion-controlled step.

To shed more light on the actual mechanism of tea infusion, we have recently developed[16] a new and more detailed steady-state model. In this model three consecutive steps are considered in the extraction of a particular constituent: its diffusion through the swollen tea leaf, its transfer across the leaf/water interface, and its diffusion away through the (stagnant) Nernst layer on the solution side.

Kinetic equations can be derived for whichever one of these three is the rate-controlling step. All these equations have the same form as equation (2) but with different rate constants k_{obs}, namely:

$$k_{obs} = 2D_{leaf}/d^2 \quad \text{(for slow intra-leaf diffusion)} \qquad (3)$$

$$k_{obs} = k_t/d \quad \text{(for slow interfacial transfer)} \qquad (4)$$

$$k_{obs} = KD_{soln}/\delta d \quad \text{(for slow diffusion across the Nernst layer)} \qquad (5)$$

Here D is the diffusion coefficient of the constituent in the sub-scripted medium, K its (dimensionless) partition coefficient between leaf and solution, k, the rate constant for the transfer of the constituent from leaf to solution, d the width of the tea leaf (assumed to be of laminar shape) and δ the effective thickness of the Nernst layer. These equations all apply to dilute suspensions for which $V_{leaf}/V_{soln} \ll K$, where V is volume. Since the parameter δ appears only in the third equation, it should be possible to test whether diffusion across the Nernst layer is rate-determining by carrying out infusion experiments in which δ is varied.

A suitable physical system is provided by the horizontal rotating disc. The value of δ for reactions taking place at its surface is given by the Levich equation[17]:

$$\delta = 0.643\, D_{soln}^{1/3}\, \nu^{1/6}\, f^{-1/2} \qquad (6)$$

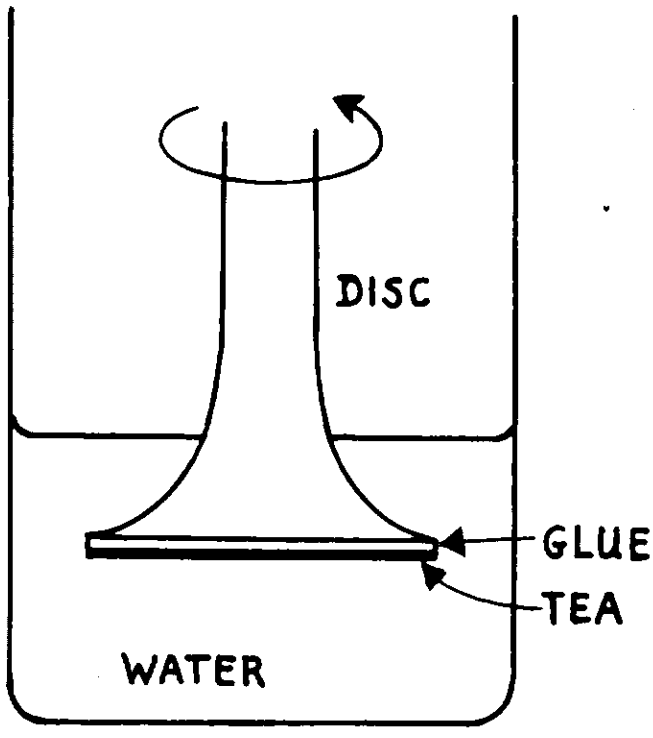

Fig. 2. Schematic diagram of the rotating disc experiments.

where ν is the kinematic viscosity and f the rotation speed in rev s^{-1}. The size of δ is therefore easily controlled by altering the speed of rotation of the disc. Thus, if equation (5) applies, k_{obs} should be proportional to the square root of the rotation speed whereas, if (3) or (4) apply, k_{obs} should be quite independent of the speed of rotation.

We have accordingly carried out a series of experiments in which fine Koomsong tea dust was glued to the underside of a large circular Perspex disc[16], as illustrated in Fig. 2. The rate of extraction of caffeine into 200 cm^3 distilled water at 80°C was then measured at various rotation speeds.

A typical graph of $\ln[c_\infty/(c_\infty - c)]$ against t is shown in Fig 3. Such plots, unlike those obtained with suspensions of tea leaf, displayed positive intercepts. We attribute these to prior extraction of some of the caffeine by the solvent of the glue. After the solvent had evaporated, this caffeine was left on the surface and dissolved quickly when the disc was immersed in the hot water. The intercepts were fairly reproducible with the given glue and showed no trend with increasing rotation speed.

Let us now concentrate on the slopes of the straight lines, k_{obs}. These were found to be completely independent of the rotation speed and this is clearly demonstrated in Fig 4. The rate of infusion is therefore not controlled by the diffusion of caffeine across the Nernst layer. If this had been the rate-determining step, the rate constants would not only have increased sharply with increasing speed of rotation but would also have been very much greater in magnitude. This is shown by the dotted line in Fig. 4, calculated from equations (5) and (6) with appropriate values for the various parameters involved. It follows that the rate-controlling step in the caffeine extraction is either its diffusion across the swollen leaf or its transfer across the leaf/water inferface.

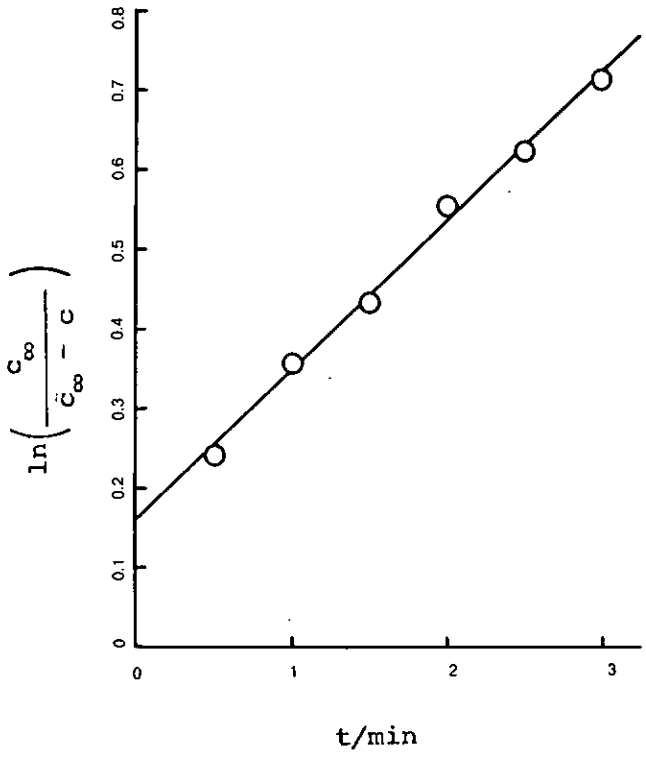

Fig. 3. Plot of a typical kinetic run with a tea-coated disc at 80°C.

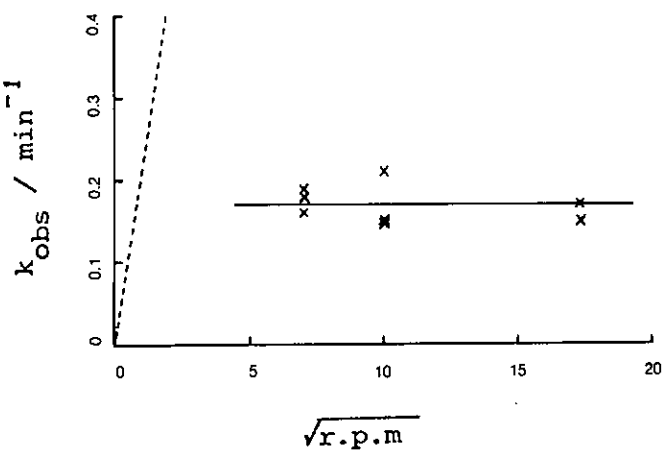

Fig. 4. Observed rate constants for caffeine infusion (x) at various rotation speeds. The dotted line shows the values predicted on the assumption that diffusion across the Nernst layer is the rate-determining step.

To sum up, we have shown that the extraction of caffeine from Koomsong tea is not a transport-controlled process. If, as seems likely, this is true also for the extraction of other constituents and for other teas, then the rate of brewing tea will not be increased by rapidly stirring the solution.

Directions in cooking manuals are quite consistent with the idea that stirring is not a crucial aspect of making a cup of tea. Thus Mrs Beeton's compendium[15] in its 1960 edition simply states that "some people like to stir the tea before pouring it out" while the 1980 edition advises "stir the tea once, then leave to infuse for 5 minutes; stir once more, then strain into cups".

The extraction of soluble matter from tea leaves has now moved from the kitchen to the factory, for the manufacture of instant tea for transport catering and for vending machines. Long has recently carried out experiments for this purpose with a highly concentrated 1:5 blended leaf:water mixture, and reported[18] that the rate of extraction of solubles was not increased by stirring his column with a mechanical stirrer. It is very interesting that the same result was found even under these quite different physical conditions.

Within the last few years, therefore, we have started to gain some understanding of the physico-chemical aspects of tea infusion but there is much still to learn. It is not unreasonable to hope that the theoretical and experimental developments generated by this research will in due course find wider application in the extraction of soluble substances from other kinds of biological material.

TABLE 1. Rate Constants k_{obs}/min^{-1} for the Extraction of Three Constituents of Tea.

Temperature	Theaflavins	Thearubigins	Caffeine
79.5°C	0.37_1	0.42_6	0.42_4
94.0°C	0.38_9	0.45_9	0.43_1

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Michael Spiro was educated at St. Andrew's College, Christchurch and at Canterbury University College. In 1950 he carried out MSc research under Hugh Parton, graduated with first class honours in Chemistry and was awarded an 1851 Exhibition Scholarship to go to Oxford to work for a DPhil degree.

From there he went to the University of Toronto in Canada for post-doctoral research and he continued to jump from continent to continent within the Commonwealth with a spell of four years' lecturing at the University of Melbourne. In 1960 he transferred to Imperial College, London, where he became reader in physical chemistry in 1965 and was awarded a DSc degree by the University of London in 1974 for his researches on electrolyte solutions and on the heterogeneous catalysis of solution reactions. In 1970 he spent six months at the University of Otago as Visiting Mellor Professor.

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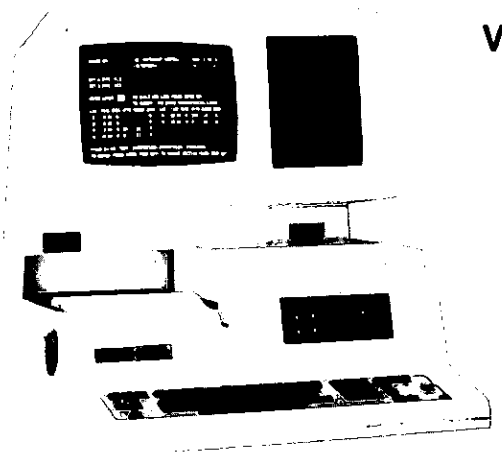

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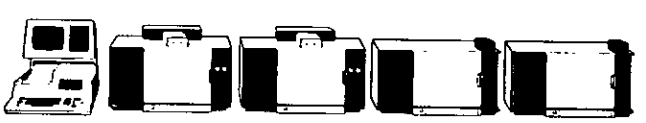

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Developments in tocopherol analysis

Peter J. Barnes and P.W. Taylor
The Lord Rank Research Centre, Lincoln Road, High Wycombe, Bucks.

Ranks Hovis McDougall, one of the major food manufacturing companies in the UK, has interests spanning the whole range of the industry, from selling seeds and animal feeds to farmers through to the packaged food products on supermarket shelves. To improve quality and nutritional value and to devise new products and processes the Lord Rank Research Centre was established by the RHM Group in 1963 and now employs about 350 scientists and support staff.

In several aspects of the research program, including human foods, animal feeds and cereal biochemistry, the determination of vitamin E plays a significant part. We have chosen to use high performance liquid chromatography (HPLC) and this paper will outline the development of tocopherol analysis and the advantages of the new HPLC technique.

TOCOPHEROLS AND TOCOTRIENOLS

The name vitaimin E is usually given to α -tocopherol which has the highest vitamin activity in bioassays of the eight isomers found in nature. The molecular structure of tocopherols is shown in Figure 1. Tocopherols have a saturated side-chain and the corresponding four tocotrienols have unsaturated side-chains; for convenience, the name tocopherol will be used here to denote the vitamin E isomers as a group whereas the abbreviations T and T-3 will be used to designate the saturated and unsaturated isomers respectively.

In addition to having vitamin activity, these compounds are antioxidants but the relative antioxidant activities of the isomers in an edible oil ($\alpha < \beta < \gamma < \delta$) is the reverse order of their vitamin E activities in vivo ($\alpha > \beta > \gamma > \delta$.).

