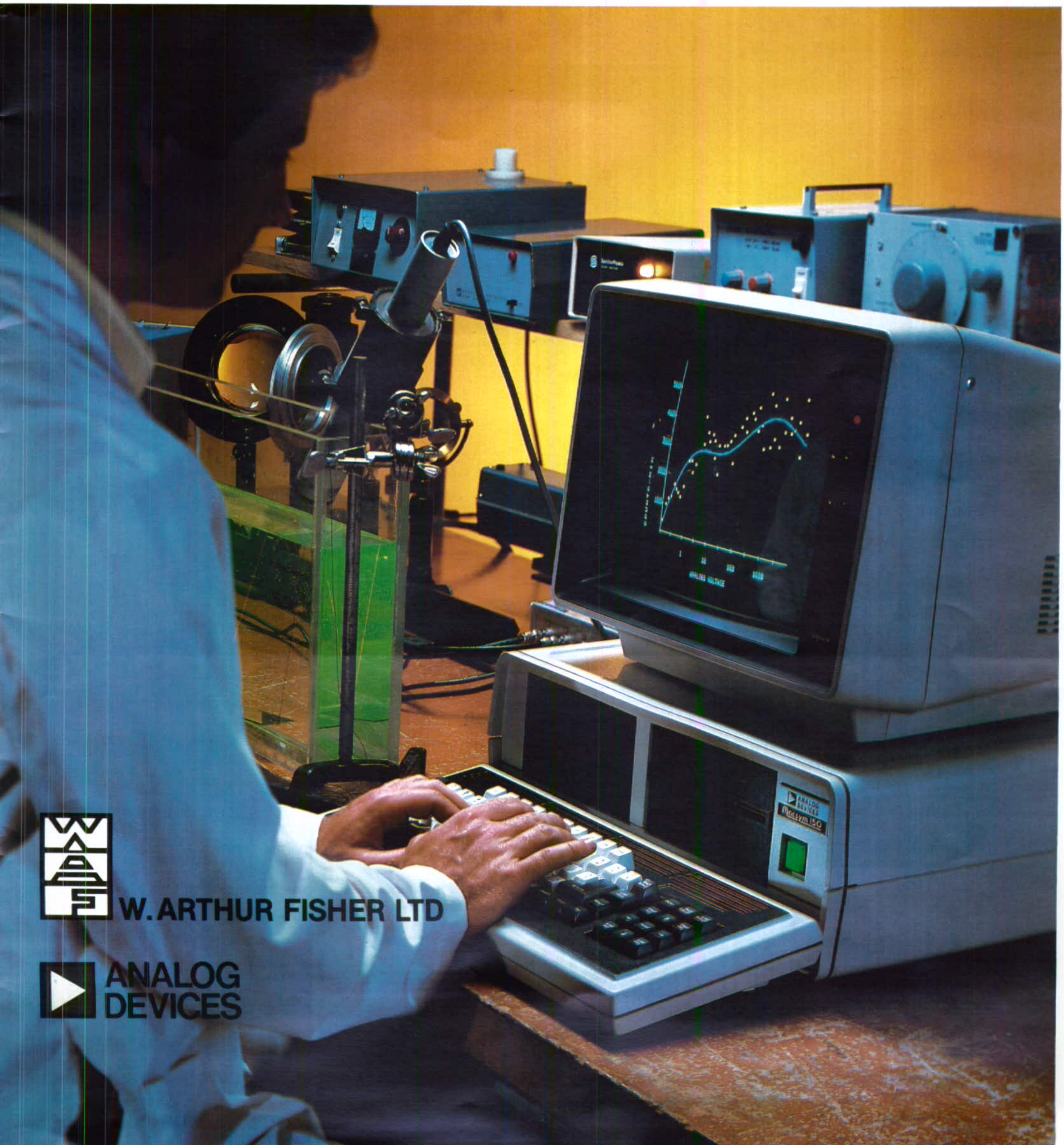
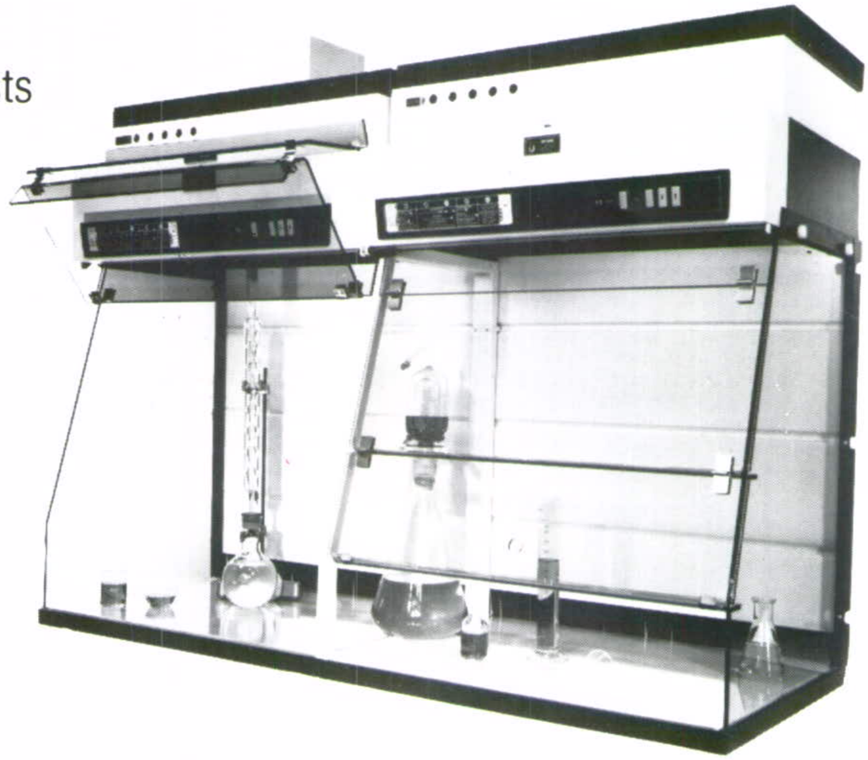
December 1983 Volume 47 No. 6

Chemistry in new zealand





Chemistry in new zealand

December 1983 Volume 47 No. 6
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EDITORIAL

TWO YEARS?
IT FEELS LIKE TWENTY

With any luck, this will be my last editorial until the 2031 special centenary issue of the Journal. When I took on the job of editor, young, full of vigour and with a full head of hair, a friend suggested that like the dung beetle who lived at the top of the hill, my task was likely to roll over me and crush me, and probably not leave me smelling of roses either. Dung beetle indeed; rather should I be compared to an unimaginative Hercules in the Augean stables .... shovelling, shovelling, shovelling.

The frustrations were there, the people who think that meeting a deadline is a sign of moral weakness, the typographical errors that lie dormant through the galley proof and page proof stages, only to leap straight into your eye as soon as you open the finished magazine, the deafening silence as the product of two months worry is sent out into the NZIC mailing list. But the rewards are also there, the people that I have met through the job, in particular the editorial committee who have been of such great support and assistance. I would like to thank the present committee, Stan Brooker, Bill Denny, Diana Fenton, Jack Garside, Pete Nelson, Lester Stonyer and Norm Thom, and past members Laurence Eyres and Joyce Waters who have been so helpful and understanding during my time as editor. To the branch editors who collected so much of the copy, to the NZIC Council for their support, and to those authors and readers who forgave my frequent lapses from perfection, thank-you.

Dr A. C. Herd

In August, I was confronted by an old friend with the words "What a bloody stupid editorial that was, it made me so excited I almost wrote you a letter." Well if I can get a chemist so emotional that he ALMOST writes to me, then I obviously have a great future in journalism and my two years have not been completely wasted.

Tony Herd

THE SCEPTICAL CHEMIST

In these financially unpropitious times, times which in the future will be known as "The Decade of the Sinking Lid", administrators and bureaucrats are industriously searching for costs to pare and overheads to whittle. Being accountants and lawyers and not chemists and scientists it seems obvious to them that the whittlings and parings should be research budgets and laboratory staff.

Dr Wright in his Presidential Address in August, recounted that in discussions with the Manufacturing Sector, it was explained to him that R and D money was often disguised as "maintenance expenses" because if identified as money spent on research, the shareholders might object.

Many employers feel that too much money is spent on research and it is difficult for the laboratory chemist to defend his budget. (Although his strength may be the strength of ten because his heart is pure, a forked tongue is more important in financial discussions.)

Is it feasible to survey the Institute, perhaps in conjunction with the next salary survey, to find the amounts that various organisations spend on R and D and on monitoring/quality control? Armed with some information, laboratory heads may be in a better position to argue (than to roll) that the next cut should be from the sales and promotion booze fund rather than the test tube account.

Phanaeus vindex

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PEOPLE

NZIC PRIZEWINNERS

Winner of the 1982 Easterfield Award, *Dr R.H. Newman* presented his Easterfield Address "Down-to-earth applications of N.M.R." to an appreciative audience at the Hamilton Conference in August.

Roger Newman works in the Spectroscopy Section of Chemistry Division, DSIR. He graduated Bsc. (Hons.) at the University of Canterbury in 1970, and operated a continuous-wave NMR spectrometer at Chemistry Division until 1973, when he went to the University of East Anglia (Norwich, England) to study the new Fourier transform NMR techniques. On graduating PhD in 1976, he turned his attention to finding applications of NMR that might be of interest to New Zealand chemists.

Dr R. H. Newman

Dr Newman has specialised in the theory and measurement of nuclear spin relaxation parameters, and in the use of these parameters when planning quantitative NMR experiments. Results of this work have been used in studies of the structural chemistry of soil organic matter, in quantitative analysis of phosphorus species in soil extracts, and in solid-state carbon-13 NMR of coal.

Hobbies include speleology, which led to Dr Newman forming the Wellington Caving Group in 1972. Examples of his underground photography can be seen in a paper on the geology of Nettlebed Cave (New Zealand's deepest cave) published in the *Journal of The Royal Society of New Zealand* (Vol. 12, p.143).

P. D. Rawdon

Peter Rawdon Chief Chemist of BP Chemicals, has been awarded the Shell Industrial Chemistry Prize for 1983. Mr Rawdon was born and educated in Britain where he spent some years as a member of a small team investigating production methods for antibiotics and vitamins particularly the B12 complex.

He transferred to New Zealand in 1961 and joined BP in 1969. He has concentrated his interests in the use of indigenous raw materials and plant processes and has been stimulated by problems relating to baby foods, milk products, adhesives, petrochemicals and detergents. More recently he has developed manufacturing methods utilising intensive raw materials and displacing imported products.

He has achieved notable success in the detergents and surfactants area using animal and vegetable oil derivatives.

A family man with three sons, he has managed to maintain many interests including philately and the history of New Zealand and Antarctica.

B. R. Dent

Barry Dent, whose paper on "Approaches to cyclopropa(2)phenanthrenes" won him the 1983 Student Paper Competition, is a PhD. student in *Dr Brian Halton's* group at Victoria University, and is involved in the synthesis of cycloproparenes. He graduated BSc. with first class honours from Victoria in 1981 and is the holder of a U.G.C. Postgraduate Scholarship. He gained first prize at the inaugural New Zealand Science Fair in 1977 and won the NZIC (Wellington Branch) prizes for Stage II and III Chemistry at Victoria in 1979 and 1980.

Ted Baker recipient of the 1983 ICI Prize, is a graduate of Auckland University, completing a Ph.D. there in 1967 under the supervision of Prof. Neil Waters. He then spent three years at the University of Oxford working with *Prof. Dorothy Hodgkin* and *Prof. David Phillips* on X-ray crystallographic studies of proteins. During this time he was involved in the successful structure analysis of insulin. Since 1970 he has been on the staff of the Department of Chemistry, Biochemistry and Biophysics at Massey University, where he is now a Reader. He has built up, at Massey, a programme of research into the 3D structure of proteins. This began with the successful high resolution analysis of the structure of the enzyme actinidin, obtained from Kiwifruit and has continued with current studies on azurin, an electron transfer protein, and lactoferrin, an iron-building protein from human milk. He has also spent short periods of leave doing research at the University of York (U.K.) and the University of Groningen (the Netherlands). He was Chairman of the Manawatu Branch of N.Z.I.C. in 1982-83 and is currently Manawatu Council delegate.

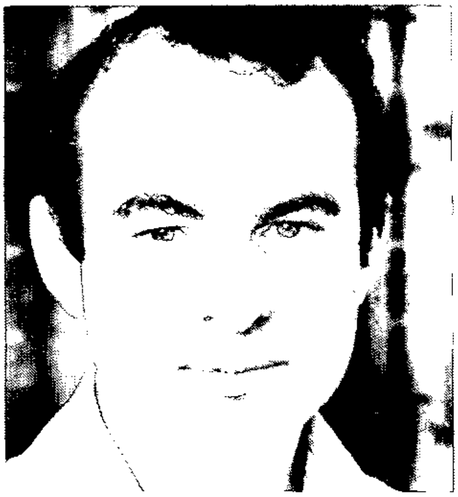
NEW GOVERNMENT ANALYST FOR AUCKLAND

Dr Peter Nelson has been appointed Government Analyst, Auckland, to succeed the late *Dr Michael Kingsford.* Pete graduated B.Sc. (Hons.) and PhD. from the University of Otago, his research work in analytical chemistry being supervised by Prof. A.D. Campbell. Appointed to the DSIR in 1970, he spent 1977 at the U.K.'s home office Central Research Establishment, doing research on applications of HPLC and Immunoassay in Forensic Toxicology. Active in NZIC affairs, Pete has served on the Auckland branch committee and is a valued member of this journals editorial committee.

CANTERBURY BRANCH SECRETARY

(The notes on retiring Canterbury Branch Secretary *John McLaughlin* came several months too late for the June issue, but started with a sentence I couldn't refuse Ed.).

The high-point of John McLaughln's scientific career was sharing a heterogeneous catalysts system with Dr Tony Herd at Otago University in 1967-70.



Dr J. R. McLaughlin

This was followed by post-doctoral studies at Liverpool, Cardiff and Massey in polymerisation reactions, diffusion and phosphate sorption respectively. In 1976 John settled at the Wool Research Organisation at Lincoln where he is a Senior Scientist in the Textile Chemistry Section. Long-term interests include elucidating the chemistry of the wool fibre surface and the phenomenon of carpet soiling. Time outside work is consumed in rearing three small children.

INDUSTRY

Paul Briggs is leaving Rentokil Ltd., (Auckland) where for the last three years he has been company chemist concerned with the wood preservation and products division. He has taken up a position as chemist with Mauri D.Y.C. Foods Ltd., at their Christchurch factory.

INDUSTRIAL PROFILE

THE CHEMBY GROUP

The Chemby Group's present status as a major New Zealand supplier of chemicals (and machinery) has its origin in H.H. Buckley Limited, a small company established in 1947 to import dyestuffs and chemicals for sale to the textile industry. In 1956 this company became Buckley & Young Limited and operated for many years under that name, steadily increasing the range of chemicals and eventually machinery which it supplied to New Zealand industry on behalf of overseas manufacturers. As the company grew it undertook joint ventures with some overseas suppliers to manufacture certain products in New Zealand; in this way were formed Colour and Synthetics Ltd, B.F. Goodrich (NZ) Ltd and Ferro Plastics (NZ) Ltd. In 1973 Chemby Industries Limited was formed as a holding company for the New Zealand interests and Buckley & Young became the major marketing arm of the Chemby Industries Group.