High natural concentrations of tocopherols are found in those plant tissues in which metabolism is very slow and seeds

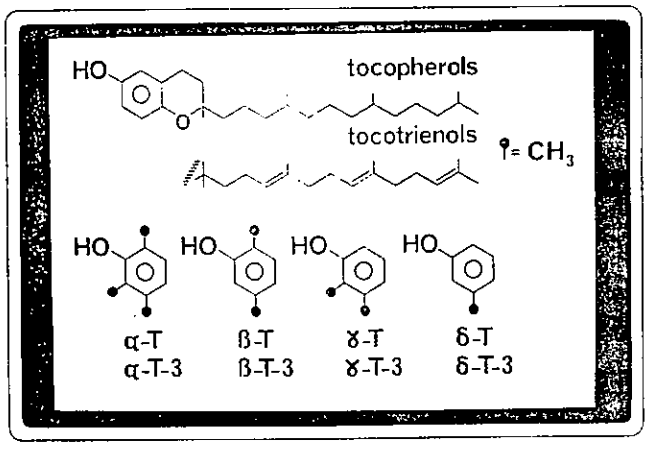

Figure 1: Molecular structure of tocopherol and tocotrienol isomers.

are particularly rich sources. Wheat, barley, rye and oat seeds contain principally α -T, β -T, α -T-3 and β -T-3, whereas maize and millet seeds contain γ -T. Commercial vegetable oils are derived from seeds and fruits and thus contain tocopherol isomers that may represent a significant contribution of vitamin E to the human diet and have a beneficial antioxidant effect in the oils.

Cereal seeds contain from 20 to 60 mg kg^{-1} of tocopherols and vegetable oil values range from 3 mg kg^{-1} (palm kernel oil) to 3000 mg kg^{-1} (wheat germ oil) with most in the range of 100 to 1000 mg kg^{-1}. All eight isomers are represented in one or more of the edible oils of commerce.

Total tocopherol content has been determined by colorimetry using the Emmerie-Engel method, which is based on the oxidation of tocopherol by ferric choloride and measurement of the resulting ferrous ion[1]. However, the method is subject to interference by other oxidizable components of the sample and fails to indicate the proportions of individual isomers present; thus the vitamin E activity or antioxidant activity of the sample cannot be calculated. Frequently α -T is separated and measured but this does not permit the contribution of the other isomers to be determined. The discussion below will be restricted to analytical methods intended to determine the composition of T and T-3 rather than just total content or α -T only.

Tocopherols are usually found in the presence of relatively large quantities of glycerolipids, especially triglycerides, which have similar solubility properties and interfere with most chromatographic separations. Thus there are two approaches to tocopherol analysis. The first is to separate a fraction in which the tocopherols are conentrated and the second is to use a slective method. HPLC with ultra-violet (UV) absorbance or fluorescence detection has recently been used for selective analysis as described below, but earlier methods were usually based on a preliminary saponification of the glycerides with ethanolic KOH and extraction of the tocopherols with the other unsaponifiable components.[2,3]

Tocopherols are very susceptible to oxidation under alkaline conditions and the presence of an antioxidant such as pyrogallol is essential during saponification[4]. It is claimed that even with pyrogallol large losses of T-3 occur[4] and this may not be noticed because T-3 standards are not commercially available for checking recoveries; α -T is often used instead, but the tocopherol isomers differ in their susceptibility to oxidation. To minimise this problem, low-temperature crystallisation of the glycerides from an acetone solution was used as an alternative initial purification step[4].

CHROMATOGRAPHIC SEPARATION

The standard saponification procedure remained the most popular method and was usually followed by chromatography to separate the tocopherol fraction or the individual tocopherols.

Paper chromatography (PC) became the method of choice in the 1950's when Russell-Eggitt and Ward[5] provided a detailed method for tocopherol assay that could be applied to complex samples such as animal feeds. Unfortunately, a large number of steps were involved, including saponification, removal of sterols and carotenoids, separation by reverse-phase PC and finally determination of the eluted tocopherols by the Emmerie-Engle method.

In 1955, Green et al[6] reported the use of two-dimensional PC (adsorption in the first dimension and reverse-phase in the second) and found less need for preliminary separation of sterols and carotenoids. By this procedure α -, β+γ, δ -T and α -T-3 and β -T-3 could be separated, these being all the known tocopherols at that time.

In 1959 a detailed method based on the two-dimensional PC introduced by Green was recommended by the Analytical Methods Committee of the Society of Analytical Chemistry[7]. Although widely used, this method alone could not separate β - from γ - isomers.

By the beginning of the 1960s thin-layer chromatography (TLC) was being applied to tocopherol analysis and three fractions, α-, β+γ, and δ-T could be separated[8].

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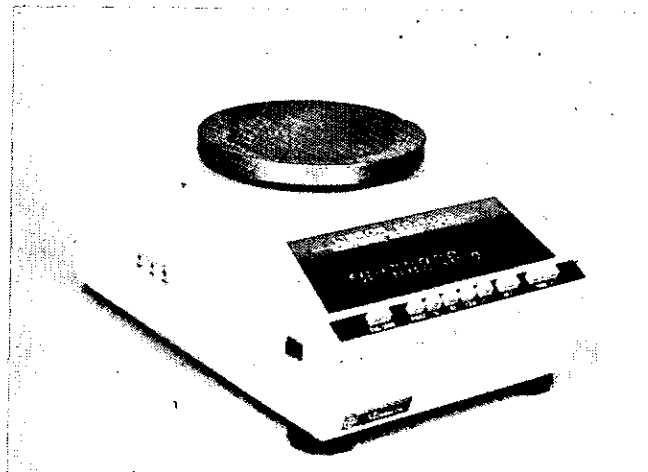

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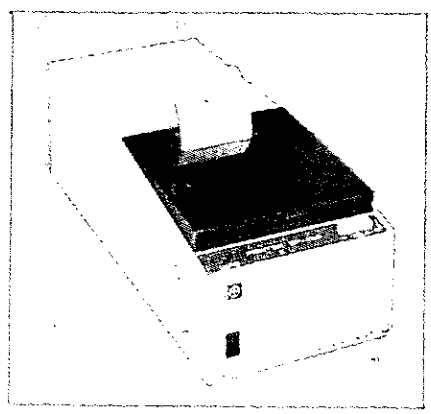

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In 1963 the crucial separation was reported of β - and γ-T by TLC using a one-dimensional development in a mixture of five solvents[9]. This method was applied to the determination of T in seven vegetable oils and offered the advantage that the non-saponifiable fraction could be used directly without preliminary purification[10]. A major step forward was made when Pennock and colleagues in Liverpool modified Stowe's method to obtain a two-dimensional TLC system in which only β -T-3 and γ -T overlapped when all eight isomers were present[11,12]; if necessary, this pair could be recovered from the silica gel and separated by other methods.

By this means they were able to revise the earlier knowledge of tocopherol structures to give the four T and corresponding four T-3 that we accept today. One-dimensional TLC systems have since been described which are claimed to carry out a similar separation[13]. TLC is more rapid than PC, offers greater resolving power and is still often used, especially when more expensive equipment is not available.

In parallel with TLC developments, progress was also made in gas-liquid chromatography (GLC), beginning with the separation of α - and γ -T in 1960.[14]. A detailed study has been made of the behaviour of tocopherols as trimethylsilyl ethers on SE-30 and Apiezon L phases and retention data were presented for sixteen tocopherols and similar compounds, including the eight isomers most commonly found in foodstuffs.[15]

Complete separation of these eight could not be obtained, especially the β - and γ - isomers. Recently, the eight isomers from palm oil have been separated completely by capillary column GLC on a 20 metre OV-17 column with hydrogen carrier gas[16], but it was still necessary to saponify the oil and prepare a tocopherol fraction from the non-saponifiable material by TLC.

With the development of much more rapid and convenient HPLC methods it is unlikely that capillary GLC will be used for routine tocopherol analysis, but instead will be reserved for specialist studies such as the separation of unusual or minor components in tocopherol mixtures and resolution of stereoisomers. The separation on a 100 metre capillary column of the two diastereoisomers of semi-synthetic d1-α -T (2-ambo-α -T) was reported in 1980, and this presents the possibility of distinguishing between natural and synthetic tocopherols in foodstuffs.[17]

DEVELOPMENT OF HPLC METHODS

The eight major tocopherols can be determined using a combination of TLC with GLC or by PC or TLC followed by a different procedure to determine the unresolved isomers. However, these methods are time-consuming and require great care to avoid oxidative losses at each stage, specially saponification.

Reliable results are more rapidly obtained if the tocopherols are separated and determined by direct chromatography of a fat or lipid extract without pretreatment; the development of HPLC provided the required method. In 1972 Thompon et al reported the determination of tocopherols by direct injection of oils and lipid extracts onto a column packed with hydroxyalkoxypropyl Sephadex and passage of the effluent through a spectrofluorimeter.[18] α - and β -T would be separated from their respective T-3 derivatives but γ -T and β -T eluted together. The use of fluorescence detection avoided interference from the other components of the sample, such as the glycerides, sterols and carotenoids.

In the following year, the separation of β - from γ -T by LC-fluorescence using a column packed with silica, was reported but no T-3 were included in the study.[19] Cavins and Inglett in 1974 achived complete separation of the eight tocopherols by a LC method, but the tocopherol fraction was concentrated by low-temperature cyrstallisation of the glycerides.[20] Although successful with a mixture of standards, the chromatograms obtained from samples were complicated by the presence of interfering peaks which might have been avoided if fluorescence detetction had been used instead of UV absorption.

These methods all involve long analysis times but in 1975 Abe et al separated the four T in twenty minutes by HPLC and found fluorescence superior to UV absorption for detection.[21] More recently, HPLC-UV has been used to determine the T composition of a range of vegetable oils by direct injection of the sample dissolved in the mobile phase of 1.5 percent propan-2-ol in n-hexane.[22]

Although UV detection was used most of the samples would have been refined oils and thus contained a minimum of interfering components. In the same year, Thompson and Hatina reported the rapid HPLC separation of the four T plus α -, β -and γ -T-3 using a column packed with 5 μm silica with a mobile phase of 5 percent diethyl ether in moist hexane.[23]

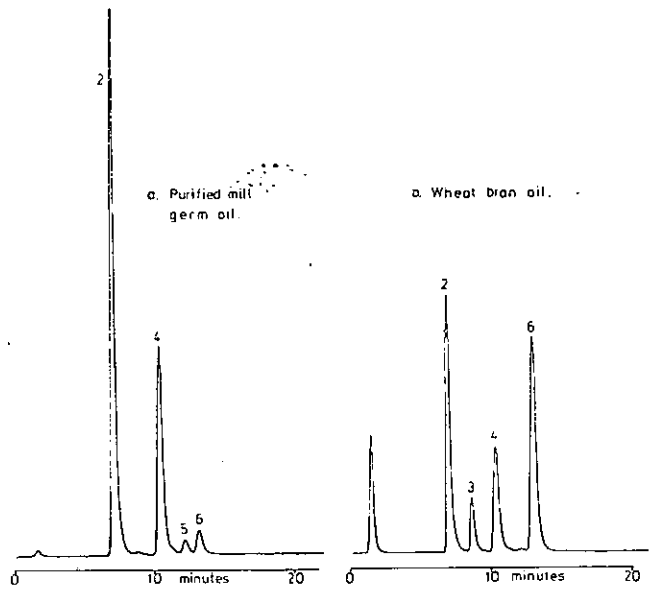

Figure 2: Analysis of a) authentic wheat germ oil and b) oil from experimentaly-prepared wheat bran by HPLC with fluorescence detection[25]. Column (250 x 4.6 mm) containing 5 μ m LiChrosorb Si60 eluted at 3ml min^{-1} with a mixture of 5% diethyl ether, 47.5% water-saturated hexane and 47.5% dry hexane. Fluorescence detection, excitation 290 nm (15nm slit), emission 330 nm (10 nm slit). Peaks: 2. α -T; 3. α-T-3; 4. β-T; 5. γ-T; 6. β-T-3; 7. δ-T.

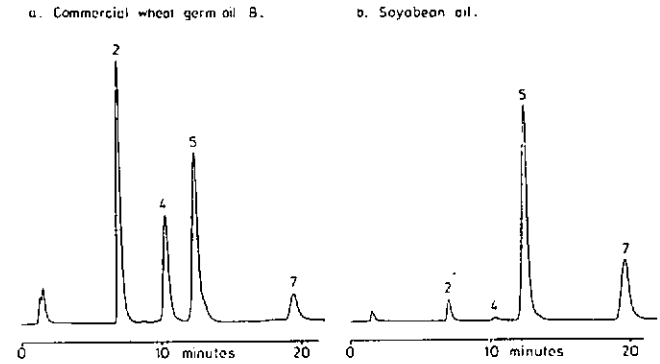

Figure 3: Analysis of a) a commercial "wheat germ oil" and b) commercial soybean oil by HPLC with fluorescence detection. Chromatography conditions and peak identification as in Fig. 2.

Samples were dissolved in hexane for injection and fluorescence detection was used, allowing greater sensitivity and selectivity than UV detection Reverse phase HPLC has also been used, but more frequently for the determination of oil-soluble vitamins including α -T and α -T acetate than for separation of individual tocopherols. As an alternative to HPLC for direct analysis of tocopherols, differential pulse polarography has been tried but fails to separate T from corresponding T-3 and β- from γ -isomers.[24]

A HPLC method similar to that reported by Thompson and Hatina has been used in our laboratories to study the T and T-3 in cereals, cereal products and vegetable oils. It can be used to measure the eight tocopherols and α -T acetate. HPLC with fluorescence detection offers a number of important advantages over other methods of routine tocopherol analysis and should be evaluated as a potential standard for international use, specially for oils and fats.[26] We have examined a variety of crude and refined oils and fats in a preliminary investigation.[27] A study of T and T-3 in wheat germ oils showed considerably differences between authentic and commercially available samples.[25] Thus, the method is potentially capable of giving a rapid indication of adulteration. Some chromatograms from the analysis of vegetable oils are shown in Figures 2 and 3.

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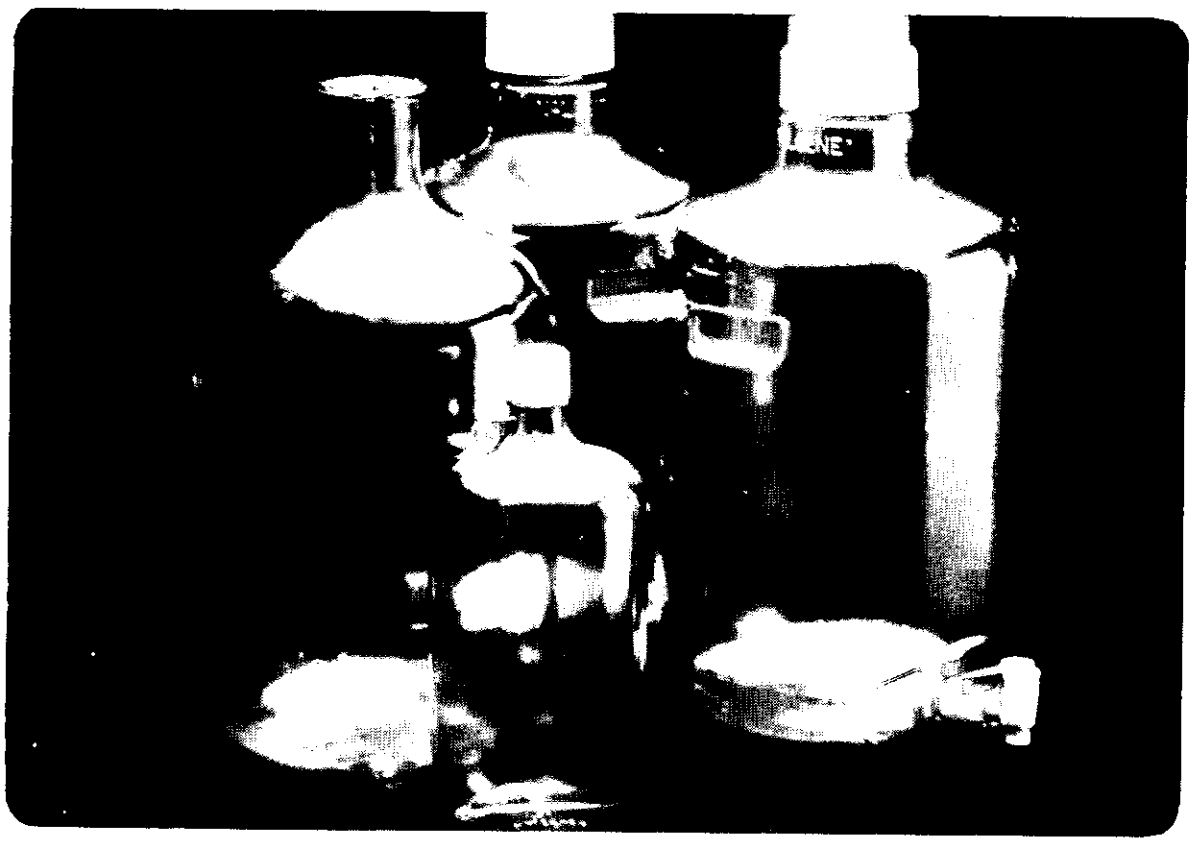

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For the routine analysis of tocopherols in fats, food and feeds, HPLC with fluorescence detection will probably supersede other methods. It is direct, requiring no saponification or preliminary purification for oils and fats; eight isomers can by separated in one short analysis; no derivatisation is required oxidative losses are minimal. Fluorescence detection ensures the minimum interference from other components of the oil or extract.

However, as we develop more powerful methods for analysing tocopherols we find that their chemistry is more complex than we expected. Although it is now commonly accepted that eight tocopherols occur in nature, the four isomers with saturated side-chains and the corresponding tocotrienols with tri-unsaturated side-chains, the presence in plant tissues of tocodienols and dehydrotocopherols has been reported.[28]

It is possible that members of these series of related compounds have been mistakenly identified in the past as the more familiar tocopherols or tocotrienols.

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Philip Taylor gained an honours degree in chemistry at the University of Bristol 1971-74. He continued his chemistry studies at Bristol obtaining a Ph.D in 1978. This involved considerable use of chromatographic methods, particularly HPLC. From 1978-1981 he was primarily responsible for development of HPLC methods and applications at RHM Research Ltd. Recently he has obtained a post in pharmaceutical and drug research with the Wellcome Foundation.

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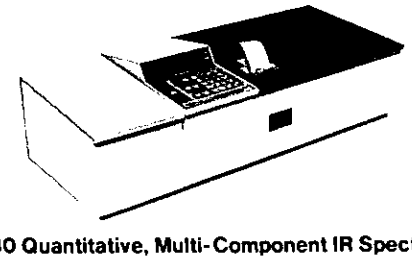

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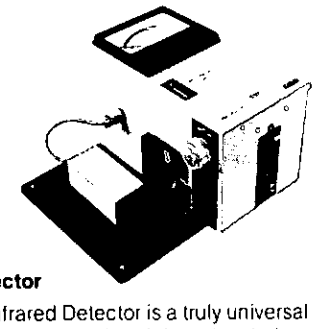

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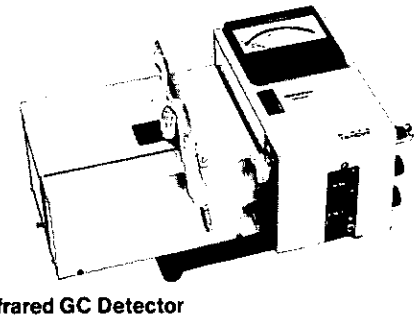

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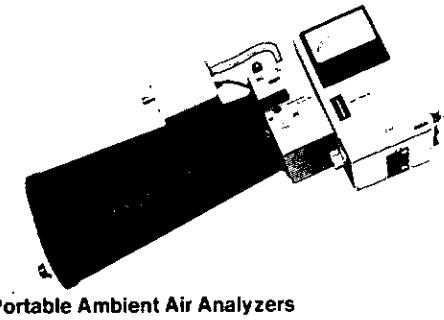

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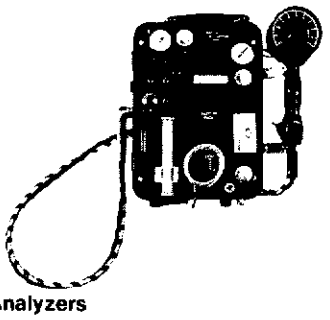

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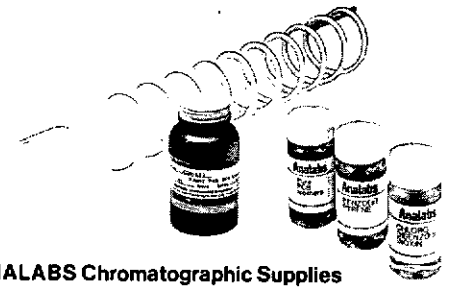

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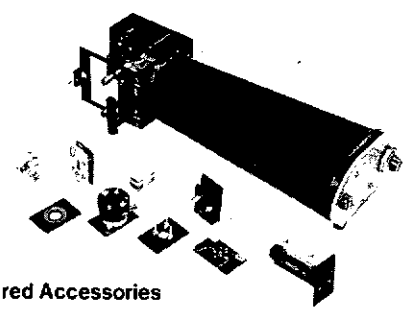

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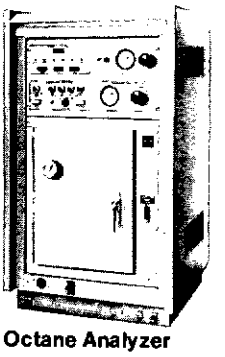

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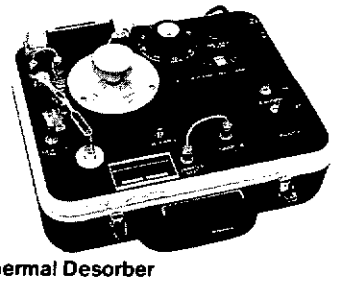
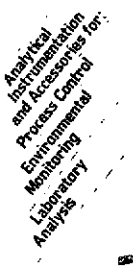
This economical instrument provides the refinery research laboratory a fast, reliable and reproducible method for measuring octane ratings in small samples. The bench mounted unit is easy to set up and operate and employs a unique measurement technique known as cool flame reaction. In this process, a simple thermal oxidation simulates the preliminary reactions that occur during engine octane measurement. The severity of the reaction within the cool flame region (prior to combustion) relates directly to the octane number. This reaction is self-generating and self-extinguishing. Read out is directly in octane numbers on either a printer or recorder.



Programmed Thermal Desorber

The CENTURY Programmed Thermal Desorber (PTD-132A) is a means by which sorbent collector tubes packed with charcoal or other adsorbents can be thermally desorbed, and the resulting 300 cubic centimetre sample stored for later analysis by gas chromatography. The instrument features user-adjustable oven temperature, desorption rate and sampling time, and also has a provision for automatic sample injection into a laboratory gas chromatograph. The PTD makes possible the determination of time weighted averages (TWA) of worker exposure to toxic gases and vapors quickly and easily without the use of expensive and hazardous chemicals.

Get complete information.



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FOXBORO

Science and politics

Last issue Chemistry carried answers to questions on science and its role in the community from representatives of the Labour and Social Credit parties.

This issue we are reprinting the questions with answers supplied by the minister of science Dr Ian Shearer.

Do you think that New Zealand's spending of 0.9 per cent of its gross national product is adequate for scientific research and development?

Shearer: in commenting on this question, our expenditure on research and development should be compared first with the levels in other countries. In 1977, the most recent year for which international comparisons are available, New Zealand's overall expenditure of 0.8 per cent Gross Domestic Product was one of the lowest of the OECD countries and similar to that of Ireland (0.8 per cent) and Iceland (0.7 per cent). Major developed countries such as UK, USA, Switzerland and Germany had levels ranging from two to 2.4 per cent although in cases like USA, half of this is devoted to defence expenditure.

The source of expenditure should be noted. Overall, at present in New Zealand about 80 per cent comes from government and about 20 per cent from industry. If the level of R & D in industry was increased so that it became about two-thirds of the total expenditure, (as is the case in many developed countries), New Zealand's overall expenditure level would also approach two per cent of GDP.

A breakdown into various activity areas of work funded through the Science Budget in New Zealand shows that about 40 per cent is applied to research and development for agriculture and agricultural products. This is appropriate, but in comparison only eight per cent of the total is spent on R & D for the general manufacturing industries.

On another basis, the proportion of R & D expenditure can be compared with total gross government expenditure (TGGE). As a percentage, the fraction R & D/TGGE was approximately 1.77 — 1.85 in the early 1970s. This fell to a low 1.42 in 1976 and has since risen to 1.58 in 1979/80. The trend to higher R & D funding is an indication of the importance that government places on scientific expenditure.

A greater enthusiasm is required from industry to undertake research for future products and needs, either within individual companies or through industry research associations. To assist with this it may be necessary for government as an interim measure to help sponsor the beginnings of new research groups. Contracts to industry for desirable developments or research is a possibility also being studied.

What specific areas of R & D would your party emphasize or de-emphasize?

Shearer: the present government policy is emphasizing controlled economic growth and the creation of employment opportunities. Science has the ability to contribute significantly to both of these objectives.

Additional job opportunities will be created by a diversifying New Zealand manufacturing industry and by searching for new manufacturing export products. Scientists must help to introduce new technology to industry, ranging fron new generation electronics to biological processing. Improved and economic means of utilising our forestry and mineral resources must be sought through further investment in research.

Major efforts in both animal and crop research must continue to achieve the productivity increases which are acknowledged to be within grasp. The horticultural industries require further assistance, to establish new crops and to process new products for overseas markets. There should also be a continued program of scientific assistance to the rapidly expanding export fish processing industry.

Transport and energy are two related problems of critical importance to New Zealand's prosperity, where more research is required, particularly to minimise the needs and costs of transport fuels. New Zealand is an energy rich country and a major research program must find the optimum way to utilize our natural gas, coal, geothermal and hydro resources. In particular, a more refined understanding of the use of our coal and geothermal resources is required.

It is not the intention of the government to maintain scientific services in the public sector that can be readily supplied by industry itself or by efficient commercial consultants. There will be a gradual de-emphasis by government of those activities which fall into this category.

Do you think the National Research Advisory Council should be given executive powers to direct scientific research and development?

Shearer: although NRAC has no executive powers, it maintains, nevertheless, a considerable and effective role in changing priorities within government R & D. It has not always been possible to accept NRAC recommendations on the ideal total level of scientific R & D in these recent years of economic stringency; but NRAC advice on priorities is normally accepted. Thus, although NRAC does not have direct executive powers, it does in practice have a strong indirect influence on the priority areas of government scientific R & D.