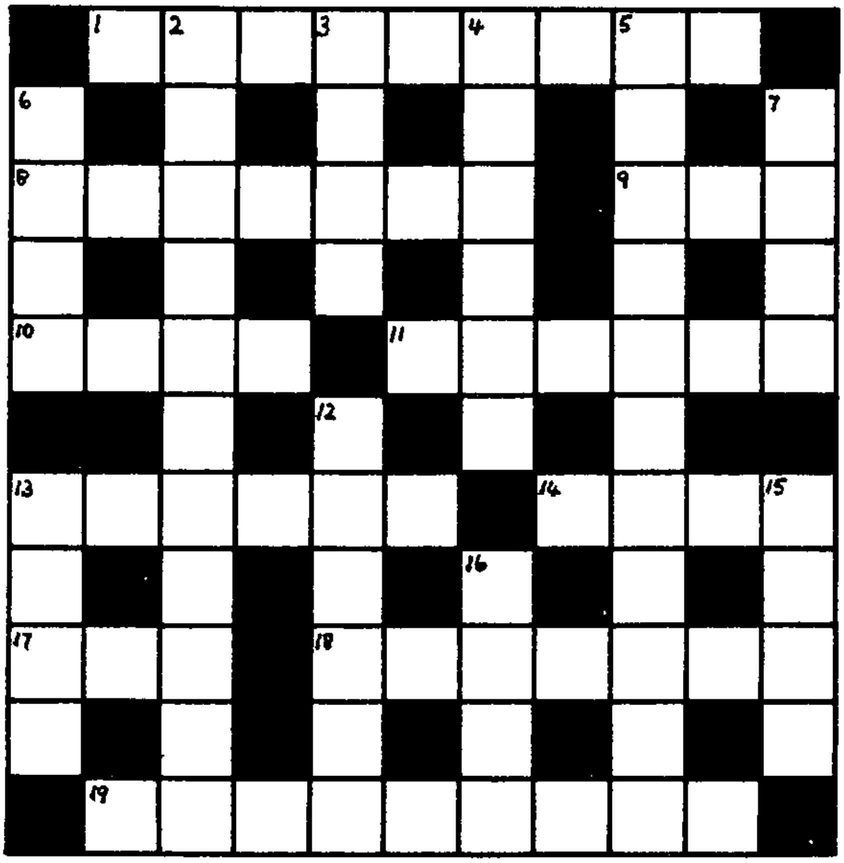
The next development in the Group's growth was an important diversification into local manufacturing with the purchase of a significant interest in Annett and Darling, a Timaru-based manufacturer of wool-scouring and wool-handling equipment and then the purchase of Smith Engineering Ltd which became Chemby Engineering Ltd. In 1980 Buckley & Young Ltd was re-named Chemby Marketing Ltd and Colour & Synthetics Ltd became Chemby Chemicals Ltd (in 1978 the 20% share in this company held by Lankro Chemicals Ltd of the UK was transferred to the Diamond Shamrock organisation when the latter took over Lankro). In the same year Chemby purchased the non-Group-owned shareholding of B.F. Goodrich (NZ) Ltd and re-named the company Chemby Vinyl Ltd. The latest diversification has been a move into the service area with the purchase in late 1982 of the assets of T.J. Sprott and Associates and the formation of a new company, Analytical and Technical Consultants Ltd which will operate as ANATECH.

The Chemby Group through its importing arm, Chemby Marketing, represents many major world-wide chemical companies including Borg Warner Chemicals, CSR Chemicals, Diamond Shamrock, B.F. Goodrich, Great Lakes, Interox Chemicals, Laporte, Novo Industri, Sandoz, Takeda, Ube Cycon and Wacker. In addition it is the major NZ distributor for ethanol and methylated spirits from the NZ Co-operative Dairy Company. Chemby manufacturing companies produce shampoo bases, bacteriocides, pigment finishes for leather, paint driers, fibreglass gelcoats and plastics compounds, drycolours and masterbatches. Practically the whole spectrum of New Zealand industry is serviced with products from the Group's own plants or from overseas via imports or has analytical services performed for it. Customer industries include tanneries, paint companies, pulp and paper mills, textiles, plastics, agricultural chemicals, cosmetics, rubber, the food industry, agriculture and horticulture.

Of the close to 300 people in the Chemby Group there are a sigifnicant number of chemists working in a wide range of fields: Management, Sales, Product Development, Process Control and Analysis. The most senior chemists in the Group are Ian Beatson, until recently General Manager of Chemby Chemicals and now General Manager of Chemby Marketing and Malcolm Robins, General Manager of Sprott Analytical Laboratories. Other qualified chemists include John Wilson, Malcolm Avery, Harry Powell, Peter Wells of Chemby Marketing, Lee Hall, David Roberts and John Wakeman of Chemby Chemicals and most of the staff of ANATECH.

As befits a group with such a strong orientation towards chemicals there are many other employees in the group who are heavily involved with chemicals although not being qualified chemists.

CROSSWORD



For obvious reasons the perpertrator of this crossword wishes to remain anonymous. However, to give you a sporting chance, he is said to be as meticulous in the kitchen as he is in the lab. Even his scrambled egg(s) lack error (6,1,5,). Answers on page 160.

ACROSS:

1. Re-emit light (9).
8. Diluting agent swirled untiled (7).
9. Where every practising chemist can be found (3).
10. Alloy of Pb, Cd, Zn makes a busted German dam (4).
11. 2,3,6-trichlorophenylacetic acid, sodium salt (3-3).
13. Radio-active isotope can be observed when fired. (6).
14. Molten ceramic glaze seen in day time (4).
17. Subcutaneous tissue (3).
18. Metal fabrication of a Greek letter, a Lady, ... er (7).
19. Cancer obtained when electric sparkin' appears in a state of unconsciousness (9).

DOWN:

2. Oil (Labiaceae) compounded by digesting tall an' a lime (11).
3. Mineral deposits upset the God of Love (4).
4. The sweet smells of agitated steers? (6).
5. Disneyland might be a good place to search for this element (11).
6. Rim common to unexploded gelignite and potted geraniums (4).
7. Where a Scottish chemist might buy his glassware? (4).
12. An oxidised state of Fe (6).
13. This porous rock sounds hardy (4).
15. Kelv. measures this (4).
16. Source of keratin evaded by bullfighter? (4).

THE PROFESSIONALS

D.E. WRIGHT

Dr Doug Wright, immediate past president of the NZIC is assistant director of the Agricultural Research Division of the Ministry of Agriculture and Fisheries. Graduating MSc in chemistry and PhD in biochemistry from Otago University, Doug has worked at Wallaceville Animal Research Station, Plant Chemistry Division DSIR, and Ruakura Animal Research Station. Fellowships have enabled him to undertake further study in Canada and the United States and work for International programmes has involved him in teaching and research in India, Asia and Africa. Doug was appointed to his present position in 1978 and is responsible for co-ordinating animal research in the Ministry of Agriculture and Fisheries. He was awarded a DSc by the University of Otago in 1982.

Adapted from the 1983 Presidential Address given at the opening of the Hamilton Conference.

The issue of professionalism is important to our Institute. To some members, our need to communicate more effectively and to present a more substantial image to the public is a critical responsibility which chemists must accept.

This year, 1983, is World Communication Year and my theme *is professional communication — a responsibility of scientists.*

In providing society with essentials and luxuries, the chemical profession has made significant contributions to this country. I suspect however that what the public sees is not the positive but the negative side of chemistry — the problems of toxicity, pollution and contamination. The public links chemistry with lead in petrol, with acid rain, with thalidomide, with dioxin; it links science with unemployment, nuclear bombs. Even in a trivial sense, the NZ Dairy Board's television advertisement featuring the allegedly undesirable role of chemists in converting plant oil to margarine as distinct to the natural purity of butter would serve as an example. This advertisement has aroused the ire of individuals and branches and generated successful protests to the NZDB. Has the NZDB accurately perceived a public fear that technology in general, and chemistry in particular, is socially undesirable? I wonder if the NZDB would similarly offend the medical profession in this way?

The public does not see the central position of chemistry in society — that chemistry provides the technical basis for example — the production of much of our energy whether it be petrol or electrical cells; we produce plastics, food, pharmaceuticals, detergents, pesticides, fertilisers, metals, and building materials and so on — the list is long.

I recall at the very first NZIC Conference I ever went to as a new graduate — appropriately here in Hamilton — the then mayor opened the conference and expressed the hope that this meeting of chemists would be rewarding and we would return to our shops refreshed! I suspect he never understood why the audience laughed. No member

No member of society, not even those who choose alternative life styles, can remain untouched by technology.

In a recent lecture at Auckland University, Professor Alan Titchener addressed the problem of *who* should control technology. He considers *this* responsibility lies with Government, with decision making based on *understanding* the technology. And I would add "understanding the *implications* of that technology".

Professor Titchener commented that "politicians are generally ignorant of technology. The typical cabinet minister is elderly, untrained in science and unaccustomed to sustained deep thought." Professor Titchener went on to quote from a 1913 description of the British Parliament — "It can do everything except deliver a competent judgement in scientific matters."

The Royal Society of New Zealand has been conscious of the need for New Zealand's parliamentarians to be better informed and through the efforts of Dr Shearer and one of our members, James Duncan, has regularly organised meetings at Parliament where technical experts have provided MPs with the opportunity to be better informed about topical issues in science and technology. The meetings have covered such topics as biotechnology, improved communication methods, genetic engineering, earthquakes, the electoral process, new developments in medicine, automation. Apart from one of these on the electoral proces when about 20 MPs were present, attendance by MPs at other meetings seldom reached double figures — the low from memory being 2 MPs.

Since these meetings have been sadly less than successful, let's look at a modern day success story in communication — the so called pressure groups which are usually vocal, well informed, intelligent and inevitably persistent. Our institute is also well informed and comprised of intelligent people, but we are rarely vocal and never persistent in pursuing an issue. In certain fields of technology our Institute contains the largest pool of expertise in New Zealand, yet this capacity is seldom used collectively.

I believe our Institute should have as one of its objectives a desire and mechanism to influence decisions of Parliament in general and Government in particular, *not* as a pressure group but as a substantial source of technical information.

To some extent our Council already has in place systems for this activity. We have an Environmental Committee which contributes to environmental impact reports from the Commission for the Environment; we have a School Syllabus Committe which has had inputs into secondary schools chemistry curricula; we have a Public Affairs Committee which from time to time considers issues such as the recently introduced Official Information Bill. Council has just considered a discussion paper on how these committees could operate more effectively.

In the last year we have had three official meetings with the Minister of Science. Such meetings are well worth continuing on the basis that *firstly* Council brings to his attention technology issues involving chemistry and *secondly* it provides a mechanism for the Minister to plug into the considerable resources of this Institute.

To inform receptive ministers is one thing, to educate backbench MPs is another. In 1979 the Royal Society of Chemistry in the UK established a pairing scheme to provide a two way channel between professional chemists and MPs. This involved pairing 30 RSC members with their constituent MPs. The idea for this system arose from the American Chemical Society which has successfully operated such a scheme since the mid 1970's. The success of the ACS is such that it is now automatically consulted by the US Government on major issues concerning chemistry and chemists. A proposal has been sent to Council for it to develop a similar scheme. Such involvement by the Institute would demand a wider committment of members and its success, if adopted, would be dependent upon a high degree of professionalism from members willing to participate.

In the 1983 National Research Advisory Council report to Parliament, the chairman, Alan Mackney, our first Vice President expresses the NRAC's concern about funding of science in New Zealand. The report states and I quote — "This year has been another year of zero growth for science and the council recognises that its major task is to convince both the public and private sectors that this is a recipe for economic disaster." Later — "Neither the public nor the private sector has sufficiently grasped the importance of science."

An article in the *Evening Post* of 8 August by political correspondent Tony Garnier quotes Dr Shearer as saying "New Zealand needs to set up a strong science and technology lobby group capable of matching the efforts of groups such as Federated Farmers, the Manufacturers' Federation and the Retailers' Federation."

Dr Shearer criticises the science community for not promoting itself or its needs. I believe his criticism to be a realistic assesment of how little science groups achieve publicly.

Last year at a meeting of the Royal Society Council, the producer of *Science Express,* Dennis Harvey, was invited to discuss criticism made by scientists of his programme. It was with some surprise councillors learned that *Science Express* is one of the most successful and popular documentary programmes on TV. When asked whether it would be possible to involve scientists more in presenting information he bluntly stated most scientists do not present themselves or their message well on TV. *Science Express* continues to be a success story well worth watching and had been more recently joined by another programme — *Production Line* — which includes considerable technical input. We have a lot to learn from these professionals who present a scientific message which is attractive and digestible to the public.

While I see an expanded role of the Institute in policy and decision making, let us recognise that Government and bureaucrats do not make wealth for a country. They can, however, provide the incentives, or, perhaps more importantly, remove the disincentives to produce.

In the July 26, 1982 issue of the NBR, Dr Shearer is quoted as saying — "Persuading top management to invest in the country's information and biotechnology futures would be a long and difficult task." He estimated that if the top 50 companies in New Zealand invested 1% of their turnovers in R & D a sum of $120 million would be spent on industrial research in New Zealand. The up-to-date figure I calculate at $140 million. Total Government spending on science in 1982/1983 was $187 million. Private investment in R & D is about one fifth of that Government i.e. about $35 million currently.

Examination of those top 50 show that about 30 are technology dependent. The other 20 are mainly financial houses, principally banks and insurance companies. In only one of those 30 companies was I able to identify a scientist — in fact a chemist amongst top management i.e. on the board of directors or the top executive. It isn't really that different for New Zealand's largest company — N.Z. Incorporated — with its headquarters in the Beehive.

Company boards and management are *dominated* by the financial professions — the accountants, economists, and business management experts. Such people have always accepted the challenge of management and financial responsibility.

How many chemists look upon the laboratory manager's job as their ultimate aim, or possibly chief chemist as the pinnacle of their careers? Why not managing director? I would remind you that Margaret Thatcher, an erstwhile adhesives chemist, made the grade!

In recent times comparisons with more successful economies have become a ritual for New Zealand planners. Japan in particular has become a favoured comparison although apart from land mass, hilly topography and location on the edge of the Pacific Ocean we have little in common. One of the most striking comparisons has been Japan's very successful approach to using technology.

In contrast to New Zealand, 67% of all seats on the boards of directors of leading companies in Japan are occupied by professional technologists. The large Japanese companies have long had a tradition of recruiting their managers from university and today in Japan over 90% of top managers are graduates. The Japanese have little respect for the amateur. I expect this is now changing in New Zealand but we are a long way behind — we still seem to have a reverence for the good practical man. I have on the wall of my office a quotation of Disraeli's — "A good practical man is a man who repeats the mistakes of his forefathers."

I believe chemists must accept a larger role not just through their technical competence but also through their ability to think scientifically and to find rational solutions. I would ask the question — does our education system set too high esteem on research as the *prestige career* for scientists? Shouldn't our best graduates be encouraged to expand their sights more to the commercial world, to study not only chemistry, but also economics? Is the absence of scientists on boards of directors due to lack of ambition, to an uncomfortable feeling about finance, or is it a reflection that industry does not recruit the most able chemists? Do we set our goals as chemists too low? I would compare this to an attitude of a feminist freind of mine who when asked why she wanted to be as good as a man retorted — "Why should I aim so low?"

The preparation of a Science Plan, changes in the structure of the NRAC, hopefully greater responsiveness from the Government to stimulate industrial technology, are all indicators of an exciting period for science in New Zealand in the next few years.