If NRAC was granted executive powers it could only be for the purpose of directing all government scientific R & D but this would be a retrograde step because:

- some R & D is jointly funded by government and industry or other private organisations;
- New Zealand has long since moved away from a centrally controlled government research facility, as was initially the case when DSIR was created 55 years ago. R & D is now carried out in many departments which have sector management and/or regulatory functions, so it would not now be practical to return to the earlier centralist system;
- a large additional and in my view unnecessary organisation would be needed, within NRAC itself, to direct and control all government R & D.

Wellington

The September meeting was addressed by one of the invited guest speakers at the Jubilee Conference, *Prof M L McGlashan*. Professor McGlashan is head of the Department of Chemistry at University College, London and his research interests include non-electrolyte solutions and chemical thermodynamics.

He spoke to the branch on The Role of the Chemist in the Energy Upheaval, in which he outlined his thoughts on likely practicable energy sources for the future and the part that chemistry has to play in the development of these.

In October the annual Mellor Lecture was given by *Prof David Buckingham*, of Otago University on The Chemistry of Water and Hydroxide Coordinated to Metals. He described research into the relevant mechanistic inorganic and coordination chemistry, including the modelling of some biochemical processes involving metal ions.

During the week of the Jubilee Conference in August, BP used its screened Wellington theatrette to screen a selection of relatively recent scientific films of general interest loaned from the National Film Library. Each daily screening was prefaced with the film made by the DSIR for the NZIC on chemistry in agriculture.

Auckland

As part of the Golden Jubilee year activities undertaken by the Auckland branch and with sponsership from NZ Refining Co and Wilsons Portland Cement, a function was held at Forum North in Whangarei in October.

Under the chairmanship of *Dr David Adcock* three speakers from the branch addressed an audience of 85 representatives of industry, secondary school teachers and pupils and members of the public.

Prof Allan Odell gave a lecture entitled Isotopes in the 80s and used a very impressive array of equipment to illustrate many principles.

Dr Jim Sprott spoke on the proposed development of wood pulping processes in Northland, emphasising the need for local support for industries that will provide more job opportunities in the region.

Neil Edmonds outlined the opportunities available and the courses at universities and technical institutes for chemists. The opportunity was taken to ensure that copies of the Institute's "Careers in Chemistry" were made freely available to secondary school careers advisers.

Otago

Many branch members were very disappointed when the oil extraction plant of Fletcher Agriculture, Dunedin, was forced to close down. This plant had been active in the manufacture of linseed oil for many years and had quite recently developed the production of cooking oils in New Zealand.

Stuart Gray who was with the Fletcher Group in Dunedin and who has served the branch very well as a committee member and also as branch editor, has, as a result of the Fletcher closure, moved to an industrial chemistry position in Brisbane.

Dr M McEwen of the Chemistry Department, Canterbury University, gave a very well attended talk to the branch entitled Jupiter and Saturn Visited and Revisited. The address was well supported by both film and slides of various space missions to the two planets and among the audience were local physicists, astronomers and engineers as well as NZIC members.

Pictured at the Whangarei meeting organized by the Auckland branch were (left to right) Ted Borthwick, Mrs Rogers, Graham Beavis and Dr John Rogers, general secretary of the institute.

The November meeting was to be a joint one with the Otago branch of the Institution of Engineers. The meeting was to take the form of a field day spent looking over the main Southland lignite deposits. Following the tour a seminar program was to be held at the Croydon Lodge, Gore.

Prizes: at its meeting on August 23 council awarded the 1981 ICI Prize of $500 for excellence in research to *Dr D A D Parry*, Senior Lecturer, Department of Chemistry, Biochemistry and Biophysics, Massey University, for his work relating the structural chemistry of complex molecules such as collagen and keratin to biophysics.

The Manawatu branch is arranging for presentation of this prize to Dr Parry. ICI, sponsors of the Prize, will be invited to participate in this occasion.

Dr M S White, processing manager, New Zealand Farmers' Fertilizer, was awarded the Shell Industrial Chemistry Prize of $200 for meritorious achievement in the field of industrial chemsitry. the assessors reported that Dr White's research over a decade at the Fertiliser Manufacturers' Research Association, Otara, provides an excellent examply of thorough, patient chemical research, equally thoroughly followed through to the manufacturing stage.

The importance to the fertiliser industry of this work on the effects of aluminium and iron minerals on the acidulation of phosphate rock and the procedures which could be used to control their effects on the liquid phase in superphosphate manufacture is undoubted. Shell New Zealand Holding Company, the new sponsors of this prize will be invited to be represented at its presentation to Dr White at a meeting of the Auckland branch.

B J McIntosh, Chemistry Department, University of Canterbury, was awarded the Chemical Essay Prize of $50.

P C Farley, Department of Biochemistry, University of Otago, winner of the student paper competition at conference, was presented with his award by the president *Dr A J Ellis* at the Jubilee Dinner.

Subscriptions: Subscriptions costs to various bodies are as follows:

	Fellows	Members	Graduates	Associates	Students
+Royal Society	£32.50	£31	£18.50	£17	£7
of Chemistry	($72.15)	($68.82)	($41.07)	($31.74)	($15.54)
‡Chem. Inst.	C$55	$55		$55	0
of Canada	($55.55)	($55.55)			
°Sth African		R28		R25	R10
Chem. Inst.		($35.84)		($32)	($12.80)
RACI	A$60	$60	$31		$12
	($82.80)	($82.80)	($42.80)		($16.60)
*NZIC	$32	$32	$14	$22	($6)

+ Application fees required.

‡No membership fee is charged at present to the 2,000 student members, on an experimental basis. Graduate students pay $5 to participate in various non-university institute programs.

°University and Technikon undergraduates are admitted as affiliates, eligible for a 60 percent reduction in the affiliate fee of R25 ($32). Full time post graduate students are eligible for 60 percent reduction in member of associate fees depending on qualifications and experience.

*Plus $4 if paid after 31.8.81

Exchange rates used: $NZ1.38 = $A1
$NZ2.22 = £1
$NZ1.01 = $C1
$NZ1.28 = 1R

The date summarise the replies received to August 1981 letters requesting information about subscription rates and student members.

All societies noted that it was now their practice to raise subscriptions regularly to match inflation as measured by the Consumer Price Index.

The register of the institute at September 22, 1981 was:

	Hon. Fellows	Fellows	Members	Associate Members	Graduate Members	Tech. Members	Total	Local Members
Auckland	7	60	259	24	22	10	392	20
Waikato	5	13	92	4	6	0	120	3
Manawatu	0	23	104	6	8	5	146	4
Wellington	7	71	228	5	13	3	327	16
Canterbury	7	64	93	4	18	1	187	11
Otago	1	40	67	1	10	0	119	0
Overseas	2	27	143	0	14	2	188	1
Totals	29	298	986	44	101	21	1479	55

As a result of the elections at the August council meeting, the grand total is 39 more than stated in the annual report. Only the fellow and member grades carry the rights and responsibilities of corporate membership.

The ratio of fellows to members averages 0.3 with a range from 0.69 in the Canterbury branch to 0.14 in Waikato. Auckland is 0.23, Manawatu 0.22, Wellington 0.31 and Otago 0.60.

The register indicates there is considerable scope for recruiting associate and technician members.

Council decided in August to circulate to branches detailed proposals for a non-corporate student member grade. It is proposed that branches will be responsible for recruiting and admittings students from tertiary institutions.

Rocklabs-Prochem Prizes: standing committee agreed in October to extend the closing date for the $2,000 Rocklabs-Prochem Prizes (p. 131, 1981 "Chemistry in New Zealand") to the end of December 1981.

1982 Awards: council reminds members that entries for the 1982 prizes — Easterfield, ICI, Shell, Chemical Essay — close with the administrative secretary, PO Box 1926, Christchurch, on April 30 1982. The rules of the prizes are in the list of members currently being printed.

Membership: *J B Hyatt*, Wellington, a foundation member of the Institute, was elected an Honorary Fellow on 23rd October.

Election of Officers 1981-1982: the president announced at the annual general meeting on August 24 that *Dr W S Simpson* had been elected by council as president, *Dr D E Wright* as Ist Vice-President, Professor R D Batt as 2nd Vice-President and Dr J. Rogers as Honorary General Secretary.

Jubilee Conference: the Auckland conference committee has advised council that a profit of about $8,000 is expected from the outstanding Jubilee Conference. Council has expressed its appreciation to the chairman, *A W MacKney*, secretary, *Dr D J McLennan* and the committee.

Council records its sincere appreciation of the material assistance of the following 38 firms and organisations: Abels, Advanced Electronics, Alex Harvey Industries, Air New Zealand, BDH New Zealand, BP New Zealand, Bank of New Zealand, Ceramco, Chemby Marketing, Chemical Cleaning, Cooks New Zealand Wine, Fisher and Paykel, Fletcher Holdings, Healing Industries, Hellaby Meats, Hoechst New Zealand, ICI New Zealand, Ivon Watkins Dow, Mobil Oil New Zealand, Mount Cook Group, Neill Cropper, Nestle Company New Zealand, New Zealand Farmer's Fertilizer, New Zealand Forest Products, New Zealand Refining, New Zealand Steel, New Zealand Sugar, Philips Electrical Industries, Research Products, Royal Society of Chemistry, Sci-Med NZ, Shell Oil New Zealand, TNL Group, Tasman Pulp and Paper, University of Auckland, Warburton Franki, Wattie Industries, Wiltons Scientific, Winstone. Some of the companies also exhibited in the trade display where 18 firms were represented.

Council and the conference committee also express their thanks to *Ann Connor, Alan Grant, Maureen Hayman, Jean Rivers, Sheila Treseder, Tony Wernham* and *Dot Wyatt* of the secretarial and technical staff of the Chemistry Department, University of Auckland, for valuable service willingly given.

Penfold Report: council has sent a copy of the report of the committee (Prof B R Penfold, chairman) on Teaching of Chemistry in Forms 1 to 7 to branches with a request that they consider activities in 1982 which would assist non-chemistry science teachers who teach chemistry in forms 1 to 5.

Council endorsed the report at its August meeting. *Dr Simpson* has asked

COUNCIL NEWS

(Continued from page 186)

the Wellington branch to set up a chemistry syllabus committee to report to council. Although the chairman or convener of this committee will not be part of the education establishment council has requested that members with teaching experience be included, or co-opted from time to time.

The objective of the committee is to deal directly with the education authorities and their boards (UEB and SCEB) drawing to their attention the matters of concern in the Penfold Report and to secure a formally recognised involvement in curriculum development and other relevant matters.

FACS: council resolved to subscribe US$100 annually to the Federation of Asian Chemical Societies of which the institute has been elected a member. The following nominations to FACS subcommittees were made: Education — *Dr J E Packer;* Environment — *Prof R Laverty;* Food — *Dr L Eyres;* Professional Affairs — *Dr J Rogers.*

The first issue of the FACS Newsletter was received in October.

Industrial Property Advisory Committee: the Minister of Justice established in April a committee to advise him "on such matters relating to industrial property policy, laws and practices, as he may refer to committee or which have been approved by him for consideration by the committee". The chairman is *Mr W M Brinsley.*

Submissions may be forwarded to the secretary, Industrial Property Advisory Committee, Patent Office, Private Bag, Lower Hutt.

UNIVERSITY NEWS

Otago

Prof Arthur Campbell, Chemistry Department and dean of science, headed the New Zealand delegation to the General Assembly of the International Union of Pure and Applied Chemistry in Leuven, Belgium.

While overseas Prof Campbell also attended the meeting of the IUPAC Commission on Microchemical Techniques and Trace Analysis, the IUPAC Congress in Vancouver, British Columbia and visited the Analytical Chemistry group at the University of Birmingham.

Prof Campbell, has also become the first New Zealander elected to the bureau of IUPAC. This is the governing body of IUPAC and he is one of the 12 elected members. He has an international reputation in the field of analytical chemistry. The maximum term of his appointment is eight years.

Dr A J McQuillan of the Chemistry Department, has been awarded a Fulbright Travel Grant by the New Zealand — United States Educational Foundation and left New Zealand in November to do research on surface modified electrodes with *Prof F C Anson* at the California Institute of Technology. From April to October 1982 he will be at York University working with *Dr R E Hester* on Raman spectroscopy of species at electrodes.

Visitors to the Chemistry Department recently have included *Dr Paul Weisz,* manager of the Central Research Division, Mobil Research and Development Corporation, Princeton, New Jersey; *Prof J H Purnell,* Department of Chemistry, University College of Swansea, *Prof M Fetizon,* Ecole Polytechnique, Paris and *Prof M L McGlashan* of University College, London.

One of the most important members of any chemistry research team is the glassblower and the Chemistry Department at Otago has been well served in this field by *Robin Gledhill.* Unfortunately, after 15 years on the staff, he has decided to transfer to the Physics Department of the University and his departure from the Chemistry scene will sadden many staff.

Gledhill came to Otago after serving his apprenticeship in glassblowing at the Chemistry Department, Victoria University of Wellington and his skills have earned him a New Zealand wide reputation.

Professors Pat Sullivan and *Max Shepherd* of the Biochemistry Department attended a symposium on yeast cell surface and secretory processes in Valencia, Spain in August. Associate Prof Sullivan is at present the acting head of the Biochemistry Department while *Prof George Petersen* is on sabbatical leave.

Dr I Forrester (Biochemistry Department) attended the Federation of Oceanic and Asian Biochemical Societies' meeting in Bali in August and *Dr M Grigor* participated in a Gordon Conference on Lipid Metabolism held in New Hampshire. *Drs Farnden* and *Russell* (Bio-chemistry Department) presented papers at the International Botanical Congress held recently in Sydney.

Dr G Walker is the new visiting lecturer in the Biochemistry Department. Dr Walker is a graduate of Heriot-Watt University, Edinburgh, although he comes to Dunedin from Denmark, where he was working at the Carlsberg Research Institute, Copenhagen. His main biochemical interests are in yeast physiology and he will be in Dunedin for approximately one year.

Prof K Holbrook, dean of science at the University of Heidelburg, has recently visited the Biochemistry Department.

Two of Dunedin's textile chemists have also been overseas recently. *Dr Peter Barber* of the textile chemistry group of the Faculty of Home Science at the University attended a polymer workshop organised by the RACI Polymer Division.

The workshop was held at Monash University, Melbourne and included sessions on polymer properties and structure relationships, reinforced polymer properties, etc.

Dr Ian Weatherall, also from the textile chemistry group, has visited textile research centres in Sydney, Melbourne, Hong Kong, Shanghai and Tel Aviv on his journey to the University of Leeds, where he is now working in the Department of Textile Industries until the end of December.

Auckland

Visitors in the Department of Chemistry are *Prof E S Hansen* of Nova Scotia (until June 1982) and *Prof J Sunamoto* of Nagasaki University, Japan, who spent a few days in the department in October.

Dr G F Schmidt of the University of California at Berkeley will be a postdoctoral fellow until October next.

Drs Michael Taylor and *John Spedding* have been promoted to associate-professors.

GOVERNMENT DEPARTMENTS

Chemistry Division DSIR

A recent seminar organised by the division was Mammalian Pheremones by *Dr D R Crump,* winner of the 1980 Easterfield Award.

Institute of Nuclear Sciences DSIR

Dr M Manning has returned from an overseas visit which included attendance at meetings in Berne and Geneva. The meetings discussed atmospheric CO_2, in particular the techniques of data collection and data interpretation. Partialy funded by the World Meteorological Office, the trip followed up an assessment of WMO CO_2 monitoring stations in seven countries carried out by Dr Manning in 1980.

In August *Dr Melhuish* attended a IUPAC General Assembly in Leuven, Belgium. The Commission (V-4) meeting was concerned with spectroscopic methods of analysis.

Laboratories specialising in analytical work using particle accelerators and microprobe techniques were visited by *Dr Coote* on a month long visit to European centres. He saw new methods in Carbon-14 dating at the Archaeology Laboratories, Oxford. On the way back to New Zealand Dr Coote was interested to see a remote monitoring system for radon gas in underground waters at Caltech. Scientists there are hopeful that the system will advance work on earthquake prediction.

Building Research Association

Dr John Duncan has returned from six months study leave spent at the University of Nottingham, UK investigating the surface chemistry of galvanised steel sheet.

Dr Wayne Sharman attended the Second International Conference on the Durability of Building Materials held in Washington DC, USA in September. He also visited government building research organisations in Washington and Ottawa, Canada and several private companies manufacturing building materials.

Dr Rob Whitney was to present a paper on painting galvanised steel to the Australasian Corrosion Association conference in Brisbane in November and was to visit CSIRO and various building material manufacturers.

A recent seminar on Wood Primers was given recently by *Dr Murray Jansen* of BRANZ.

CONFERENCES

Early fears of a clash of dates with the RACI 7th National Convention and various other chemistry symposia which could have made the 1982 Dunedin Conference a non-event, have proved to be completely without foundation.

Many of the country's leading chemists and biochemists — specially government and university groups — have been contacted by the local committee and their response has been an enthusiastic 'yes' for a three day conference in Dunedin from August 26 to 28, 1982.

Some of the highlights of the proposed program will be a Corbett Symposium to mark the retirement at the end of 1982 of *Prof R E Corbett*, a lignite chemistry session and many specialist group meetings.

As a part of the conference program some sessions will be held at the Intermay Agricultural Research Centre, Mosgiel. This visit should be of particular interest to agricultural chemists, plant and animal biochemists, soil chemists, etc. Opportunities will be provided to inspect various activities at the research centre, such as deer farming, biogas production, animal nutrition, trace element analysis, etc.

Post conference workshops will also be held and one of them is to be in the form of a carbohydrate and lipid colloquium. This workshop has already stimulated considerable interest and support.

The first circular for the conference should be available this month.

The ACHEMA '82 Chemical Engineering Exhibition will be held in Frankfurt am Main, June 6 to 12, 1982.

The Water Conference, 1982, on the theme Water in New Zealand's Future, will be held at the University of Auckland, August 24 to 26. It is sponsored by the Institution of Engineers and the Royal Society. Information from the Centre for Continuing Education, University of Auckland.

The annual conference of the organisation for Quality Assurance will be held at the University of Auckland, May 19 to 22. Information from the Department of Continuing Education in Auckland.

The 13th conference on the Chemistry of Natural Products, sponsored by IUPAC, 142 Oxford Rd, Cowley, Oxford, will be held in Pretoria, South Africa, August 2 to 7.

IUPAC is also sponsoring an International Symposium on the Safe Use of Solvents, at the University of Sussex, Brighton, March 23 to 27.

An international conference on Coal Fired Power Plants and the Aquatic Environment will be held in Copenhagen, August 16 to 18. Enquiries to DIS Congress Service, Linde Alle 48, DK-2720 Copenhagen.

Prof Leon Phillips of the University of Canterbury has accepted an invitiation to be the Liversidge Lecturer at the 52nd ANZAAS Congress at Macquarie University, North Ryde (a suburb of Sydney) from May 10 to 14. Prof Liversidge, FRS, was the founder of ANZAAS and its first Secretary (1888). Liversidge Research Lectures in Chemistry have been delivered at each meeting of the association since 1930.

The title of Prof Phillips' lecture will be Photochemistry with Lasers and he will describe investigations he has been carrying out using a dye laser as a probe to study the kinetics of excited atoms such as mercury, lead, cadmium or using an excimer laser to generate fragments such as the radical CN for kinetic studies.

Futher details regarding the congress and its program (Circular Two) can be obtained from the organising secretary, 52nd ANZAAS Congress, Macquarie University, NSW 2113 Australia. Queries relating to Section Two can be addressed to Dr. M. Howden, Chemistry School at Macquarie University.

The Polymer Division of the Royal Australian Chemical Institute invites members of the NZIC interested in polymers to write for their free news letter, published every six months. Requests to Dr G B Guise, CSIRO Division of Textile Industry, P O Box 21, Belmont, Vic. 3216, Australia.

A Cumulative Index to Chemistry in New Zealand, Vols 29 to 44, 1965 to 1980 has been prepared and is available in photocopy form at $2 a copy. This updates previous cumulative indexes published in 1956 and 1966 in the Journal of the New Zealand Institute of Chemistry. Orders should be sent to S G Brooker, Chemistry Department, University of Auckland.

C R Barnicoat

Dr Cuthbert Richmond Barnicoat, "Barny" to all who knew him, died in Nelson on November 21, 1980.

Barny's memory will live on in the minds of his friends, colleagues and former students as a stimulating teacher, a dedicated research worker and a director who inspired loyalty and affection. Above all he will be remembered as a warm, friendly person with wide-ranging scientific and cultural interests.

Dr Barnicoat was born in 1902 and educated in Palmerston North, before graduating from Victoria University of Wellington in 1924. He was a senior scholar in chemistry and was awarded the Sir George Grey Scholarship and later, in 1925, the Jacob Joseph Scholarship.

Dr Barnicoat was employed at the old Dominion Laboratory and later transferred to the newly-established DSIR; it was here that he became interested in the chemistry of foods and food quality. In 1930 he travelled to the UK while studying changes in chilled foods during transport and storage. This was followed by a soujourn at the Low Temperature Research Station in Cambridge.

On his return to New Zealand in 1931 Dr Barnicoat worked at the Dairy Research Institute, Palmerston North until 1936, when he was awarded a Commonwealth Fund ("Harkness") Fellowship which took him to Minnesota, where he gained his PhD for studies of fat oxidation.

In 1940 Dr Barnicoat joined the staff of the then Massey Agricultural College and eventually became associate professor of biochemistry. It was there that he built up a strong research team and developed his interest in the problem of wear in sheep's teeth; a problem of major agricultural importance and one which was to last him the rest of his life. He was awarded his DSc by the University of New Zealand in 1952.

In 1959 Dr Barnicoat was appointed director of the Cawthron Institute, Nelson; he had many family links with Nelson and was keen to try to restore the institute's role in agricultural research. He initiated the Thomas Cawthron Fellowships in an attempt to recruit overseas scientists to the staff and he was instrumental in obtaining a major grant from the Golden Kiwi Lottery funds to assist with the purchase of modern laboratory instrumentation. It is sad to have to recall that Dr Barnicoat did not always get the support that he deserved from the Cawthron Institute Trust Board and has never received the full credit that he deserves for his work for the Cawthron Institute.

Dr Barnicoat was a man of many parts. He was chairman of the New Zealand section of the Royal Institute of Chemistry (1950-51), president of the Institute of Chemistry (1957-58), president of the Dairy Science Association (1955) and was on several Royal Society committees.

In addition he had active interests in ornithology, astronomy, in music, in educational groups and he was a devoted member of the Anglican Church. Dr Barnicoat is survived by three daughters: Jane (Mrs P Webster, Wellington), Elizabeth (Mrs D MacCreadie, Nelson) and Margaret (Mrs L Sunde, New Plymouth).

J R L Walker,
Botany Dept.,
University of Canterbury.

W G Hughson

The sudden death of W G M (Mick) Hughson in early August, was a great shock to his many friends and colleagues. Mick Hughson was a man with many interests and his loss will be felt not only by the members of the NZIC, who appreciated his efforts to promote coal as a key element in our energy future, but also by the young folk of his church and the aged members of the congregation.

As a foundation member of the Institute of Chemistry, chairman of the Wellington Branch in 1940, honorary general secretary 1944-57, and president 1962-63, Mick Hughson can be truly said to have been one of the most active, loyal and enthusiastic members. He was elected an honorary fellow in 1969.

Mick was born at Okato, Taranaki and attended New Plymouth Boys High School. He graduated MSc from Canterbury University College in 1927 and was then awarded a DSIR National Research Scholarship to work on low-temperature carbonisation of New Zealand coals under Professor H G Denham.

The interests created during this scholarship, remained with him throughout his life. His first practical experiments for DSIR included locomotive steam coal trials on the Christchurch-Springfield run using various blends of West Coast coal. These trials were later repeated in the North Island and the work led to the elimination of coal imports for locomotive purposes.

In 1927 DSIR persuaded coalmine owners to contribute on a 50/50 basis to a research program organised under a Fuel Research Committee. During the years 1928-31 Hughson, as a chemist on Dominion Laboratory staff, did extensive work for the committee on the carbonisation of coals from both islands on a laboratory and pilot scale.

A further project in 1931 was to establish briquette manufacture using an experimental roll press on a shed where there is now a car park to the Wellington Overseas Terminal.

Funds for this research stopped in the early 1930s during the depression when Mr Hughson joined the newly established Waikato carbonisation plant at Rotowaro near Huntly. He remained there for four years, before returning to Wellington in 1936 to become a senior member of the newly established Coal Survey formed by the first Labour government to revive the New Zealand coal industry.

Over the next 20 years, Hughson and his dedicated team, accumulated much of the chemical and calorific value data that are now available on New Zealand coals.

In 1946 Mick went to Australia to investigate the possibility of using low-grade New Zealand coals in total gasification processes and to investigate briquetting trials on Southland lignites.

Mick Hughson was well known internationally as an expert in New Zealand coal utilisation. He was a member of the UK Institute of Fuel. In 1951 he visited fuel research centres in the United States and Canada after attending the American Chemical Society 75th Jubilee Conference and in 1956 he spent several months in Europe while representing New Zealand at the Commonwealth Committee on Fuel Research. In 1961 he was again the New Zealand delegate to the meeting of this committee in Sydney and also attended the 6th World Power Conference in Melbourne.

Although the Coal Research Committee terminated in 1954, Mick remained as secretary of a utilisation committee within DSIR dealing with the technical and research problems associated with coal use.

His knowledge of energy resources resulted in his being asked to be a member of the New Zealand World Energy Committee and in the immediate years before his retirement in 1968, he collated much of the current New Zealand knowledge into a paper he presented at the 7th World Energy conference in Moscow.

In his retirement he was co-author of a book on the history of Chemistry Division since 1865.

Although institute members will remember Mick Hughson as a proponent for coal and as an excellent emissary for energy research in coal utilisation, his many friends will remember him as a very enthusiastic, genuine person.

He was brought up in a dedicated Methodist Church family and gave unstintingly of his time and energy to the Northland Church and latterly to the Lower Hutt Methodist Church. He is survived by his wife Pat and three sons.