I see our potential role as chemists as being far more substantial than just our chemical expertise. The influence we will have on society will depend upon our willingness to participate more in planning and decision making. We have been fortunate in having a number of our members who have show their willingness in this way — we need another generation of the Mackneys, Seals, Johns, Llewellyns, Sopers, McCombs to name just a few who have moved away from the security of the comfort blanket of their science.

PROCESSING WITH MAGNETIC PARTICLES

B.A. Bolto
CSIRO Division of Chemical and Wood Technology, Melbourne

E.J. Fish
Austep Pty Ltd

D.W. Weiss
CSIRO Planning and Evaluation Advisory Unit, Melbourne.

This paper represents the first part of the plenary lecture presented to the 1983 NZIC Conference by Dr Weiss, the inaugural RACI/NZIC exchange Fellow. The second part of the paper will appear in the February issue of Chemistry in New Zealand.

DR B.A. BOLTO

Dr Brian A. Bolto is a graduate of the University of Western Australia (Ph.D. 1957). After three years postdoctorate work in North America he joined CSIRO, where he has been active in research into the use of polymers in new water treatment techniques such as the Sirotherm desalination process, magnetic polymers for ion exchange and other purification processes, and the role of polyelectrolytes in the Sirofloc water clarification and decolorization process. He is currently Leader of the Water Purification Section at the CSIRO Division of Chemical and Wood Technology in Melbourne. He was elected a Fellow of the Australian Academy of Technological Sciences in 1978, and recently received a senior doctorate from the University of Western Australia (D.Sc. 1982).

This paper reviews the outcome, and current status, of extensive Australian collaborative research between CSIRO, which initiated the projects, ICI Australia Pty Ltd, AMDEL, AUSTEP Pty Ltd and various tertiary institutions, on the general theme of developing more intense, and less expensive, methods of water treatment through processing with a variety of magnetic particles. In Part 1, the emphasis will be on water treatment, reference will be made to potential applications in other fields in Part 2.

MUNICIPAL WATER TREATMENT APPLICATIONS

a) Trends and Needs

Municipal water treatment involves the removal of very small amounts of dissolved or suspended materials from very large volumes of water. The flows involved are more than an order of magnitude greater than those experienced in the process industries. Because of the low value of the treated water, treatment must be achieved at a low cost. In recent times intense competition has developed for capital funds for the various government service industries of which water supply is but one. Two important factors in Australia have been the rapid rise in energy costs and capital needs of the energy service industries, and infrastructure requirements to service the rapid development that has occurred in the resource industries. At the same time, growing demands for water supplies have required the development of more distant sources of incremental water supplies or the use of nearer supplies of lower quality. For a variety of reasons the quality of stream water in the populated areas has been declining and there has been strong pressure for better quality effluent discharges. The net result is the need for more intensive water treatment processing, without sacrificing product water quality, and effluents and wastes of better quality which can be more cheaply disposed of, thereby reducing capital requirements and other costs.

By far the most important water treatment process is the removal of turbidity and colour (humic and fulvic acids). Clarification and decolourization is desirable not only for aesthetic reasons, but more importantly, for reason of public health and should be mandatory for supplies withdrawn directly from rivers.

A new element of concern in recent times is the realisation that traditional disinfection of water with chlorine can produce low concentrations of halo-organic materials which may carcinogenic. Since these arise from the reaction between chlorine and humic and fulvic acids, there is a growing need to ensure the removal of both humic and fulvic acids before disinfection. The use of long pipelines for water transmission in some parts of Australia exacerbates the problem because chlorine needs to be injected at a number of places so that the overall dosage is high. In the USA, the use of activated carbon filtration for final purification is becoming widespread to comply with new regulations.

Widespread use of anaerobic underground water supplies in Australia often requires removal of "iron" because they contain ferrous ions which oxidise and precipitate as an objectionable stain if they are not removed.

Whilst the removal of both permanent and temporary hardness is widely practised in a number of industries, the removal of permanent hardness is not carried out to any extent for municipal supplies in Australia, except by domestic water softeners. For the householder temporary hardness is now of greatest concern, owing to the depositions that occur on heating such water and the widespread use of detergents rather than soap for laundering which are not affected by permanent hardness. Australia's largest artesian water supply, from the Great Artesian Basin, and a number of other artesian supplies, are highly alkaline and there are several large plants removing the alkalinity (sodium, calcium and magnesium bicarbonates) for both municipal and industrial uses. Such processing also reduces the total dissolved solids (TDS).

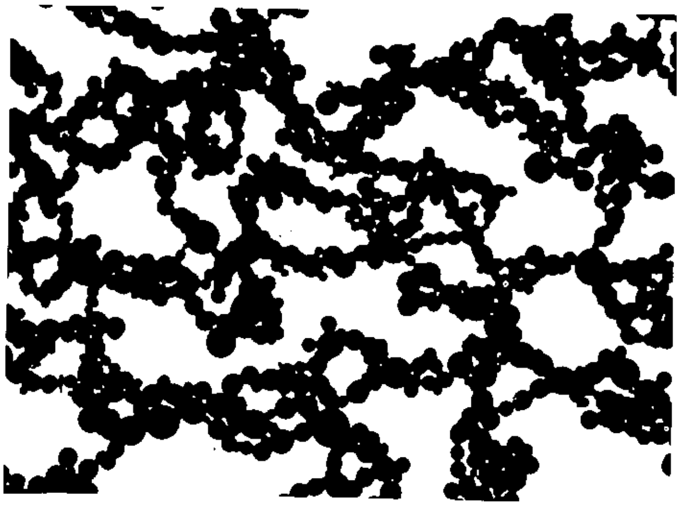


Figure 1 Magnetised resin containing 20% gamma iron oxide.

Demineralization (i.e. complete removal of dissolved salts) is widely used for producing high quality boiler waters. Partial demineralization (desalination) is used for producing municipal supplies only when there is no alternative because of its high cost. However, since most readily accessible low salinity water supplies are now almost fully or fully committed, increasing use can be expected to be made in the years ahead of substantial supplies of marginally saline water (500—1000 mg/L) that occur in extensive saline catchment areas of south western WA and Victoria.

The growing cost of water supply, and particularly of effluent disposal, is promoting greater reuse of treated sewage effluents which must be regarded as a future resource. This often requires "tertiary treatment" to remove suspended materials and colour. However, the accumulation of salinity is a limiting factor, particularly in cooling circuits, or coastal sewerage systems subjected to sea water infiltration.

A cheap desalination process is required for removing 500—1000 mg/L of salinity to remove a water reuse limitation and for the utilization of marginally saline water from saline catchment areas.

In future years, when the results of extensive epidemiological and other studies become available, it may become necessary, for reasons of public health, to optimise the levels and ratios of calcium, magnesium and sodium ions in water supplies. This would place further pressure on the need for cheap, intensive and flexible water treatment processes.

pressure on the need for cheap, intensive and flexible water treatment processes.

b) Processing with Magnetic Particles

For many years the theme of intensive water treatment through the use of finely-divided active materials has dominated the research of the water treatment group in CSIRO (now in the newly-formed Division of Chemical and Wood Technology). The general need, as previously mentioned, is to present to a large volume of raw water flowing under a low head, a high area of 'adsorbent' reactive surface so as to promote rapid adsorption of the impurities to be removed. Once the adsorption cycle is completed these particles must be removed as rapidly as possible to minimise plant size and adsorbent inventory.

CSIRO has pioneered a new solution to this old problem through the use of a variety of magnetic particles. Finely divided magnetised particles are used in a dispersed form in an agitated zone during the adsorption phase of the treatment process. When adsorption is complete, transfer of the particles to a quiescent settling zone induces magnetic flocculation (Figure 1) and rapid settling of the flocs. Subsequent regeneration, as in the adsorption cycle, can involve dispersal of the flocs once more in an agitated zone for further chemical treatment.

An extensive R & D program, initiated by CSIRO but involving intensive collaboration with ICI Australia Pty Ltd, AMDEL who has participated in the pilot plant development, the Perth Metropolitan Water Authority and various tertiary institutions has resulted in the development of a number of variations on this theme to meet a variety of water treatment needs. Commercialization, and further engineering development, required the establishment, with initial assistance from the Department of Science and Technology, of a new company AUSTEP Pty Ltd for supplying commercial plants based on these new processes; special synthetic resin requirements are to be provided by ICI Australian Technology Engineering Processes, was formed in 1979 by the Clough Engineering group of Perth, Western Australia, and Davy McKee Pacific Pty Ltd of Melbourne, Victoria, part of the international Davy McKee Engineering Group. It thus has access to extensive engineering resources and an ability to market overseas as well as in Australia.

The progress of these new developments is described below.

(1) 'SIROFLOC' Process*

This process is used for the removal of turbidity and colour from water supplies. CSIRO research in 1977 discovered that magnetite, a naturally occurring iron oxide, was capable of removing colloidal material and colour from turbid coloured water. This discovery was the basis for the 'SIROFLOC' process'.

(i) The Process: The process works on the same principle as conventional alum processes for turbidity and colour removal in that a material with a positive surface charge attracts negatively charged clay and colour colloids. In the alum process, aluminium sulphate reacts with the alkalinity in natural waters to form a fine precipitate of a complex aluminium hydroxide, which at the appropriate pH has a positive charge. In 'SIROFLOC', finely divided magnetite, an iron oxide, has a net positive charge at the appropriate pH. While the principle of adsorption is similar, the different properties of the charged particles lead to radically different design of a continuous treatment plant (Figure 2). The aluminium hydroxide is a light particle which must be

* *'SIROFLOC' is a registered trade mark of AUSTEP Pty Ltd for a process for removing colour and turbidity from water with magnetic particles.*

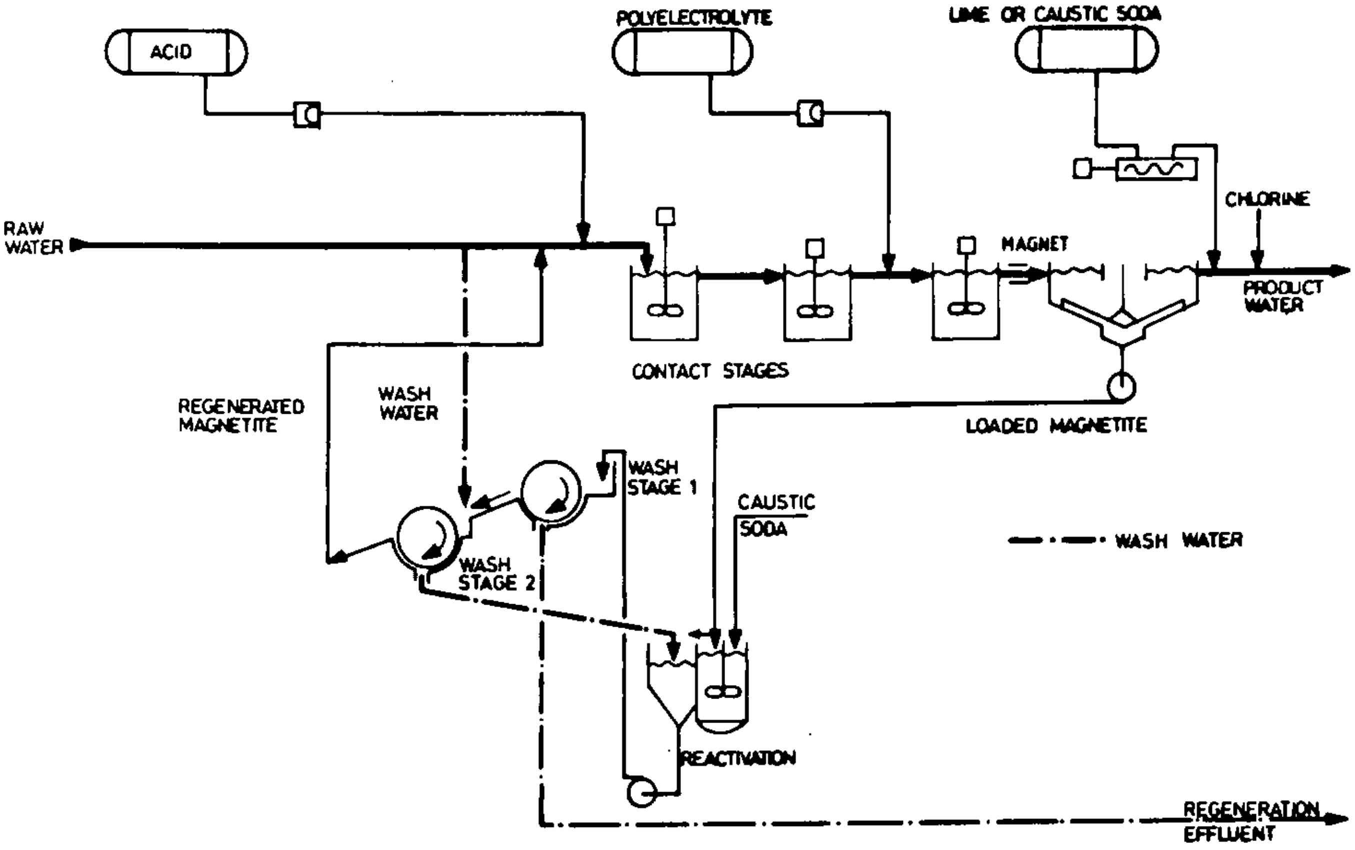


Figure 2 'SIROFLOC' process flowsheet

treated gently, and settles slowly, while the magnetite particle is heavy and requires a different approach.

Adsorption in the 'SIROFLOC' process is more rapid and takes place in a stirred tank at a pH within the range 5.5—6.5. The velocity of agitation is relatively high to ensure that thorough mixing occurs with the heavy iron oxide particles which are in the range of 1 to 10 micron in size. The magnetite is contacted with the water for about 3 minutes and during this time most colour is adsorbed along with some of the turbidity. A positively charged polyelectrolyte is then added to assist the flocculation of clay colloids and any remaining colour, and the contact is continued for a further period depending on the water being treated.

The magnetite with its adsorbed impurity colloids passes through a magnet field on its way to the clarifier. This causes the 1 to 10 micron magnetised magnetite particles to clump together to form flocs of 100 micron size and larger. Magnetite has a specific gravity of 5 and so when it reaches the clarifier the heavy "flocs" settle extremely rapidly, with settling velocities of 50 m/hr for most of the "flocs". Unfortunately, not all of the fine particles magnetically flocculate so that to avoid magnetite carry-over, the clarifier is designed with a lower upflow rate, between 10 and 15 m/hr, depending on the water and the operating temperature.

The rapid settlement gives clarified water with a turbidity less than 1 NTU and true colours less than 5 Pt/Co units and hence no final filters are required.

In the alum process the specific gravity of the alum flocs are very close to 1.0 and hence upflow rates are much lower, in the range 1.5 to 5 m/hr, depending on the clarifier design. Despite this, significant carry-over of flocs occur which require a filter to remove them.

The flocculated, settled magnetite and impurities are pumped from the bottom of the clarifier as a concentrated slurry and an alkali, caustic soda or soda ash, is added to reverse the surface charge on the magnetite. With a negative charge, the negatively charged impurity colloids are repelled from the surface and can be separated. The cleaned magnetite can then be re-used in the process. This contrasts with the alum process in which a bulky gelatinous sludge is formed which must be dried in order to be disposed of easily.