A J Ellis,
Immediate Past President,
NZIC.

DSIR SCIENTISTS WIN AWARDS

Two members of the Department of Scientific and Industrial Research — one its director, have recently received awards in recognition of their work.

The director Dr Trevor Hatherton, has recieved the Royal Society of New Zealand's 1981 Hector Memorial Medal and Prize for his studies in geology and geophysics.

Dr Richard Furneaux, who works in the chemistry division in Lower Hutt, has been awarded the Royal Society's Hamilton Memorial Prize.

Dr Hatherton's work was mainly on earthquakes and volcanoes in New Zealand, the South Pacific and Antarctica; a field in which he has been working since the 1950s.

Born in Yorkshire, Dr Hatherton was educated at the universities of Birmingham and London. He graduated BSc (Hons) in physics and PhD, DSc from the latter before coming to New Zealand.

From 1956 to 1959 he was chief scientist for the New Zealand international Antarctic expeditions — for which he was awarded the Polar Medal. In 1959-60 he was Commonwealth Fund fellow at the California Institute of Technology and in 1966-67 was visiting professor of geophysics at Stanford University.

In recognition of his work for the international Antarctic program, Dr Hatherton received the OBE in the 1958 honours list. He has long been a fellow of the Royal Society of New Zealand. In February this year he was co-ordinator of an international earthquake conference at Napier.

Established in 1914, the Hecor awards are made annually in memory of Sir James Hector, first director of New Zealand's geological survey and one who founded what are now the DISR, the meteorological service, the National Museum and the Royal Society of New Zealand. Awards are made in rotation to scientists for advanced research in one of seven disciplines.

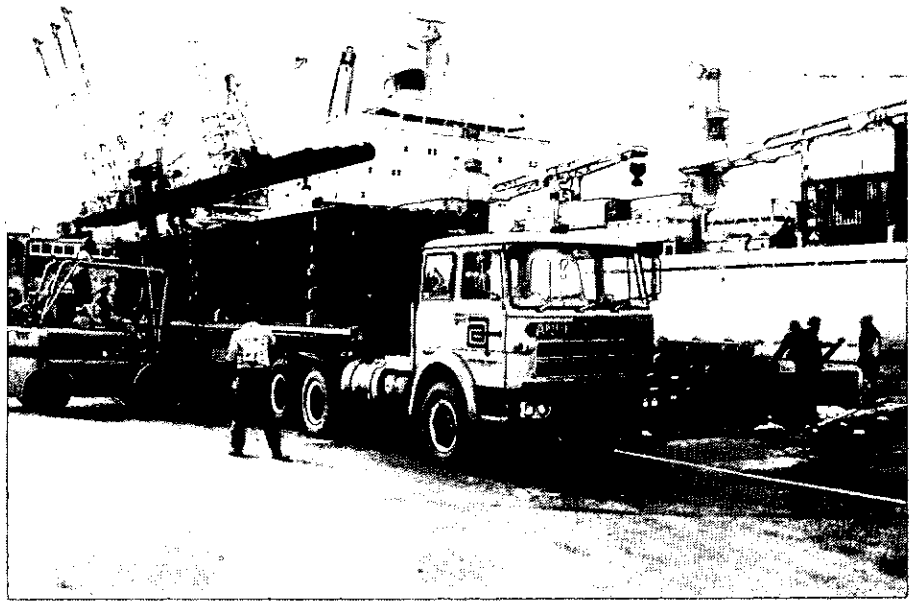
The Hamilton Mermorial Prize was established in 1922 in memory of Angus Hamilton, an early ethnologist and director of the Colonial (now National) Museum. The prize is given annually and is intended to encourage young scientists' research in New Zealand and the Pacific Islands.

Dr Furneaux was born in Wellington in 1950 and was educated at Scots College and Victoria University of Wellington, from which he graduated MSc (Hons) in chemistry in 1973 and Phd in 1976.

From 1972 to 1976 he was on the staff of Victoria; then for two years was a research associate in wood chemistry at the University of Montana. Before joining DSIR in 1980 he held a post-doctorial fellowship at Victoria.

Dr T Hatherton

Dr R Furneaux



More than 32 km of pipeline which will carry methanol from the Petralgas Chemicals plant at Waitara in North Taranaki through to the port at New Plymouth, has arrived in New Zealand.

The pipe has been unloaded in Auckland from the freighter Willowbank (pictured) and was coated with special polythene tape corrosion protection by an Auckland company, Spiral Welded Pipes of Auckland before being railed to New Plymouth to await laying.

It is expected that the pipe will be laid during the coming summer.

MORE SUPPORT OR FACE DELAYS

There could be delays in introducing future new medicines to New Zealand unless the government becomes more supportive of the pharmaceutical industry.

This prediction has come from the president of the Pharmaceutical Manufacturers' Association Geoffrey Bethell of Auckland.

Bethell, speaking at a seminar at the Central Institute of Technology, Wellington to discuss the economic viability of the pharmaceutical industry in New Zealand said the government's attitude to the pharmaceutical industry had been negative through depression of prices and official encouragement of prescribing of non-patented medicines.

"Without reasonable government support for innovative research-based pharmacuetical companies and without extension of patent life for medicines to that agreed to in most developed countries, New Zealand could face delays in the introduction of future new medical therapies," Mr Bethell told the seminar.

He also warned that the high costs of research and the difficulty in securing an adequate return, meant that the pharmaceutical companies world-wide were doing less research and diversifying into other areas of business.

The costs of developing a unique medicine were now about $65 million and for every novel chemical entity that became useful medicine, about 10,000 other compounds had been tested and rejected. Of the 16 years of patent life, about 10 years were taken up in testing and obtaining approvals and there was a need to extend the patent life to at least 20 years.

Research had to be funded out of current earnings, because government and investors alike were reluctant to commit money to long-term, high-risk pharmaceutical research.

Without the prospect of profit, investment in future research would not take place.

"Many companies within the pharmaceutical industry are experiencing tight profit margins and eventually service to the health care industry must suffer as companies diversify away from prescription medicine lines." said Mr Bethell.

"Against this background the pharmaceutical industry has become a target for political measures aimed at alleviating the health care cost explosion."

But Bethell said the pharmaceutical industry, far from being a major contributor to increased costs, was an essential factor in the control of health care costs.

Many direct and indirect benefits were derived from the introduction and use of new and improved medicines and pharmaceuticals could take a large part of the credit for increased life expectancy and for the control of major diseases such as tuberculosis, scarlet fever, whooping cough and diphtheria.

Although there was concern in New Zealand at the costs of health care services, New Zealand in fact spent a smaller proportion of its gross national product on health than many developed countries.

"Cost cutting in one area of health care may increase costs in another sector causing an overall increase in total health care costs," said Bethell.

CHEMISTRY TEACHING FORMS 1 TO 7

Some time ago the NZIC council set up a committee chaired by Prof R B Penfold and drawn from a wide spectrum of chemists and located in Christchurch to look into this topic, with a view to making recommendations to the appropriate bodies. The committee reported to council in August.

It noted that science is only compulsory for the first two years in secondary schools and that four out of 10 pupils elected not to take the subject any further, which the committee considered highly undesirable in a technological society. More emphasis should be given to the role of chemistry in modern society and the institute's Chemical Processes in New Zealand, should be updated because of its value. A summary of the main recommendations is given below:

- Because attitudes to chemistry and chemists are formed principally at school, the teaching of chemistry in schools is a vital concern for the institute.
- Most school pupils see chemistry as a subject of little relevance to the world around them and of little importance in their everyday lives.
- School laboratory facilities, especially at the lower levels, are inadequate for the teaching of chemistry.
- Up to Form 5 there are insufficient teachers with adequate academic backgrounds in chemistry.
- The chemistry content of most school syllabuses contains insufficient emphasis on the role of chemistry in modern society and includes material of too great a conceptual difficulty.
- The institute should seek to influence curriculum development through the Education Department and Universities Entrance Board and should encourage branches to promote in their local schools, an awareness of the importance of a study of chemistry.

CHANGES TO WEIGHT VALUES

At the 31st IUPAC General Assembly held in Leuven, August 26 to 29, 1981, the following changes in the recommended values for atomic weights were approved:

Hydrogen	from	1.0079 ± 1	to	1.00794 ± 7
Silver	from	107.868 ± 1	to	107.8682 ± 3
Lutetium	from	174.967 ± 3	to	174.967 ± 1

A discussion of the reasons for these changes and the detailed Table of Standard Atomic Weights will appear in the commission's full report to be published in the Journal of Pure and Applied Chemistry. The commission's Table on Isotopic Abundances of the Elements will accompany this report.

INCREASED COSTS FORCE PRICE RISE

Due to ever increasing handling and postal costs it has become necessary to increase the price of the book Chemical Processes In New Zealand edited by J E Packer.

From January 1, 1982 the price will be $14 ($11 plus handling and postage). There is a $1 reduction for NZIC members making the price to members $13.

Any orders received before January 1 will be processed at the current price of $12 ($11 to NZIC members). Books can be ordered from NZIC Auckland Branch, P.O. Box 5139, Wellesley Street, Auckland. Cheques should accompany the order and be made payable to NZIC Chemical Processes Publication.

RSC INFORMATION ON APPLICATIONS

The Royal Society of Chemistry has recently sent information concerning its special applications procedure for associate members of the society applying for admission to an appropriate category of professional membership and also for existing members seeking transfer to the fellowship.

Copies of the forms and further details are available from Prof Peter de la Mare, University of Auckland. The closing date for applications under the special procedure is December 31, 1981.

HIGH RATING FOR GEOTHERMAL WORK

A bulletin just published by the DSIR, Geothermal Energy for New Zealand's Future, claims that New Zealand's achievements in investigating and harnessing geothermal heat, rank second only to the country's successes in agriculture.

The director-general of DSIR, Dr David Kear, the bulletin's publisher, said it is intended for the interested layperson, particularly those who might be considering using geothermal energy.

The publication describes where our geothermal resources are and what they are best suited for.

The bulletin records that our geothermal resources have a potential sufficient to supply the current total North Island electricity demand, or seven times more than is presently generated by geothermal steam. But Dr Kear said it is most unlikely all this resource will ever be harnessed for electricity generation because of environmental considerations, tourism and more efficient direct use. The booklet can be obtained from the Science Information Division of the DSIR for $6.75

COMPANY LOOKS FOR JOINT VENTURE

An Australian manufacturer of biodegradable chemicals for use in the food, dairy, laundry and automotive industries is looking for opportunities of a joint manufacturing venture in New Zealand.

Adams Industrial Chemical Company of South Melbourne, Victoria, is already supplying its products in Australia to government departments, hotels, motels, clubs, restaurants, schools and hospitals.

The product range includes detergents, disinfectants, deodorants, aerosols, powders, polishes, floor sealers, soaps, sanitising agents, cleaning products, insecticides, degreasers and chain lubricants.

Organometallic compounds (fourth edition)

Volume one: The main group elements

Part two: groups IV and V

B J Aylett, Chapman and Hall, London 1979, 521 plus xi pages, hardback $110.50 New Zealand

As a research student I purchased a Methuen monograph, Organometallic Compounds by Geoff Coates published in 1956. This little pocket-sized book of under 200 pages became deservedly popular for its convenient thumb-nail sketches of the preparation of properties of common organometallic compounds, blended with brief but topical comments about their structures and properties.

The book has grown through the years with the Third Edition of 1967 splitting into two volumes. Volume 1 on The Main Group Elements is now appearing in the Fourth Edition and has again been divided. Bernard Aylett has been brought into the now extensive team of authors (G.E. Coats, B.J. Aylett, M.L.H. Green, D.M.P. Mingos, K. Wade) and has produced Part two of Volume 1, on the Organometallic Compounds of the Main Group IV and V Elements.

Part of the reason for the expansion of Volume 1 into two separate books, was the decision to include silicon and arsenic chemistry as well as the heavier elements which Coates originally surveyed.

It is a tremendous task to bring these very widely investigated elements into this treatment without grossly unbalancing it. However Aylett has succeeded brilliantly in producing a book which still has the character of giving valuable thumb-nail sketches of the preparations and properties of a well chosen range of organometallic compounds, of discussing significant structural and bonding properties and of leading the reader readily to more detailed sources.

The scale of Aylett's task can be seen from the fact that the number of references quoted for Group IV is nearly 1,800 which is made up of 600 references in the new silicon section and a near doubling of the references to Ge, Sn and Pb compared with the Third Edition. A similar pattern has occurred for the 570 references in Group V.

When we consider the very extensive activity in silicon chemistry, the question arises whether a section in a book like this could possibly reflect all the work. However, one finds on examination that all the major topics are included. Thus we find discussion on matters of current interest like the silatranes, on silicon-element double bonding, on divalent silicon, on mechanisms of reactions at silicon, on polymers and many others.

The treatment is necessarily less detailed than in a specialist review and often information has to be collected in a number of places. There is a substantial effort to include cross references in the text, but the index could have been somewhat fuller. Thus one can find a good broad survey of silicon reaction mechanisms by combining several sections, but we do not see an entry for mechanisms, or reaction mechanisms in the index even though specific types such as S_N1 are included.