In the 'SIROFLOC' process, following reactivation with alkali, the magnetite is washed and separated from the impurities by using magnetic drum separators. These are simple stainless steel hollow drums which rotate through a bath of the diluted magnetite and impurities. Permanent magnets are mounted inside the drum in the lower arc, and the magnetite is attracted to its surface as the drum surface passes these magnets. As the drum passes from a north to a south pole, the magnetite flips over the same way as iron filings on a sheet of paper over a magnet. This

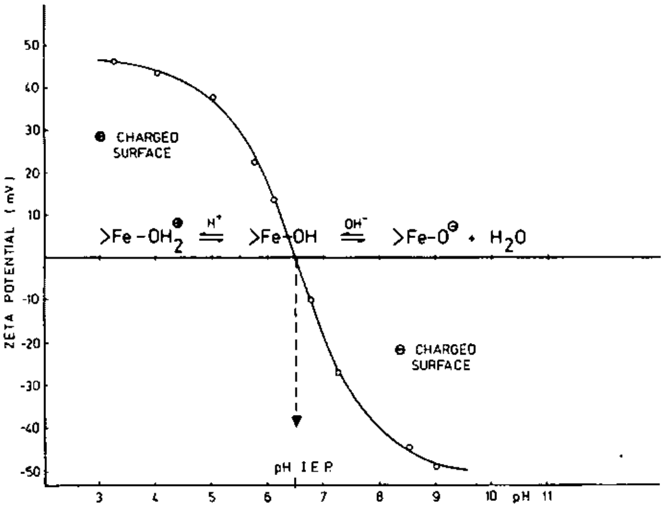


Figure 3 Surface charge development and isoelectric point (iep) of magnetite[2]*.*

gives a "winnowing" action similar to the removal of husks from rice, and improves the washing efficiency. Raw water is used for washing and, depending on the flow scheme used, can be from 2 to 5 percent of the raw water flow. The magnetite is returned to the contact tanks.

The resultant wash water contains the original colloids but concentrated 20 or more times. There is no gelatinous sludge present. Disposal can often be back to the source stream after some settlement. The waste water can be further treated and recycled, but the economics of doing so depend on the relative cost of the raw water.

(ii) Some Physico-chemical Aspects: Extensive studies are in progress aimed at elucidating the colloid chemistry of the system as well as improving its performance[2-5]. Figure 3 shows how the surface charge of a magnetite surface changes with pH which has an isoelectric point (iep) of about 6.5[2]. The iep of the surface is greatly influenced by impurities. The low iep of raw magnetite is caused by adsorbed silica and clay particles, which are progressively removed from the surface on washing with an increase in iep towards a value of 6.5 As shown in Figure 4, ata a pH value below the iep the magnetite surface will adsorb negatively charged colloids from the water. When the amount of impurities exceed a certain level, the quantity of magnetite needed for the complete removal of turbidity and colour is impracticably large. It is advantageous, therefore, to use magnetite in conjunction with another coagulant. In practice, both inorganic salts such as aluminium sulfate and suitable organic polyelectrolytes can be used. A simplified picture of this complex system is shown in Figure 4. Alkali-treated magnetite is contacted with raw water for short periods at pH < 6.5. There is an immediate interaction of the positively charged magnetite particles with anionic organic species, such as humate ions and negatively charged colloids like clay and silica. This is aided by a subsequent addition of a cationic polyelectrolyte which is believed to act via a bridging mechanism.

Regeneration reverses these processes since it operates at a high pH which reverses the surface charges (Figure 4).

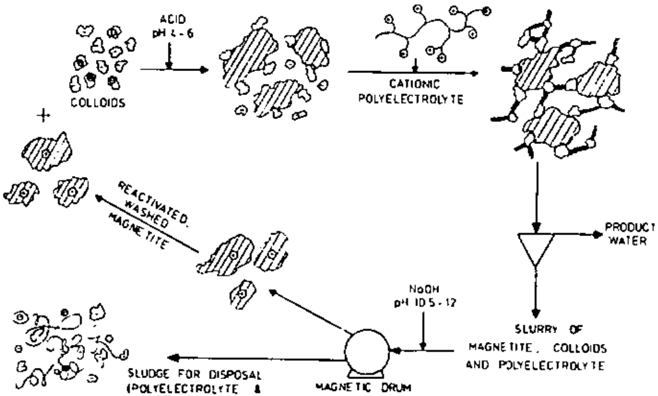


Figure 4 Isolectric point of natural magnetite after various treatments, and colour removal as a function of pH[2]

(iii) Competitive Position of SIROFLOC: Two commercial SIROFLOC plants are successfully operating in Australia. The first, a demonstration plant, is operated by the Perth Metropolitan Water Authority and involved scale-up from a pilot plant operated by AMDEL to a 35 ML/day plant. This plant was financed by the Department of Science and Technology. It treats a complex anaerobic, highly coloured bore water containing both sulphide and ferrous ion. Following successful demonstration in 1981, the process was sold on a competitive basis to the Tasmanian Government at Bell Bay as a 20 ML/day plant. This has been operating satisfactorily from January 1983. Some of the operating data obtained are shown in Table 1.

TABLE 1: WATER QUALITY PERFORMANCE OF OPERATING 'SIROFLOC' PLANTS

	Raw Water	Product Water
Mirrabooka, Perth W.A.		
Turbidity NTU	20-40	< 1
Colour Pt/Co	60-120	5
Iron mg/L	1.5-4	< 0.8
Bell Bay, Tasmania		
Turbidity NTU	3-10	0.6
Colour Pt/Co	60-100	< 5

Current research is aimed at further simplification of the regeneration system, improved removal of fulvic acids and a modification to cheapen iron removal from anaerobic bore water.

The experience provided by these commercial plants establishes the following competitive advantages for the 'SIROFLOC' process.

Capital Cost

The process uses much smaller clarifiers than the alum treatment process due to the higher upflow velocities in the clarifiers. The complete clarification avoids the use of filters. Waste water disposed of is less of a problem. This results in lower civil engineering construction costs and the removal of backwash pumps, blowers, etc. used in the filters. Some of these savings are used in the regeneration of the magnetite but the overall effect is to reduce capital costs by between 20 and 40 percent.

Ease of Operation

Because of the rapid settling velocity, there are no blankets to maintain in the clarifier and the plant can be started and stopped at will with specification water produced within 10 to 15 minutes. The Bell Bay, Tasmania plant is operated in this way.

When raw water quality changes, the polyelectrolyte dose or the magnetite concentration, or both, can be adjusted rapidly to cope with these changes. Experience in Australia has shown that the magnetite has a residual capacity to absorb increases in turbidity and colour, thus giving some time for operator reaction without causing poor product water.

Jar tests can be carried out to establish operating parameters with relatively unskilled staff, and as a guide to operation.

Conclusion

The 'SIROFLOC' process is lower in cost and simpler to operate than the conventional process. It is suitable for all types of water so far encountered and can provide an economic solution to water treatment needs.

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NEW PROCEDURES FOR THE SEPARATION OF AMINO ACIDS PEPTIDES AND PROTEINS BY REVERSED PHASE HIGH PERFORMANCE CHROMATOGRAPHY

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INTRODUCTION

Since 1970 the spectacular growth area in chromatography has been in a new development known as HPLC. HPLC is best described as high performance liquid chromatography since the essence of the technique is the highly resolutive separations which can be achieved by the use of uniform microparticulate chromatographic supports and well designed equipment[1]. The use of liquid chromatography for the analysis of biological materials has many advantages over the classical technique of gas chromatography, since the liquid mobile phase allows the separation and recovery of substances which are not readily volatilized. In addition, liquid chromatography is to be preferred for molecules which have high polarity, high molecular weight, a number of ionic groups or thermal instability. Such features are characteristic of most biological macro-molecules, and have caused many difficulties in other chromatographic modes.

Polypeptide samples are structurally complex due to a high molecular weight relative to small organic molecules, a three dimensional structure which can be readily perturbed by electrolytes and organic solvents, and the occurence of twenty different amino acids in polypeptide chains. It is clear, therefore, that the selectivity available with microparticulate silica-based columns and the advantage of high precision equipment will be fully utilized in biological analyses. Already several published separations suggest that the resolving power of this new chromatographic technique is excellent, e.g. porcine insulin is well separated from the monodesamido derivative (charge difference of -1), ovine and porcine endorphins (dif ference of a single methyl group) can be completely resolved[2].

AMINO ACID SEPARATIONS

An important development in the separation of amino acid and polypeptide samples by reversed phase HPLC has resulted from the examination of a variety of ion-pairing reagents[3]. These results demonstrated that the addition of hydrophilic (for example phosphoric acid or hydrophobic (for example hexanesulphonic acid) reagents to the mobile phase allowed the chromatographer to manipulate the retention time obtained for an amino acid or polypeptide sample. The use of alkylsulphonates of increasing carbon-chain length as ion-pairing reagents allowed the chromotographer to increase the retention of a solute by simple changes in the composition of the mobile phase[4]. Fig. 1. illustrates the use of these reagents, where 3-methylhistidine was successfully analysed in different samples (urine, plasma, amniotic fluid and a hydrolysate of a muscle sample). In each case the use of an alkylsulphonate of a different chain length allowed resolution of 3-methylhistidine from other components of the biological sample[4].

POLYPEPTIDE SEPARATIONS

The addition of an ionic modifier is essential for the separation of polypeptide samples by reversed phase HPLC[1]. Typically a polypeptide molecule is retained indefinitely on the column in the absence of an ionic modifier added to the mobile phase. A major effect of an added electrolyte is to suppress deleterious interactions between the silanol groups present in all reversed phase packings and the protein molecule. In the initial stages of the development of this technique phosphate salts, such as triethylammonium phosphate proved to be particularly suitable for the analysis of polypeptide samples. These salts are involatile, however, and not suitable for

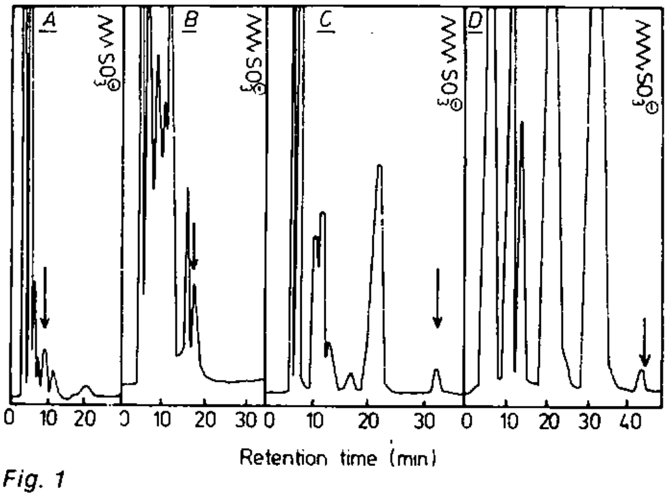

Fig. 1

Analysis of a 3-methylhistidine in a 5- μl urine sample (A); 15- μl plasma sample (B); 15- μl amniotic fluid samples (C); and 2.5- μl muscle sample (D). The chromatographic conditions used in Fig. 1 were followed except that the following alkylsulphonates were used: (A) hexanesulphonate; (B) heptanesulphonate; (C) octanesulphonate; (D) nonanesulphonate. In (D) 1.5% acetonitrile was added to the mobile phase, in all other cases an aqueous solution of the ion-pairing reagent was used. The analysis used a μ Bondapak C_{18} column (300 x 4 mm I.D.) The flow-rate was 0.8 ml/min and other chromatographic parameters were as previously described. The samples were detected by post-column fluorescent derivatisation which used a mixing chamber with o-phthalaldehyde (1 ml/min) and a fluorescent detector (Waters Model 420), excitation 340 nm and emission 440 nm. Reprinted with permission of authors, reference[4].

preparative separations. Recently a number of modifications were introduced in an effort to extend the excellent analytical separations (typically from 5 to 200 μg) to a large scale chromatographic system, where the purified material could be rapidly isolated from the mobile phase under mild conditions. This review will concentrate on recent developments in this promising application of HPLC.

In initial studies aimed at examining the effect of acid solutions on the elution of peptides from reversed phase columns the use of acetic acid and trifluoroacetic acid as mobile phase additives was examined. It was observed that acetic acid gave broad peaks with significantly greater retention times[3], and was generally not suitable for the analysis of peptides. Trifluoroacetic acid, however, gave excellent results that were comparible to those obtained with phosphoric acid solutions. The major disadvantages of this mobile phase when compared with phosphoric acid was the greater acidity of the fluorinated acid which resulted in decreased column life-time and a somewhat greater absorbance at 210nm. A major advantage, however, was the excellent volatility of trifluoroacetic acid solutions which conveniently allowed preparative separations[5].

Another factor that facilitates preparative separations is the availability of a preparative HPLC such as the Waters Prep-500 System which allows the proportionate scale-up of an analytical separation. An example of this scale up is the preparative separation of a 5g sample of a tetrapeptide Leu-$(Gly)_3$ on a 5.7 cm x 30 cm Prep Pak-500-C_{18} cartridge (75 μ m)[6]. The mobile phase contained 0.05% trifluoroacetic acid dissolved in water: methanol (95.5) and a flow rate of 100 ml/min was used (back pressure 100 p.s.i.). The recovery of purified material was at least 95% and the purified sample was shown to be homogenous by analytical HPLC and by amino acid analysis. A later publication[7] described the purification of the following synthetic peptides in up to 5g loadings per preparative run — Gly-GlyOEt, GlyGlyGlu, GlyGlyLys, PyrHisGly, $(Pro)_3$ and the pentapeptides Leu- and Met-enkephalin.

It was observed in a preparative separation of the polar peptide Gly-Gly-Glu that a mobile phase which contained 0.05% trifluoroacetic acid gave minimal retention of the peptide on a C_{18}-column[8]. For this reason we decided to examine perfluoroalkanoic acids which were significantly more lipophilic than trifluoroacetic acid for the preparative separation of polar peptides. Perfluorobutyric acid was found to be particularly useful in the analysis and purification of polar peptides. The addition of a 5 mM solution of the reagent to the mobile phase resulted in a significant in crease in retention of the peptide relative to that obtained when trifluoroacetic acid was added to the mobile phase. In addition, the ammonium salt of the acid could be removed from the purified peptide by extraction with ether, a solvent in which most peptides are insoluble. The usefulness of this mobile phase was demonstrated by the successful purification of the peptide Pyr-His-Gly (see Fig. 2). In this Figure part B shows the separation achieved when the synthetic product was chromatographed with a mobile phase which contained 0.05% perfluoroacetic acid. In this elution profile there is poor separation between the tripeptide and early eluting polar impurities. Part A shows the same separation except that perfluorobutyric acid is used as the ion-pairing reagent. In this case Pyr-His-Gly is well separated from early and late eluting impurities. This result can be attributed to the increased retention of the solute

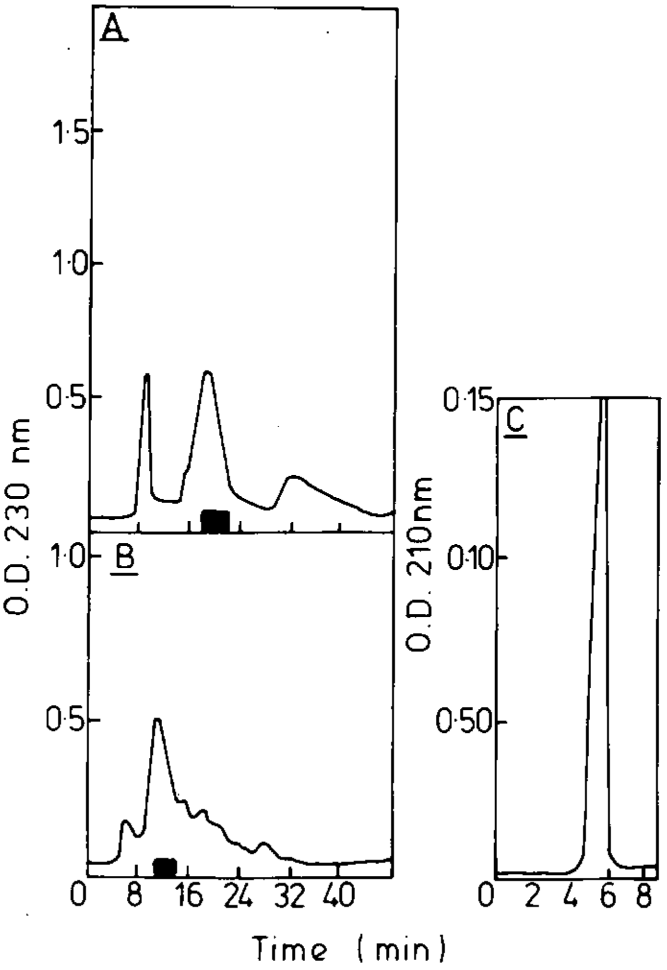

Fig. 2

Preparative separation of Pyr-His-Gly. A 1 g sample of the crude product was dissolved in the mobile phase and injected onto the C_{18}-column. A flow rate of 100 ml/min was used for the preparative separation shown in parts A and B. In part B the mobile phase was 0.05% perfluoroacetic acid, parts A and C perfluorobutyric acid (5 mM). The analytical separation shown in part C was carried out on a Bondpak-C_{18} column, with 5mM perfluorobutyric and as the mobile phase. The materials that were pooled and isolated in the preparative runs were shown by the solid bar. Reprinted with permission of authors, reference[6].

on the C_{18}-column when complexed with the more lipophilic ion pairing reagent. Fig. 2C shows the analytical HPLC profile of the purified material[8].