The sections on germanium, tin and lead chemistry have been expanded about 20 per cent from the last edition and have been arranged more logically. Thus polymeric and cyclic metal-metal bonded species like $(R_2M)_x$ have been separated from the section on organo-element (II) species.

Sections added or expanded include divalent species, transition metal compounds and increased material on structural and spectroscopic properties.

The pattern for Group V is similar. The new section on arsenic ranges widely from "Cadet's fuming arsenical liquid" to discussions of such topics as fluctionality in (C_5H_5) $AsMe_2$ or polydentate arsenic ligands. The sections on antimony and bismuth have been updated and expanded. Next edition — phosphorus?

The text has been all reset with considerable improvement over the Third Edition in the presentation of the diagrams and reaction schemes. The reviewer however regrets the loss of running references at the foot of each page with the reversion to the less convenient listing of references at the end of each chapter.

All this has been presented in Aylett's meticulous style and with very few misprints and errors. I was slightly relieved to find the pattern of perfection made more human by the statement on page one that "tin IV chloride is readily hydrolysed giving species such as $SnCl_6^{2-}$".

Overall, this book cannot be too highly recommended to any worker in this area, or to any reader who wishes to get a good and very readable introduction to this important area of organometallic chemistry. We have here commercially extremely important compounds, for example, the silicones and organotin species and also work that is in the forefront of current interest.

It is therefore very unfortunate that the New Zealand price is so fantastically high that it will be a matter of agonizing consideration whether to buy this volume for a university library, let alone for individual purchase. Despite this, it is to be hoped that all potential readers will have access to a copy.

K.M. Mackay

K.M. Mackay is professor of chemistry at the University of Waikato.

An introduction to industrial organic chemistry (2nd edition)

Peter Wiseman, Applied Science Publishers 1979, paperback 366pp

In his preface Peter Wiseman states: "The modern student of organic chemistry has available to him (or her), a massive range of general texts, many of them of superb quality. Yet he could read all of these and still be left with a yawning gap in his knowledge of the subject — he could have only the most meagre understanding of how organic chemistry is applied in society. This book will help bridge that gap."

It would have been more correct if Wiseman had substituted "industry" for "society" in his leading paragraph, for his work gives a good general account of the chemistry and industrial processing of organic chemicals, but on the whole it fails to elucidate the chemical and physical properties of the chemicals discussed in relation to their uses in society.

There are exceptions to this in the discussion on the properties of synthetic fibres, which explains how certain fibre forming polymers can be used in the textile industry while others are excluded because of their low melting points, poor chemical stability, lack of dye fixing capacity and insufficient ability to absorb moisture.

If such an account had been given on all the organic chemicals discussed, which end up as final products in our society, the value of this text would have increased immensely.

Apart from the above aspect and an over indulgence in discussing the petrochemical industry, this text serves amply as an initial reference for the student wishing to gain a basic idea of industrial organic chemistry. This is especially the case for anyone seeking information on petroleum refining. Virtually three chapters out of the 12 are devoted to the petroleum industry giving a more than adequate account of reaction conditions, recoveries, reactions and mechanisms and use of products.

In general each chapter deals with a specific group of compounds and the discussion on each compound follows basically the same formet i.e. shows reagents consumed and compounds produced, gives a brief account of product uses, explains the relevant reactions and their mechanisms with reaction conditions, illustrates the economic viability of the various processes available and finally gives annual tonnages produced in the UK and USA.

There are many noteworthy features of this text. Firstly, how Wiseman illustrates to the academic that although a reaction may be thermodynamically the most suitable, it is useless in industry unless certain industrial factors can be met, i.e. the plant must be located near the raw materials and these be relatively inexpensive in relation to the final product; reaction conditions must be economically sound and there must be a source of release for any by-products produced.

Other noteworthy features which make this a good reference for the chemistry student, are a well written and discernable text with ample illustrations plus excellent reference and index sections. Also there are interesting reviews on the history of certain processes, i.e. the hydration of ethylene in the production of ethanol.

The only actual error found, although minor, is in the temperature range for the hydrogenation of fats and oils which Wiseman states to be 130 - 170°C. More correctly it should be 150 - 200°C, but perhaps this is being pedantic due to the reviewer being employed in the oil and fat industry.

A.J. Kettle

A.J. Kettle is a chemist with Abels.

Introduction to organic chemistry

A. Streitweiser and Clayton Heathcock, Collier-Macmillan New York and London (distributed in New Zealand through Cassell & Co), 1277 pp.

This book has been received rather late from the publishers to justify a lengthy review, but it may be said that it compares well with similar books and indeed appears to be at a significantly higher level.

It covers topics at a rather slower rate and in greater depth; it features the functional group approach exclusively.

The questions at the end of each chapter are good and of a more than usually high standard. Some may consider the very late introduction of aromatics in chapter 21 a bad feature, while the book is not strong on proteins, nucleic acids and carbohydrates, which make it less suitable for biochemists in training.

R.C. Cambie

R.C. Cambie is professor of organic chemistry at the University of Auckland.

Fibrous proteins: scientific, industrial and medical aspects: volume 1 and 2

Edited by D A D Parry & L K Creamer, (Academic Press, London, 1980, Vol. 1, 508 pages, Vol. 2, 257 pages.

"There is no other country in the world that relies so heavily upon the export of its primay produce in general and fibrous proteins in particular in order to maintain its standard of living as does New Zealand. .....Consequently it seemed very appropriate that New Zealand should host the fourth in a series of International Conferences on Fibrous Proteins. Massey University, with its background of interest in applied biological research, was a natural choice of venue."

And so it was, as the above quotation from the preface of the volumes under review explains, that one of the most important international conferences to have been held in New Zealand took place in Palmerston North in February 1979.

These two volumes which are the record of that conference would need no further justification, but it should be noted that the editorial policy adopted has made one of them much more than just an account of the proceedings.

The conference was organised in sessions in the normal way, these being centred mainly on muscle/meat, keratin/wool or collagen/leather, but focussing on particular fields; at each there was an invited address on the current state of that field.

Volume 1 comprises the collection of these addresses and the stature of those contributing and the comprehensiveness of the cover are such that this volume must be the authoritative work on fibrous proteins at this time.

Volume 2 is more the conventional record, containing 23 research papers chosen from the 50 actually given; its value has been enhanced by the selection of the more significant, but it remains a work for the specialist in every aspect but one. The introductory paper (actually the opening address of the conference), The Importance of Fibrous Proteins in the New Zealand Economy, should be read by each one of us and could well have justified publication on a much wider basis.

The two volumes are beautifully produced and should at least be on the shelves of every library in the country.

D Hall

Professor Hall is professor of chemistry at the University of Auckland.

Computers in the curriculum — chemistry

D Want and K Shaw, Schools Council Publications 1978, distributed by Edward Arnold, London, 140 looseleaf sheets.

For those with access to an interactive computer system, this loose leaf publication provides a number of very useful programs for the teaching of the principles of chemistry at senior high school, or first year university level.

Basically the publication consists of a set of teacher notes (yellow pages) and a set of student notes (white pages) relevant to each of seven topics with one, sometimes several, computer program(s) associated with each topic.

The publication is of little value without the associated programs. Unfortunately listings of the programs are not provided and while this may not be disadvantageous to users in Great Britain where the programs may be available locally, it is a considerable drawback here in New Zealand where computer program libraries are uncommon.

A copy of the programs on punched tape or as a listing can be obtained using the application form (purple page) provided. Typing the programs into a computer could be a time consuming task.

The programs are written in BASIC so as to minimise the problem of installing the program on a wide variety of computer systems which support interactive BASIC. One major handicap in such scientific based computer assisted instruction is caused, however, by the lack of lower case sub and super scripts in the programs. For example: mol dm^{-3} would appear on the screen as MOL DM-3.

An introductory chapter (yellow pages) discusses CAL and the various chemistry orientated ways in which an interactive system can be used to advantage. As pointed out many possible uses of the computer were discarded as offering no advantages over existing teaching methods or aids, e.g. books. Thus the emphasis is placed on simulations (e.g. manufacture of sulphuric acid), exploring models (e.g. lattice energy) and educational games.

For a teacher with an interest in computer assisted instruction and prepared to obtain the programs and adapt them to their particular computer system, this is a publication well worth having.

D Shooter, G. White

D Shooter and G White are both senior lecturers in chemistry at the University of Auckland.

Principles of protein structure

G E Schulz and R H Schirmer (edited by C R Cantor), Springer Advanced Texts in Chemistry, Springer-Verlag NY, 1979, 314 pages, $A28.

The stated aim of the German authors is to consider the principles of protein structure which can be drawn from the determined structures and to use these to understand the action of a protein within an organism.

They show that the great diversity of protein functions can be unified by structural principles into a relatively few recognisable configurations.

The book is clearly and logically laid out, drawing not only on their own distinquished contributions to the field of protein structure, (Schulz, Schirmer, Sachsenheimer & Pai (1974) — adenylate kinase, (1978) — glutathione reductase.) but, as well, on the 70 plus protein structures determined to date.

The authors open with fairly standard chapters on the amino acids, the peptide bond and the bonds stabilising protein structure, both covalent and non-covalent. This leads on to intermediate chapters on the folding of the polypeptide chain, the kinetics and thermodynamics of chain folding, super secondary structure and structural domains.

Later chapters cover the prediction of secondary structure from sequence, protein models and protein-ligand interactions.

In chapters nine and 10, the main protein families are examined — the serine proteases, the immunoglobulin fold, the globin fold and the Rossmann fold of the NAD-dehydrogenases, including their evolutionary relationships and phylogeny.

The final chapter is concerned with enzyme catalysis and the mechanism of muscle action. An appendix concludes the text, dealing with the statistical treatment of helix-coil transition including the Zimm and Bragg model.

Layout of the text is particularly lucid, with breakdown of the material into easily digestible packages. A particularly pleasing innovation is the use of principal paragraph headings in bold type. This feature allows rapid skimming to find information of immediate interest as well as providing a running summary of ideas introduced.

There are ample figures and well drawn diagrams: ORTEP, CPK-space filling, Nicholson, Kendrew-Watson and cylinder and arrowed strand graphic models, drawn with great clarity and attention to detail.

The reference section of 800 citations is exhaustive and pays tribute to the vast increase in structural knowledge of proteins resulting from better, faster data collection, more protein cyrstals and dedicated protein crystallographers.

This is an up to date treatise on an important and rapidly advancing subject and can be recommended to both specialist and student in the field.

A E C Cutten

Dr Cutten is a research fellow in the Chemistry Department, University of Sydney.

LUMINESCENCE SPECTROMETERS

Warburton Franki is the agent in this country for the Perkin-Elmer LS series of luminescence spectrometers.

Luminescence is the generic name used to cover all forms of light emission other than that arising from elevated temperature.

The LS series takes advantage of the use of microprocessors for both digital signal handling and for complete instrument parameters combined with digital displays, simplify instrument operation and the company says set new standards of performance and versatility. A pulsed xenon lamp having low power consumption and minimal ozone production is incorporated within the optical module.

The optical module incorporates stepper motor driven monochromators which can be driven independently, to obtain the normal excitation and emission spectra, or synchronously either at the same wavelength or at different wave lengths.

The excitation monochromator covers the wavelength range 230-720nm while the emission monchromator covers the wavelength range 250-800nm. Zero order is selectable on both monochromators.

The basic instruments cover the emission ranges 250-650nm and for those applications requiring a wavelength range of 250-800nm, a red sensitive photomultiplier is available.

A choice of five scan speeds together with time drive and fast/slow forward and fast reverse slewing. The monochromator can be set to particular wavelengths through the use of the GO TO λ button, together with HIGH λ and LOW λ wavelength limits. When a Model 561 recorder is connected to the LS-5, chart formatting is under control of the instrument.

The luminescence signal is displayed digitally with a movable decimal point and sign indicator. The sensitivity can either be set through the keyboard using the Fix SCL button or can automatically be set. Zeroing a blank signal is performed by pressing the Auto Zero button and the signal may be offset on the recorder by using the Rec SCL button.

To improve the precision at high sensitivities, the fluorescence signal can be integrated before being displayed. The analogue output to a chart recorder is digitally filtered using a Savitzky/Golay quadratic smoothing function and five operator selectable widths to provide optimum recorder output under scanning conditions. Through the use of an RS232C interface both instruments may be connected to a data station for instrument control and external data manipulation. The large sample compartment can be fitted with a wide range of accessories including a four position thermostatted turret, semi micro flow cells, LC cell accessories polarisation and front surface assessories.

With the LS-5, the gating of the sample photomultiplier can be delayed such that it no longer coincides with the flash. When used in this mode the instrument measures phosphorescence signals and both the delay of the start of the gate (t_d)and the duration of the gate (t_g) can be selected in multiples of 10 μ sec from the keyboard. Decay times may be accurately measured by varying the delay time and noting the intensity at each point.

Bio- and chemiluminescence may be measured in the phosphorescence mode by simply closing the excitation shutter and varying (t_g) to adjust the sensitivity.

The LS-5 also includes a number of additional features.

BECKMAN AID TO CHEMICAL ANALYSIS

The microprocessor-controlled LS 9800 Series Liquid Scintillation Counting Systems from Beckman Instruments, is said to provide simple operation and maximum accuracy in biomedical research and industrial chemical analysis.