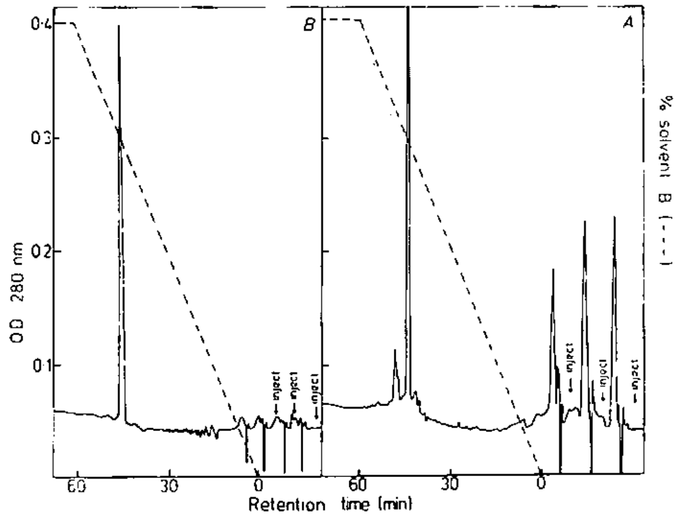

Fig. 3

The purification of 350 µg of the peptide Leu-Glu-Ser-Phe-Leu-Lys-Ser-Trp-Leu-Ser-Ala-Leu-Gly-Gln-Ala-Leu-Lys-Ala was accomplished using a Radial Pak-CN column with a linear gradient from 0.1 M NH_4HCO_3 to i-PrOH CH_3CN: 0.1 M NH_4HCO_3 (3:3:4) at a flow rate of 1.0 ml/min. The sample was loaded in three injections from a solution in 5 ml of 6M urea. Part A shows the elution profile for the crude peptide mixture. The purified sample was pooled (2 ml), diluted to 6 ml with 0.1 M NH_4HCO_3, and rechromatographed using the same conditions as in Part A. Reprinted with permission of authors reference[9].

Ammonium bicarbonate has been a popular solvent for the separation of peptides by conventional chromatographic techniques due to its excellent volatility and the high solubility of many peptides in the buffer. The high apparent pH of this mobile phase (7.7 to 8) precludes its use with siliconaceous supports packed in inflexible columns, due to the generation of column voids caused by dissolution of the silica. The radial compression that is used with the flexible-walled columns fitted in the Radial Compression Module from Waters Assoc. circumvents this problem as any voids that may be generated are removed during column compression. Provided the column is washed with water and then isopropanol each evening, we have found that an extended life-time of at least 6 months can be achieved with Radial Pak-C_{18} or -CN columns[9]. As a further precaution a guard column filled with Porasil B-C_{18} packing material is used. The guard column does not degrade the separation, but does allow for a significant increase in column life-time due both to removal of contaminants from the sample and mobile phase and to dissolution of silica in the guard column (thus partially presaturating the mobile phase with silica).

Fig. 3 shows the purification of a 350 µg of the synthetic peptide Leu-Glu-Ser-Phe-Leu-Lys-Ser-Trp-Leu-Ser-Ala-Leu-Glu-Gln-Ala-Leu-Lys-Ala. Prior to the HPLC separation, this peptide had been partially purified by gel filtration and ion exchange chromatography. The sample was loaded in 5 cm^3 of 6 M urea as three approximately equal volumes through the U6K sample injector. The large peak was collected (see bar in Figure 3A) and rechomatographed as shown in Figure 3B. Before re-chromatography the trapped peak (2 ml) was diluted to 6 ml with 0.1 M NH_4HCO_3 and loaded as three approximately equal volumes using identical conditions as those in Figure 3A. The purified peptide was characterised by amino acid analysis — a typical result was Ser 3.0(3), Glu 3.1(3), Ala 2.9(3), Leu 5.0(5), Phe 1.0(1), Lys 2.0(2) and Trp 1.0(1). The recovery of the purified peptide, as measured by amino acid analysis was 87%[9].

PROTEIN SEPARATIONS

While the separation of amino acids and peptides by reversed phase high performance liquid chromatography (HPLC) is becoming an accepted procedure, the separation of proteins by this technique still requires careful evaluation. The biological acitivities of many proteins are sensitive to denaturation by extremes in pH, by contact with organic solvents or high salt concentrations, by absorption onto glass or hydropobic moieties, or at an air-water interface[1]. However careful careful choice of reversed phase columns of medium polarity e.g. C_3H_7-phenyl, when combined with a suitable choice of organic modifier e.g. isopropanol and optimal salt concentrations e.g. 0.1 M phosphate at pH values of 3 to 7, has allowed the separation of proteins with retention of biological activity[2].

The pore size of the silica used in the manufacture of the reversed-phase packing material is crucial for the separation of high molecular weight proteins. A recent comparison of LiChrosorb RP-18 (10nm pores) with Aquapore RP-300 (30nm pores) showed that the latter column was notably superior for the chromatography of proteins with a molecular weight exceeding 15,000 D, e.g. the separation of [^{14}C] methylated bovine pancreatic trypsin inhibitor, myoglobin and ovalbumin[10].

In addition, the type of silica used in the preparation is just as important as the pore size, in fact it may be of crucial importance[11]. For example we described the use of the Radial Pak-C_{18} column for the high efficiency separation of complex peptide and protein mixtures. Fig. 4 shows the successful chromatography of a mixture of C-apolipoproteins from human very low density lipoproteins (VLDL) using an acetonitrile gradient programme. In this

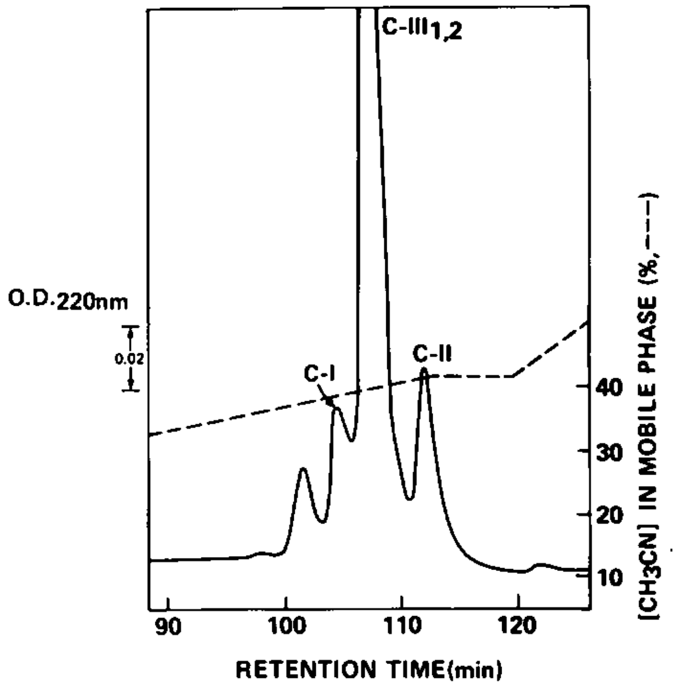

Fig. 4

The elution profiles of a mixture of C-apolipoproteins obtained from human VLDL when chromatographed on a Radial Pak-C_{18} column and with an acetonitrile gradient (see dashed lines). A 0.1 mg sample of the protein mixture was dissolved in 0.1 ml of 1% TEAP, 6 M guanidine hydrochloride and then chromatographed on the Radial Pak-C_{18} column with an initial mobile phase of 1% TEAP, pH 3.2. Reprinted with permission of authors, reference[14].

separation the Radial Pak-C_{18} column clearly separated apolipoprotein C-I from C-$\text{III}_{1,2}$ and C-II. With the same chromatographic conditions, a μ Bondapak-C_{18} column gave a broad peak with no separation of the protein mixture. An important difference between the two columns is that the μ Bondpak-C_{18} column, but not the Radial Pak-C_{18} column, has unreacted silanol groups blocked by 'end-capping' with trichloromethylsilane. Such groups, which are likely to be hydrated, may reduce mass transfer resistance for a polar solute from the aqueous eluent to the surface of the stationary phase. In addition silanol groups, in the presence of low pH mobile phases, may introduce specific hydrogen bonding interactions with polar solutes.

One area where HPCL separations are having a dramatic impact is in the field of sequence determination of proteins. HPLC has been used in all phases of sequence determination, ranging from isolation of the protein sample, separation of protein fragments after chemical or enzymatic cleavage and separation of PTH derivatives. The overall application of HPLC to this important area of protein chemistry has been recently reviewed[12].

The introduction of a glyceryl coating onto a silica particle has allowed the production of a pressure-resistant support suitable for high performance gel permeation chromatography (HPGPC). The introduction of the glyceryl group reduces reversed phase interactions to a sufficient extent that separations based on molecular weight differences can be achieved. It must be emphasised, however, that true molecular weight separations can only be achieved if the composition of the mobile phase is carefully optimised[13].

In conclusion, reversed phase HPLC has rapidly become an important new technique for the separation of proteins as can be judged from the following the successful separation of insulin, somatomedins, lipotrophins, endorphins, neurophysins, growth hormone and milk proteins[1,2].

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HEWLETT
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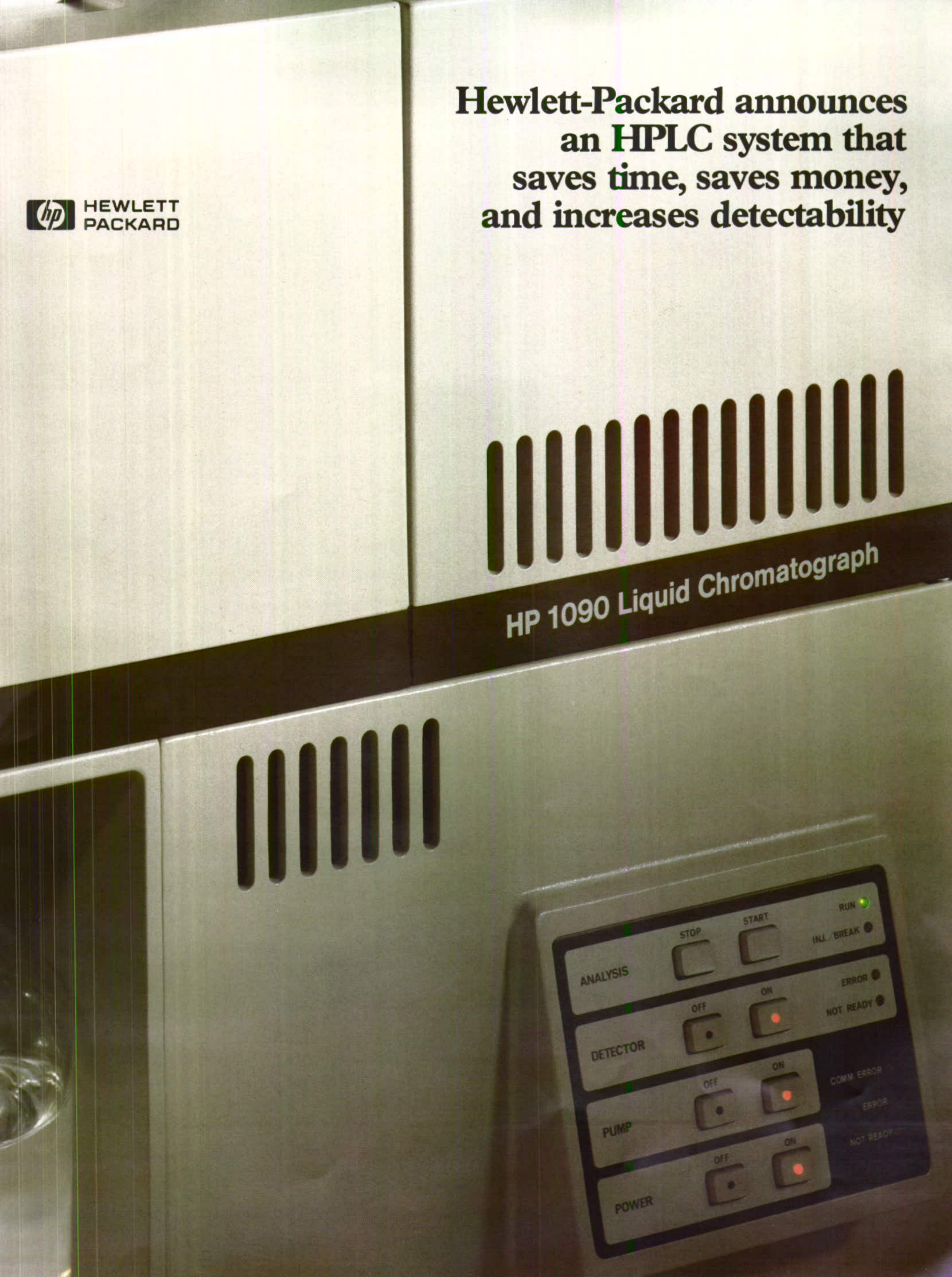
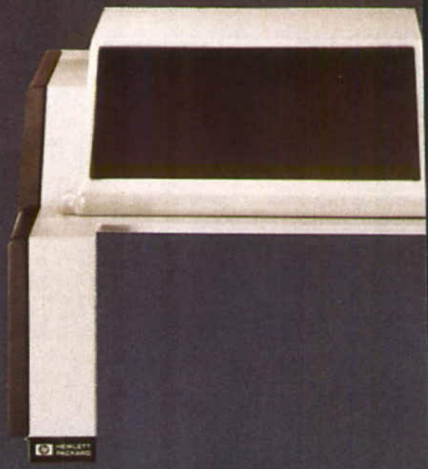
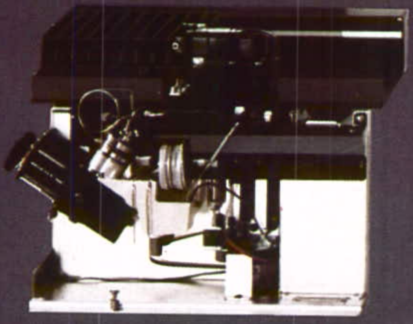
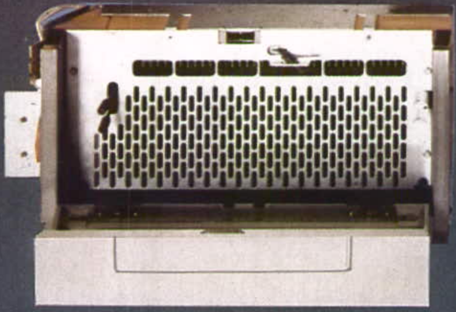
Hewlett-Packard announces an HPLC system that saves time, saves money, and increases detectability

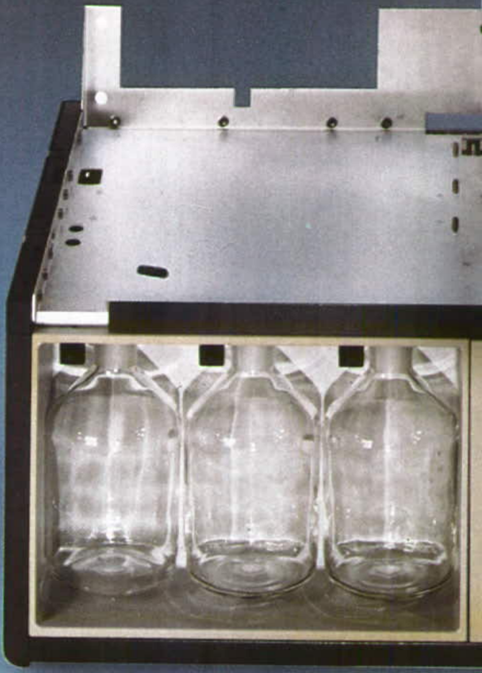


The HP 1090 Family of Integrated LC Modules









Maximum operational flexibility.

Now there's an integrated LC system that is 'future-proof'. An instrument that can easily be adapted as technology advances and as your needs change. The combined advantages of integrated systems and stand-alone components. Hewlett-Packard announces the HP 1090 Family of Integrated LC Modules.

Every module in the integrated system is chosen by you, to suit your needs. Every module is easily removed and quickly exchanged. Maximum flexibility, and maximum module use. You buy only what you need and upgrade when you want. You know that each new module will be an optimum match, will give maximum performance. The HP 1090 lets you satisfy today's demands and plan for those of tomorrow.

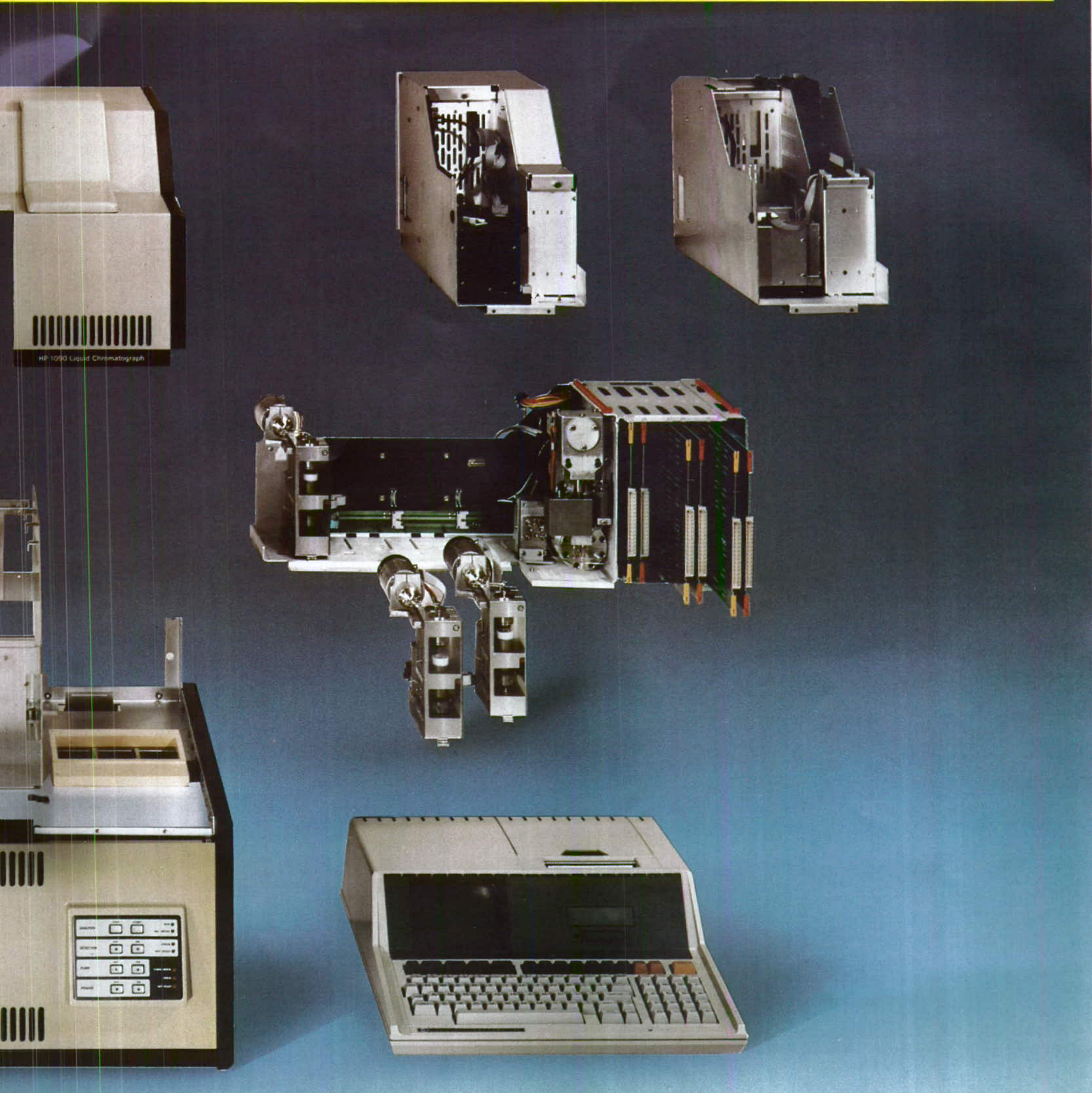
You get system specifications, not module specifications. Every module is compatible. There's a minimum of cables and connections. And every module communicates intelligently. That means fully synchronized automation and complete documentation. There's no duplication of control systems. Bench-space is low. Maintenance is simple.

Gain plenty. Lose nothing.

Each module in the HP 1090 family is designed to meet the stringent requirements of Low-Dispersion Liquid Chromatography: fast response times; reduced capillary lengths with small internal diameters; miniaturized injector and flow-cell volumes; and optimized geometry for every component and connection in the flow path. Even more critical, the solvent delivery system generates gradients at high flow rates (for high-speed columns) or low flow rates (for micro-bore columns) with equal precision.

But don't think that we're asking you to give up your existing methods. The HP 1090 will match your present LC system in every respect. And then leave it behind.

Today's LC. Tomorrow's LC.



Optimum chromatographic performance.

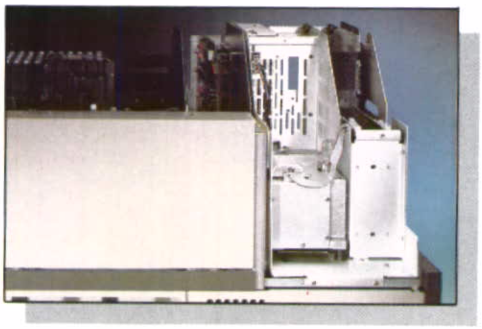
Run your routine methods, and explore the benefits of new LC techniques. Ensure optimum performance with standard columns thanks to minimum external peak-broadening. Increase throughput by combining high-speed columns and intelligent automation. Or use micro-bore columns to increase detectability and cut solvent consumption by 80%.

Lower solvent costs. Higher throughput. Greater detectability. And all in a system of integrated modules, giving you flexibility, upgradability and integrity. Today's needs. Tomorrow's needs. The HP 1090 has the answers.

The HP 1090 gives you more.

...and your results

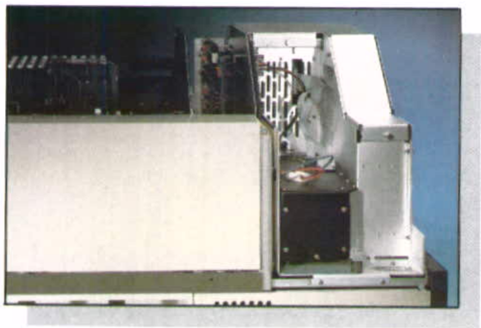
Detector 1



The filter-photometric detector provides programmable wavelength-switching at an economical price. A filter-wheel gives a choice of 7 wavelengths per analysis. Switching time is under 2 seconds, with no baseline offset.

Detector 2

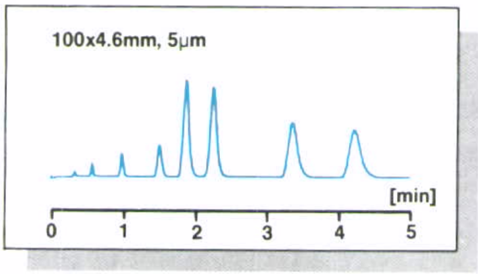
The diode-array detector looks at all wavelengths simultaneously, allowing instant acquisition of spectra anywhere in the analysis. Get automatic checks on component identity and purity. Optimize detectability and selectivity by monitoring 8 wavelengths at once or by varying the bandwidth and response time.



Communications

The HP 1090 accomodates a wide variety of data handling and communications options through analog output, HP-IB or serial interfaces. The system master is the HP-85 Personal Computer. As new communications standards become established, they can be incorporated into the existing architecture.

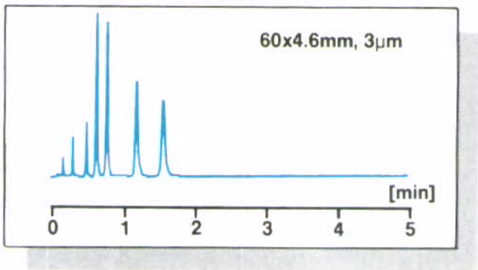
Today's LC



Get the best from your present methods thanks to low peak-broadening, intelligent automation, ease of operation and low cost of ownership.

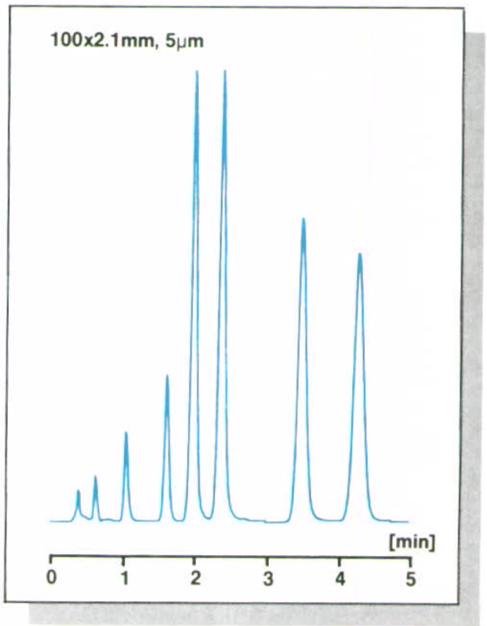
High-speed LC

Compared to a standard 10cm column packed with 5μm particles, the new 6cm columns packed with 3μm particles complete the analysis 3 times faster and increase detectability. Combine the high-speed columns with a fully automated system, and the costs per analysis are dramatically reduced.



Micro-bore LC

Compared to standard 4.6mm i.d. columns, the new 2.1mm i.d. columns reduce solvent consumption by 80%. They can easily save 15% of the cost of the complete instrument in only one year! Detectability is 5 times higher: a real benefit with limited or very dilute samples.



Ownership

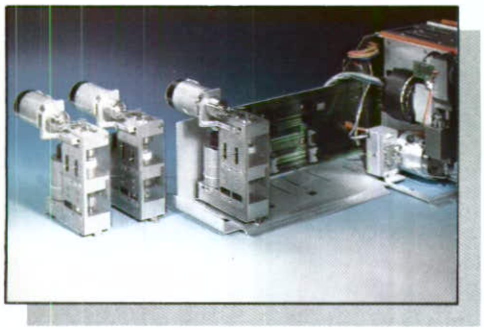
The HP 1090 is designed for high reliability and low running costs. Built-in diagnostics and easy, safe access to all parts ensure that maintenance is simple and straightforward.

Choose your system...

The modules described below are just part of a family that will grow for many years to come. Each module makes its own contributions to chromatographic performance.

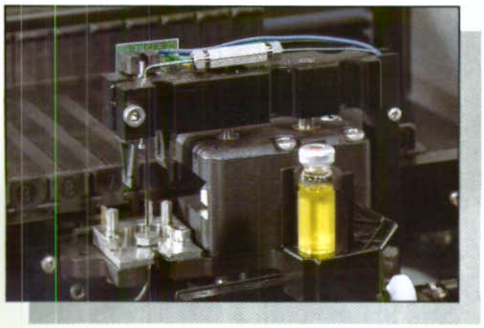
Pump

The DR5 Solvent Delivery System has a dynamic range of 5000. A syringe-type metering pump in each solvent channel delivers any flow rate from 1µl/min to 5ml/min by true volumetric displacement. This permits 1-99% gradients, with better than 1% precision, even at 100µl/min. Delay volume is below 0.5ml. Choose isocratic, binary or ternary. Columns can be high-speed, micro-bore or standard.

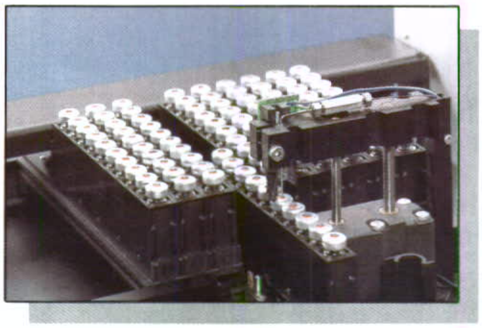


Auto-injector

The auto-injector use one of two high-resolution syringes to give programmable injection volumes from 0.5µl to 250µl. A 1µl injection is possible from as little as 5µl.



Autosampler



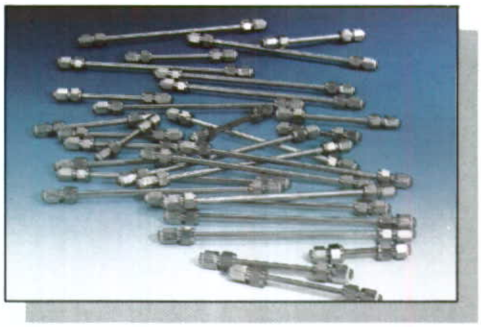
For maximum throughput, combine the auto-injector with the autosampler. It's fully programmable, giving fast, random access to 100 samples. Ten interchangeable magazines simplify sample preparation.

Manual valves

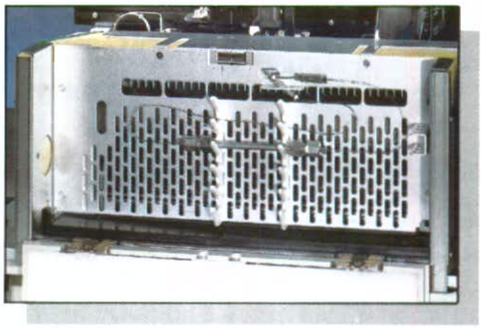
An economical alternative to the auto-injector is the Rheodyne Model 7010 manual valve. Or, for the very lowest peak-broadening, choose the Rheodyne Model 7413.