The series enables users to upgrade their instruments from the LS 6800 to the LS 7800 and the LS 8800 to the LS 9800. The differences in the systems are the available options, including a two phase monitor, 12 inch CRT screen, 40 character marquee, floppy disks, random coincidence monitor, H#, automatic quench compensation, quench compensation factor, spectrum search, spectrum analysis, single photon monitor, per cent single and dual reference, single, dual and triple label DPM and single and dual label digital integration.

A feature of the series is the two phase monitor. By detecting any phase separation in an organic-aqueous cocktail system, the monitor alerts the user to data sample handling problems that may result in questionable data.

A video CRT display enables the user to see all of the sample counting parameters at a glance. The screen displays current sample data, time of day, diagnostic notes, quench curves, histograms, sample spectra or the Compton spectra generated by the Cs 137 source. During the editing of the program, the entire file is displayed and everything displayed can be printed out simultaneously on a built in 80 column printer.

The LS 9800 series also includes a 40 character alpha/numeric marquee. This single-line CRT displays counting parameters and diagnostic notes and guides the researcher through editing of the user count program by displaying the contents of the user file one line at a time.

Command tower programming provides flexibility in multi-user capabilities. By dialing in the appropriate number on the tower, the user can summon the count program, calibrate the instrument, bypass a group of samples or stop the counting cycle.

New editing capabilities on the LS 9800 extend multi-user flexibility. Floppy disks expand program storage capability. Single, dual and triple label DPM, single and dual label digital integration and spectrum analysis programs are standard.

Automatic quench compensation allows optimum channel settings for each sample under variable quench conditions for single, dual and triple label isotope experiments to maximize the accuracy of final results. Quench compensation factor provides optimum throughput and maintains maximum accuracy. For sample preparations in which chemiluminescence is suspected, the random coincidence monitor indicates the percentage of counts in the sample that may be due to single chance coincidence events.

The spectrum search routine provides a reliable endpoint determination for any radioisotope used in liquid scintillation counting. The spectrum may be displayed on the CRT and is printed out on either the CRT or marquee versions.

SOLVENT PROOF CHROMATOGRAPHY COLUMNS

Chromatography columns able to withstand organic solvents and pressures up to 1 MPa (10 bar) have been introduced by a British company Wright Scientific, Stonehouse, Gloucestershire, for the industrial chemist.

The Solvent-Proof High-Performance range (SPHP), designed to fill the gap between laboratory and production scale equipment, is suitable for gel filtration, ion exchange or affinity chromatography. It is said to be resistant to all aqueous and orgainic solvents used in liquid chromatography.

All parts in contact with the eluant stream are of borosilicate glass, PTFE or other fluoroplastics, Jackets can be used with most coolants, including alcohol and ethylene glycol, and the columns can be operated at up to 100°C.

Columns are offered in two bore sizes — 26 mm and 70 mm — each available in lengths of 400 mm or 900 mm. Pressure ratings of the 26 mm bore columns are up to 1 MPa (10 bar) and of the 70 mm bore up to 700 kPa (7 bar).

Normal chemical cleaning materials may be used and columns and accessories, including plumbing, can be autoclaved at 121°C for 20 minutes without detrimental effect. Limited autoclaving at 135°C for five minutes can also be carried out.

Columns are colour coded for easy operation and all components are interchangeable. The leak-proof high-pressure plumbing system, with special gripper seal fittings, requires no flaring.

Other features include thread adjusters for precise bed height adjustment and a zero dead column plumbing system which eliiminates sample dilution and mixing. Columns are supplied double adjustable for precise sample application and upward flow elution.

New Zealand agent is Smith Biolab, Auckland.

NEW RANGES FROM WILTON

Wilton Scientific has introduced new ranges of equipment and services from some of its principals.

Labline has released a series of four new rotary evaporators. Models include a standard configuration, efficient model for high boiling points, refrigerant model for low boiling solvents and a collection model with vacuum connection at the lower end of the condenser for low boiling solvents which emit vapours.

All models feature dual teflon vapour seal, variable speed drive and quick release flask ring. Accessories available include a fast action jack and thermostatic water bath.

AVL has introduced the AVL 9801 Automatic Sampler for use with the AVL 980 Electrolyte Analyzer. It can be added to the system at any time. The AVL 980 is an ion selective analyzer for determinations of sodium potassium and ionized calcium in whole blood, plasma, serum or csf.

Sartorius has produced the Sartophor system which is a versatile analytical assembly for microelectrophoresis and associated procedures including electro-focusing, electro-immuno-precipitation and counter-immunoelectrophoresis.

The system features integrated parts and accessories designed for use with either cellulose acetate or gel substrates. Components include a tank with lid, membrane bridge, gel tray, multiple sample holder, multiple sample applicator and exchangeable electrodes.

A catalogue is available covering the Sartophor system and the system itself will be available in early 1982.

Buchler Instruments has produced a new condensed catalogue featuring several new or what are claimed to be unique products.

The Vortex Evaporator is a complete sample preparation station. It heats, cools, vortexes and concentrates samples in test tubes, scintillation vials, ampules and culture tubes.

It is said many steps in sample processing for protein hydrolysis, RIA, electrophoresis, GLC, HPLC and scintillation counting can be accomplished in a single tube with this apparatus. It has been found to have particular application in drug abuse screens, steroid extractions and concentration of chromatographic fractions.

The DPS1000 is an electrophoresis power supply with three regulated output modes: constant power to 200 watts, constant voltage to 1000 volts, constant current to 200 milliamps.

The unit features led digital display and push button controls. The DPS1000 is suitable for iso-electric focusing, sds-page, two dimensional and immuno-electrophoresis.

RISKS OF EXPLOSION ARE 'LESSENED'

Risks of explosion caused by electrostatic charge when handling flammable liquids are said to be able to be reduced with the aid of an earth proving unit from a British manufacturer, Hiltcroft Precision Instrumentation, Knutsford, Cheshire.

Effectiveness of earth connections on a variety of plant can be tested and the unit will not allow equipment to operated until it has positively proved the earth or any fault in the earth connection has been corrected. If earth continuity fails when the plant is operating, the power supply can either be shut off or a visual or audible alarm given.

Tests are made by passing a minute electrical current to the item of plant to be proved, through the earthing connection and back to the proving unit which detects any interruption in the current in the loop resulting from an earth fault.

Voltages in the circuit are incapable of generating a spark which could result in combustion and the unit's design is such that, in the event of a fault in the current, a current or voltage surge cannot reach danger level.

Self-checking facilities ensure that all components are in good working order, for a component fault could have the same effect as a poor earth connection. Indicator lamps show the state of circuits.

Units measure 370 mm x 155 mm x 295 mm and options include units to deal with multiple earths on one item of equipment.

PEOPLE

Dr S M Boniface has returned from the University of Papua New Guinea, Port Moresby, to take up household duties in Auckland.

R K Cull, MSc student at Canterbury, has been appointed assistant chief chemist at *Empire Rubber Mills*, Christchurch.

R J Munster, after a period as corrosion engineer with Occidental of Libya, Tripoli, has returned to New Zealand and taken up a post with *Shell BP Todd*, New Plymouth.

D G Howard has left Solid State Equipment of Lower Hutt, for *B R Homersham*, in the same area.

Dr Z S Kooner has gone from Otago University to the *University of Lethbridge*, Alberta, Canada.

Bill Peddie, previously at Secondary Teachers College, Auckland, is now head of department at *Mangere College*.

Mary Vujcich recently of NZ Farmers' Fertilizer Co, Auckland, is now with the *Division of Mineral Chemistry, CSIRO*, Port Melbourne.

K B Old has gained his PhD from Waikato University and joined the *NZ Co-op Dairy Co.*

J S Hogg, head of department at *Waimea College*, Nelson has retired; he will continue to live at Stoke.

Fr M F Mahoney of St Patrick's College, Wellington, has gone to *Sao Paulo*, Brazil.

Dr J R Gibson has been located at *Shell International*, the Hague, Holland.

B P Korner has left Fibremakers at Bayswater, Victoria and gone to *ICI* Brisbane.

Mrs K P Fletcher is now at *Central Hawkes Bay College, Waipukurau.*

T E Ogden is now with *Lion Breweries* in Wellington.

Dr D S Perera has been appointed acting director, *PACRA*, Nae Nae.

D S Winter is works chemist with *Southland Co-op Phosphate*, Invercargill.

Dr C K Lai is now a post-doctoral fellow at *MIT*, Cambridge, Mass.

D N Cope has been appointed geochemist with *KRTA*, Auckland.

Dr N J Walker with *NZ Milk Products*, has been transferred from Rosemont, Ill., to Petaluma, California.

Z Demchenko has retired as chief chemist at *Griffin & Sons'* biscuit factory, Lower Hutt, after many years in the position.

G Webster has rejoined *Abels* Auckland, after five years overseas with Unilever in Australia and Austria.

Dr David Carter, technical manager, Lower Hutt laboratory of *Dulux*, has recently completed a technical mission overseas.

Brian Elliot, research and development manager, decorative products *ICI Paints Division*, UK, visited the Dulux New Zealand Development Laboratories at Lower Hutt and Auckland during November.

Jim Mansell, chief chemist of *Mobil Oil* has been promoted to technical manager effective December 14.

Dr Jack Garside, director of *TELARC*, attended the International Laboratory Accreditation Conference in Mexico City during October.

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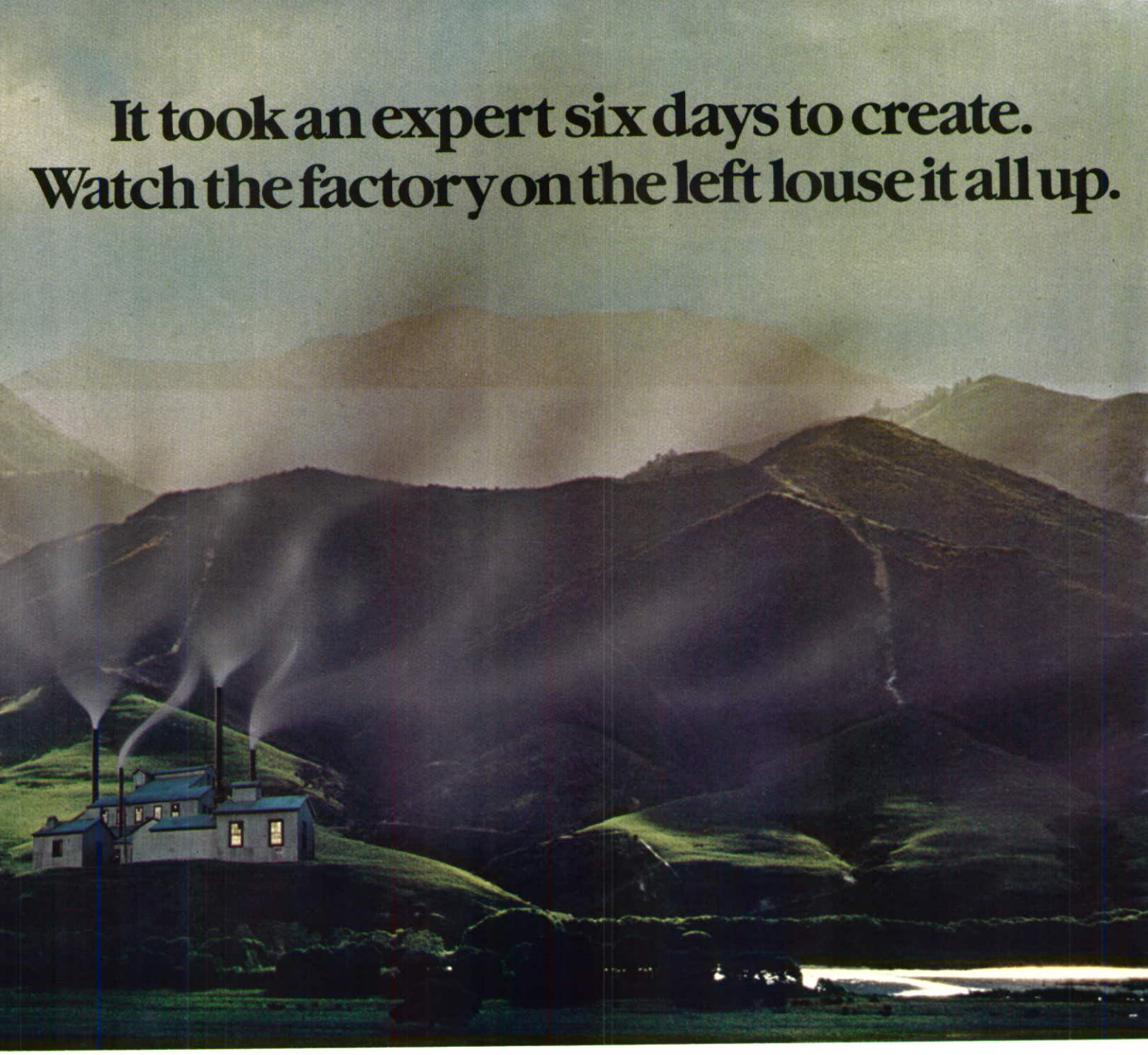

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