Columns

A full range of high quality columns is available: standard columns to run your existing methods; micro-bore columns for solvent saving and increased detectability; high-speed columns for increased throughput.

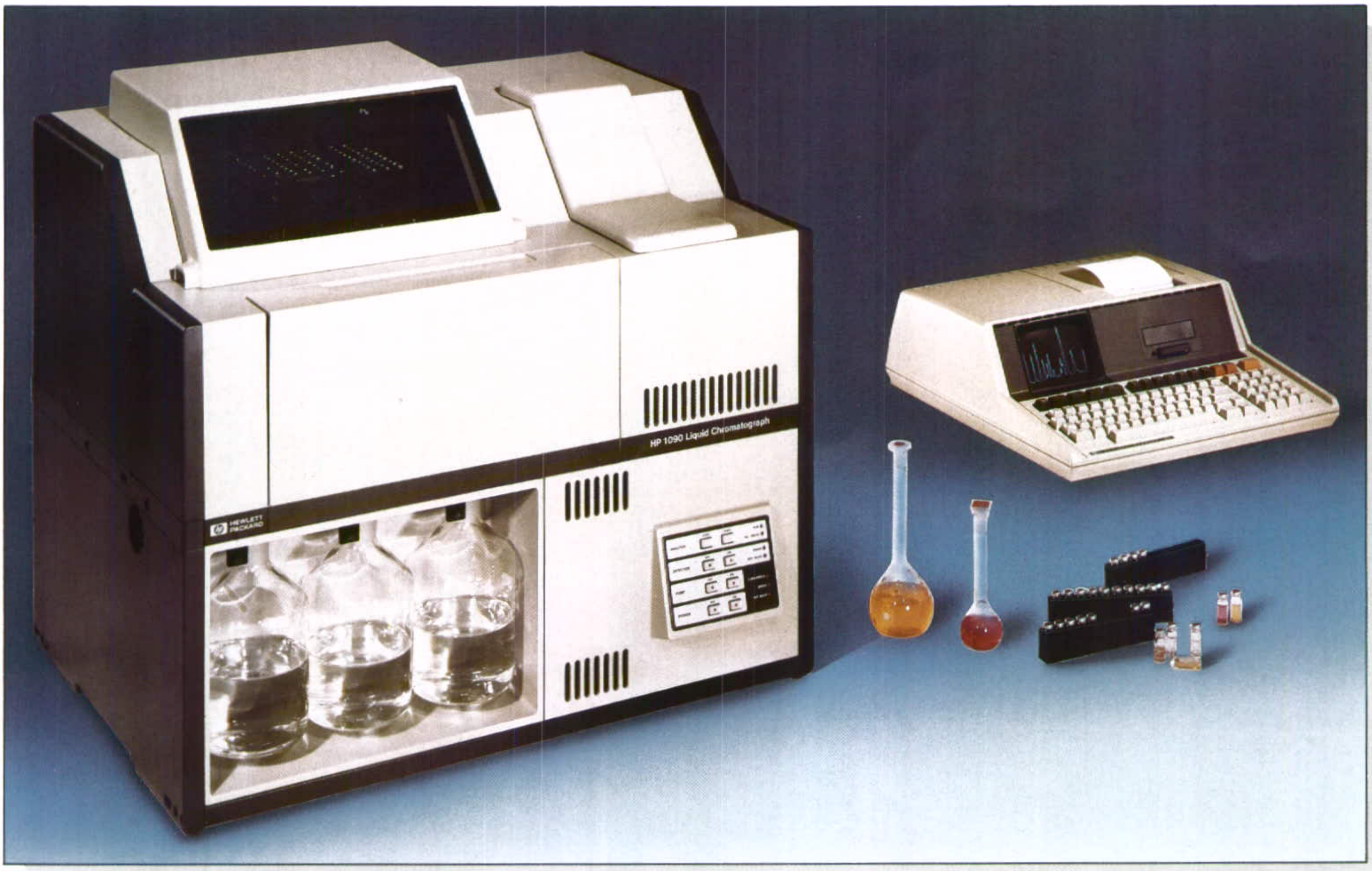


Oven



Take full advantage of the marked influence of temperature on selectivity and plate number with this efficient heated column compartment. Temperature homogeneity in the column is ensured by pre-heating solvent in a 2µl capillary. The heat exchanger maintains a temperature precision of ±0.5°C.

The HP 1090 gives you more.



Like to know more?

We've shown you only a fraction of the chromatographic possibilities and money-saving benefits of the HP 1090 Family of Integrated LC Modules. Your local Hewlett-Packard representative will be happy to tell you more.

HEWLETT
PACKARD

northrop
INSTRUMENTS & SYSTEMS LIMITED
Wellington - Phone 850-091
Auckland - Phone 794-091
Christchurch - Phone 488-874

For more information, write to:
Hewlett-Packard, Analytical Group, 1820 Embarcadero Road, Palo Alto, CA 94303, USA
Hewlett-Packard, Central Mailing Dept., P.O. Box 529, 1180 AM Amstelveen, The Netherlands

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COUNCIL NEWS

New PO Box Number

With the transfer of the Registrar, Denis Hogan, and the Christchurch Chemistry Division Laboratory to the new building, adjacent to the University of Canterbury's campus at Ilam, the Box Number of the NZIC office is now 29-183, Christchurch.

Entries for 1984 Prizes

Members are reminded that entries for the Easterfield Award, ICI Prize, Shell Industrial Chemistry Prize and Chemical Essay Prize should be sent to the Administrative Secretary, PO Box 29-183, Christchurch, before 30th April 1984. The rules for these Prizes are set out in the 1982 List of Members.

Dates of Council Meetings

A telephone meeting of Standing Committee is arranged for 23rd November 1983. In 1984 Council will meet in Wellington 8/9 February and 19/20 August with telephone meetings planned for 8 May and 20 November.

Public Affairs and Science Policy Committee

The President, Professor R.D. Batt, and Council wish to ascertain whether Institute members would support a statement on behalf of the Institute along the following lines on the issue raised by Brian Davis in the October number of "Chemistry in New Zealand."

"The President on behalf of the New Zealand Institute of Chemistry (Inc.) advises the New Zealand Government that its members consider there is a need for urgency in obtaining international agreements to halt the production of nuclear weapons and urges the Government to promote moves toward total nuclear disarmament."

Members are asked to advise Dick Batt or their Branch Secretaries of their views.

Pac Chem '84

Air New Zealand are offering the following opportunities for NZIC members to take part in Pac Chem '84 to be held in Honolulu 16-24 December 1984.

1. On Thursday 13th December fly Auckland to Honolulu. Lei greeting and transfer to Reef Towers Hotel. Fly Honolulu-Auckland Monday 24th December. Cost per person of a share twin rooms is $1778 plus $40 departure tax subject to increases in air fares, hotel rates, currency fluctuations etc. A city/Punch Bowl Sight-seeing Tour is included and on Sunday 23rd a day room until late departure transfer to airport.

2. Stay at the Pacific Beach Hotel, travel as in 1. Cost per person of a share twin room is $2520 plus $40 departure tax subject to increases as in 1.

The costs are based on 10 adult full fare paying passengers travelling throughout. Should this number alter recosting would be necessary. Members interested should direct their enquiries to Roger H. Gower, Air New Zealand, Private Bag, Auckland, telephone 797-515, ext. 8501, or by circling 40 on the reader reply card.

Pac Chem '84 is the 1984 International Chemical Congress of Pacific Basin Societies. The deadline for receipt of abstracts of contributed and invited papers is June 1st, 1984. The NZIC is one of the official participating organisations in this Congress sponsored by the ACS, the Chemical Institute of Canada and the Chemical Society of Japan. Further information is available from Dr D.E. Wright, MAF, Private Bag, Wellington.

Energy Advisory Committee

Professor R.F. Meyer, Chairman of the Energy Advisory Committee, Ministry of Energy, Private Bag, Wellington, has invited opinions and concerns on Energy Planning in New Zealand, particularly the 1983 Energy Plan published in early September (cost $3.75 from Government Printer bookshops). "Energy Planning '83", cost $5.50, is said to be easier to read and gives background to current energy planning rather than technical details of the Energy Plan.

This year the EAC is particularly interested in comments on gas planning and co-generation. Submissions and comments were requested by 16th December, a deadline which readers of this issue are unlikely to be able to meet. Accordingly the EAC has been advised that members may wish to make submissions as soon as possible after that date which the EAC is prepared to accept if notified.

"Confidential" submissions may be made.

Car Badges

Mr E.C.G. Fletcher, Havelock North, has suggested that the new NZIC logo, featured on the cover of the October issue of "Chemistry in New Zealand", be produced in a form suitable for a car badge. Members who would support this proposal are invited to inform their Branch Secretary.

New Zealand Energy Research and Development Committee

This committee, the address of which is University of Auckland, Private Bag, Auckland, requests ideas or proposals which, if successfully developed, could lead to significant changes to processes or activities. The proposals should relate to energy intensive processes or activities so that any changes would result in significant improvements in their thermodynamic efficiency and/or substitution for indigenous energy resources. Consideration should also be given to improved competitiveness, prospects for new industrial development and exports.

Royal Society of Chemistry. Corday-Morgan Memorial Fund

The Royal Society of Chemistry to assist chemists and chemistry overseas has resuscitated the Corday-Morgan Memorial Fund. This exists to assist members of any established Chemical Society/Institute in the Commonwealth to visit chemical establishments in another Commonwealth country. There is no restriction on age but the visits must clearly be of benefit to the country concerned. It is hoped that lectures will be given during a visit. Applicants must be travelling to another country (not necessarily in the Commonwealth) and would stop en route to visit a third country, which must be in the Commonwealth. Funding would cover the additional costs of the stopover, together with appropriate subsistence.

The average grant will be about 250 pounds with an upper limit of 500 pounds. The closing date for applications on the official form are 1st April and 1st October and should be made before the appropriate one even if information about aspects of the visit is still awaited, c/o Secretary General, RSC, Burlington House, Piccadilly, London WIV OBN, attention Mr Stanley Langer.

A second and related scheme applies to members of the RSC only. Application dates etc are similar to those outlined above.

J. ROGERS
Honorary General Secretary
18th November 1983

MEMBERSHIP

The following membership elections were approved by Standing Committee on 23rd November 1983.

Members

Hancock William Stephen B.Sc. (Hons.) Ph.D. (Sth. Austr.) Dept. of Chemistry, Biochemistry & Biophysics Massey University (Reader).

Sheppard Caroline Mary M.Sc. (NCAA) Chemistry Division, DSIR, Gracefield (Scientist).

Winward Gordon B.Sc. (Hons.) Salford M.I. Chem.E. Kaipara Edible Oils Refinery Ltd., Auckland (General Manager).

Graduate Members to Members

Campbell Graeme George B.Sc. Shell Oil NZ Ltd., Wellington (Product Asst. Polymers).

Mason Jennifer Mary B.Sc. (Hons.) (Well.) Chemistry Division DSIR Gracefield (Scientist).

Sinclair Bruce Ronald B.Sc. Applied Biochemistry Division, DSIR, Palmerston North.

Graduate members

Bennett Adrian Francis M.Sc. (Massey) Building Research Assn. of NZ, Porirua (Chemist).

Chin Anthony Paul B.Sc. Carborundum (NZ) Ltd., Auckland (Technical Manager).

Dent Barry Roy B.Sc. (Hons. Well.) Chemistry Dept., Victoria University of Wellington (Ph.D. Student).

Lyon Robert Barry B.Sc. Sterling Pharmaceuticals (NZ) Ltd., Auckland (Control Chemist).

McQuilkin Michael John B.Sc. Elastomer Products Ltd., Christchurch (Compounding Manager).

Stevens Earl Victor John B.Agr.Sc. (Hons.) (Massey) Dept. of Biochemistry Massey University (Demonstrator).

Turepo Manea B.Sc. Chemistry Dept. Auckland University (Student).

Walsh Kevan Arthur John M.Sc. (Waikato) Chemistry Division, DSIR, Auckland (Scientist).

Death W.S.H. Wick (Canterbury).
Resignations Mrs C.C. Brown (Otago) D.R. McFarlane (overseas), S.J. Nunn (Auckland).
Life Members J.R. Beck (Wellington), R.C. Lawry (Wellington).

BRANCH NEWS

AUCKLAND

The September meeting of the branch was addressed by *Dr Tony Moffatt*, UK. In a light-hearted and entertaining lecture, Dr Moffatt described how some well-established chemical and spectroscopic techniques were finding new applications, especially as non-invasive procedures, in investigations in clinical chemistry.

The annual Chairman's Dinner was held in October at the Landing Restaurant. The evening featured a specially-prepared banquet of Chinese and Malaysian dishes, and *Norm Thom* entertained with a short address on his 1982 visit to China. Despite the fact that the Treasurer appeared to abscond without paying the bill, the evening was a great success.

WAIKATO

Dr Rainer Eschenbruch, DSIR, Te Kauwhata Viticultural Research Station, addressed the September branch meeting. He not only gave the attending members a clear insight into the influence of gelatine fining on wine quality, but also dispensed generous samples of the end product. The development of lively discussions on marketing potentials and the quality and cost of local wines, resulted in a most entertaining and enjoyable evening.

Ken Hamilton, who works at the Forest Research Institute, Rotorua, gave an interesting talk about the application of chemistry to paper making, at the October branch meeting. The speaker, who had previously worked at the Caxton Paper Mills, regards himself primarily as a "paper maker", and is conscious of the need for more "science", especially chemistry, in an area characterised at present by "craft". He described paper making processes, including the way in which fibre structure influences the properties of paper and the problem of pitch particle contamination of paper sheets.

MANAWATU

At the Branch AGM on 5 October, *Dr Ken Whittle* was elected Chairman for the coming year. *Mr Denis Body* (Secretary), *Dr Julian Lee* (Treasurer), *Ted Fletcher* (Hawke's Bay Representative), *Dr Keith Sewell* (Taranaki Representative) and *Dr Cecil Johnson* (Branch Editor) were also elected. Other members of the new Committee include *Dr Ted Baker* (Ex-officio, Past Chairman and Council Delegate), *Prof. Dick Batt* and *Warren Holloway* and *Ramsey Southward*.

The Chairman's Address was given by *Dr Ted Baker* (Department of Chemistry, Biochemistry and Biophysics, Massey University) on "Protein and Nucleic Acid Structure — Old Approaches, New Developments". Dr Baker started his address with a description of the application of X-ray crystallography to the determination of the structure of "small" (eg. actinidin), medium size (eg. lactoferrin) and large (eg. tobacco mosaic virus and tomato bushy stunt virus) protein molecules. He described how the sub-units of these proteins fit together and how structure models for them can be refined by the use of fast computer methods, particularly for the testing of suggested structures against experimental data. Computer graphics are necessary for the study of the larger molecules. Dr Baker completed his address with a discussion on aspects of the structures of nucleic acids.

The 9th Manawatu Science Fair was held at Queen Elizabeth College, in Palmerston North, from 8-11 September. This event attracted 183 entries at intermediate and senior levels in biological, social, physical and earth science categories. Branch prizes for the best exhibits with a chemical theme were awarded to Blair Vernon and Anthony Pratt of Ross Intermediate School for "H_2O — or is it?" a project on the electrolysis of water, (Intermediate Physical Science) and David Reeves of Awatapu College for "Identification of Colouring Compounds in Foods" (Senior Open Section). The first Taranaki Science Fair was held in New Plymouth on 24 September. This event, under the chairmanship of *Dr Chris Kirk*, attracted approximately 50 entries as well as essays and a computer program section.

The final Branch meeting for 1983, a combined seminar with the Department of Chemistry, Biochemistry and Biophysics at Massey University, was addressed by *Prof. Neil Bartlett* of the Chemistry Department, University of California at Berkeley, on "Noble Gas Chemistry." This meeting was attended by 7th form pupils of local schools and their teachers, as well as by Branch and Departmental members.

Prof. Bartlett reviewed the history of noble gas chemistry, from his preparation of O_2PtF_6 (in the late 1950's) and subsequent synthesis of the first noble gas compound, $XePtF_6$. This led to the synthesis of other compounds involving the elements krypton, xenon, radon, fluorine and oxygen. Prof. Bartlett concluded his presentation with a discussion of bonding in noble gas compounds and how this can be used to predict the stability on various proposed compounds. This was a most interesting account of this area of chemistry, a recent report of which was published by *C.B. Hunt* in the September issue (1983) of Education in Chemistry, p177.

WELLINGTON

The Branch invited secondary schools in the Wellington Branch region (which includes Nelson, Marlborough, and the Wairarapa) to participate in an analytical competition. Entrants (maximum of 2 per school) were supplied with a 100 ml sample of ethanoic acid (acetic acid) of approximately vinegar strength, from a batch made up and analysed by Chemistry Division, DSIR at Lower Hutt. Any analytical technique could be used but the results had to be accompanied by a description of the method. In the event all entrants used titration of acetic acid with sodium hydroxide in a one, two or three-stage determination depending on the steps taken to standardise the sodium hydroxide.

Of the 14 schools entered, 6 provided results within 2-3% of the reference analysis — a very encouraging performance. Many of the laboratory reports accompanying the results were of an excellent standard. The winning school, Wellington High School, received a prize of $50 and a Champion Certificate. These were presented to John Sim, the winning student entrant representing the school, at the prize-giving ceremony of the Wellington Science Fair on 4 September. Four highly commended certificates were also issued. The Wellington Branch hopes to make the competition an annual event.

CANTERBURY

The September meeting of the Canterbury Branch was addressed by *Prof. Neil Bartlett*, visiting Erskine Fellow in the Chemistry Department, University of Canterbury during September/October. Professor Bartlett is noted particularly for his work on the discovery of the first compounds of the inert gases.

In his talk he discussed how the adduct $XePtF_6$ was formed by reacting xenon with the powerful oxidising agent PtF_6 — and how interest in the chemistry of the noble gases then expanded rapidly particularly when the xenon fluorides were formed. He then reviewed the known chemistry of the noble gases and the techniques used in deriving compounds from them.

At the Branch AGM in October, outgoing Branch Chairman *Dr John McKinnon* (Wool Research Organization of New Zealand) spoke about "Fascinatingly Filthy Fibres." Using three different examples from the cleaning and soiling of wool and synthetic fibres, he illustrated how recognition and characterization of a technical problem may require basic information and lead to research activity. He also spoke generally on the way research resources can be used in industrial research and development.

At the meeting *Dr Kip Powell* was elected incoming Chairman, and other committee members elected were *Alf Baker* (Deputy Chairman), *Dr Chris Easton*, (Secretary) *Dr Selwyn Maister* (Treasurer), *Dr John Cretney* (Branch Delegate and Editor), *Alex Drysdale* and *Drs John McKinnon, Jeff Plowman*, and *Peter Steel*.

OTAGO

At the September meeting, *Ms. Phylis Pattie*, cellarmaster at Montana Wines' Auckland Plant, talked to the Branch on red wine production. A wine-tasting session followed the talk. There were several events in October. Firstly, *Prof Neil Bartlett*, F.R.S., from the University of California at Berkeley, gave a lecture entitled, "Noble Gas Chemistry." Earlier in the day he had spoken to the Chemistry Department on metal fluoride intercalation compounds of graphite. The Annual General Meeting of the Branch was held on the 13th. Following official business, *John Billcliff* gave the Chairman's Address entitled, "What goes on in kid's minds", based on the results of the Learning in Science Programme conducted by Waikato University. On the 25th, *Prof. R.A. Duce* from the University of Rhode Island addressed a joint meeting of the Otago Branches of the Royal Society and the N.Z.I.C. on the subject — "Investigations of Ocean-atmosphere Chemical Exchange: An International Challenge."

On the industrial front, *Arthur Wilson*, Manager at the Southland Dairy Co-op plant at Edendale, reports that the Company is currently test marketing in the Otago-Southland area a product new to New Zealand called whey cheese. Whey cheese is a traditional Norwegian product, hitherto confined mainly to Scandinavia. In the normally-accepted sense, it is not a cheese since it is biologically inert. The Southland development is an attempt to modify traditional whey cheese to a texture and flavours more acceptable to more people. Four flavours — chives and onion, bacon, citrus and mango — are included in the twelve-month market test. Besides it's primary use as a spread, recent experience has highlighted a wide acceptability in cooking recipes. Development of the innovative, continuous, manufacturing process is fortuitous since much more whey will result from the Dairy Board's current policy of expanding cheese manufacture. The whey cheese plant was commissioned in 1980. Since then, when 290 tonnes were produced, production has increased to a planned 1150 tonnes for the current dairy season.

UNIVERSITY NEWS

Auckland

Mr S.G. Brooker, Honorary Lecturer in the Chemistry Department, has been invited to present a paper at the International Conference on Lecithin to be held at Vienna in April next. He will also be visiting the Palm Oil Research Institute, Kuala Lumpur, Malaysia, and will be spending some time at the Federal Institute for Fat Research, Munster, West Germany, where he hopes to get some ideas on orange roughy oil.

Massey

Prof. Dick Batt, President of the Institute and Foundation Dean of Science (1969) at the University, will be relinquishing the latter post at the end of 1983. He will continue as Head of the Department of Chemistry, Biochemistry and Biophysics as Professor of Biochemistry and Director of the University's Alcohol Research Team. The new Dean of Science will be *Prof. Geoff Malcolm,* Foundation Professor of Physical Chemistry. Professor Malcolm was the Institute's President in 1977. He has been the Massey Representative on the UGC Research Committee and was formerly the University Entrance Board's subject convenor for chemistry and chief examiner for Scholarship and also School Certificate chemistry. He is currently the external assessor in chemistry for the University of the South Pacific in Fiji. Numerous significant developments in the Faculty of Science will be coming to fruition in the near future.

Dr Bill Hancock (Department of Chemistry, Biochemistry and Biophysics) has received a grant from the Medical Research Council of NZ for a three year period of research on the chemical synthesis of peptides that will be used to study the function of lipoproteins. As part of this work, *Dr Dave Harding* of the same department will prepare chromogenic peptides for the assay of blood factors.

Dr V.F. Larsen and P.N. McFarlane (Biotechnology Department) have received a research grant from the Scientific Research Distribution Committee (Kiwi Lottery) to assist with the project on energy production from industrial wastes. They are undertaking cooperative research with members of the Dairy Research Institute and Forest Research Institute on the production of methane from whey and sawdust respectively.

Dr Ray Field, Professor of Meat Science at the University of Wyoming, now on sabbatical leave at the Meat Industry Research Institute of NZ and Ministry of Agriculture and Fisheries, Ruakura, recently visited *Dr Roger Purchas* of the Animal Science Department to discuss aspects of meat science. While in the Department Prof. Field presented a seminar on "Developments in Meat Processing in the USA, with Emphasis on Mechanical Deboning." This form of meat recovery is being introduced into U.S. processing plants, although some legal problems associated with labelling of the products have to be settled. It has been used for many years in the fishing and poultry industries. Prof. Field also discussed other aspects of meat processing, in particular the production of reconstituted meat products to market requirements, and flavour problems in some products.

Canterbury

Dr Ward Robinson returns from leave at Bristol University in December. *Dr Jack Austin* is currently on one year's leave at the University of Western Australia, Perth.

Otago

Dr Geoff Krissansen (Biochemistry Department) has been awarded a fellowship to work in the Cell-surface Biochemistry Group lead by *Dr Michael Crumpton* at the Imperial Cancer Research Fund Laboratories in England.

Dr Mark Bradley has returned from the Howard Hughes Medical Institute at the University of Vanderbilt, Tennessee, where he worked with *Dr David Garber* on in vitro fertilisation and production of monoclonal antibodies to proteins of the zona pellucida of the egg. He is now a Research Officer in the Department of Surgery where, with *Dr Barbara Heslop,* he will investigate compatibility antigens in connection with transplantation studies.

In the Pharmacy Department, *Prof. D.G. Perrier* has been nominated a member of the Board of the New Zealand Pharmacy Education anbd Research Foundation. He has also been appointed to the Pharmacy Advisory Committee of the Central Institute of Technology.

Dr Don Ferry (Pharmacology Department) is about to spend 12 months extending his experience of clinical pharmacology by working with *Dr Cubbedu* in the Clinical Pharmacology Division at the University of North Carolina.

In August, *Prof. A.D. Campbell* from the Chemistry Department travelled to the I.U.P.A.C. General Assembly at Lyngby, Denmark where he attended meetings of the Bureau and Commission on Microchemical Methods and Trace Analysis, and represented New Zealand at the Council Meeting. He returned via Amsterdam where he was the official representative of I.U.P.A.C. at the 9th International Symposium on the opening ceremony. Also from the Chemistry Department, *Dr Keith Hunter* and scientists from Caltec and Auckland, Rhode Island, Connecticut, and Texas Universities took part in an oceanographic cruise in the N.E. Tasman Sea. The expedition was sponsored jointly by the U.S.-N.Z. Co-operative Science Programme and the Sea-Air Exchange Programme. A clean laboratory was constructed on board the D.S.I.R. vessel 'Tongaroa' to handle air, rain and seawater samples in a study of atmospheric inputs of trace elements and sulphur gases to the ocean. Sampling equipment was used which avoided contamination from the ship, and computer simulation of air-mass trajectories by the N.Z. Meterological Office were used to indicate when air could be sampled which was free from city pollutants. Following the cruise, *Dr William Fitzgerald* from the Marine Sciences Institute of the University of Connecticut, and *Prof. Robert Duce,* Director of the Atmospheric Sciences Centre and Professor of Oceanography at the University of Rhode Island, visited the Department. Dr Fitzgerald lectured on the "The Marine Atmospheric Chemistry of Mercury," and Prof. Duce, on a two-month sabbatical leave as a William Evans Visiting Fellow, gave an 8-lecture course on the chemistry of the marine atmosphere. Finally from the Chemistry Department, *Brian Moynihan* is to join the Shell Oil Company's analytical laboratory in Wellington after researching for a year with *Prof. David Buckingham.*

GOVERNMENT DEPTS AND RESEARCH INSTITUTIONS

DSIR — Mt Albert

The recently renovated food processing laboratory at MARC was opened by *Dr Kear,* recently retired DG of DSIR, in an informal ceremony. The refurbished laboratory will be known as the Strachan Building after *George Strachan* former head of the processing group.

Dr John Turner from the University of East Anglia, Norwich is spending 12 months at MARC. He will be working with *Dr Robin Mitchell* on the mode of action of phaseolotoxin.

We also welcome to MARC *Dr Wendell Roelofs.* Dr Roelofs is the recipient of a NRAC Senior Research Fellowship. At MARC he will be working in the horticulture group of Entomology Division on the pheromones of leaf rollers.

DSIR — Palmerston North

On 15 September, *Mr Doug Hay* of the Business Studies Department of Massey University presented a seminar to the Applied Biochemistry Division entitled "Safety and You in Your Workplace." In many laboratories there are many obvious dangers to their occupants, such as the lack or non-accessibility of fire extinguishers, covered emergency exits and unsecured gas cylinders. Other dangers, such as unsafe fume cupboards and the presence of toxic chemicals in the atmosphere, are less obvious but can readily lead to fatalities either now or in the future. Mr Hay claimed that few people would know the currently accepted threshold limit values set for toxic chemicals, or even where to find these values. In many cases the threshold limit values of chemicals are decreased (some by large amounts — eg. those for vinyl chloride monomer since 1962) as the real toxicity of chemicals are realised. Mr Hay also discussed the use of chemical monitors, workplace safety audits and the attitude of the Accident Compensation Corporation and of unions to occupational diseases.

On 13 October, *Miss Cynthia Owen,* Head Librarian of the Palmerston North DSIR library, presented a seminar on "Data Base Searching in ABD". Miss Owen compared manual literature search methods with computer assisted (via satellite to America) procedures. She described the strategy needed to develop a meaningful search, so that neither too little or an excessive amount of information (at a great cost) is generated. Care is required in spelling (American vs. European) and the use of abbreviations (eg. can limestone be reduced to lime without including the fruit?) Miss Owen completed her presentation with a brief description of the developing N.Z. data bases.

DSIR — Wellington

Dr L.J. Porter, head of the organic section, will be visiting the USA for 12 months from January 1984 to work at the Western Regional Research Centre, USDA at Berkeley in California with Dr B. Chan on the chemistry of natural resistance in plants.

Mr L.E. Sharman, head of the forensic section will be visiting London during 1984 to work with *Dr P. Martin* at the Metropolitan Police Laboratory on the identification of proteins characteristic of human seminal fluid.

Mr W.R. Braithwaite has retired from Chemistry Division.

Dr W.F. Giggenbach of the Geochemistry section was recently in Japan where he attended the 4th Symposium on Water-Rock interactions. He also visited Geothermal research organisations in Japan.

Dr G.J. Sutherland of the Drugs and Alcohol section recently visited Singapore and Australia where he attended the 1st Asian Pacific Congress on Legal Medicine and Forensic Sciencies, and the eighth Australian Forensic Science Symposium. While he was in Australia Dr Sutherland also visited laboratories involved in illicit drug investigations.

Mr H.J. van Enckevort, who recently completed PhD studies at the University of Waikato has been appointed to the forensic section.

Dr C. Vilain, from the Chemistry Department, University of Liege in Belgium is working at Chemistry Division until May 1984 with *Dr K.R. Markham* on the Chemotaxonomy of NZ Gymnosperms.

INSTITUTE OF NUCLEAR SCIENCES

Dr Brian Robinson arrived back in September after two years at the University of Kuwait Geology Department teaching geochemistry, economic geology and physical geology. His research there was mainly on the use of stable isotopes in determining the origin of groundwater, coastal brines and gypsum soils. Returning to the Institute of Nuclear Sciences he will continue stable isotope work on ore deposits and geothermal systems as well as examining the possibility of using similar techniques to determine the source and migration patterns of oils.

Dr Michael G. Sklash, on sabbatical leave from the University of Windsor, Windsor, Ontario, Canada, is visiting New Zealand for four months to work on catchment hydrology using geochemical and isotope techniques.

During the first two months he collected samples from two Forest Research Institute catchments near Reefton; one in beech forest, the other having been logged and replanted in radiata pine four years ago. He will analyse the samples for deuterium at the Institute of Nuclear Sciences, to investigate differences between the catchments in the transmission of rainfall from slopes to stream.

CHRISTCHURCH

Both DSIR (Chemistry) and Wheat Research Institute are settling in to their new facilities in the Ilam Research Centre on the university campus. DSIR reports total chaos at present. The Centre is to be officially opened next year and an article will appear in a later Journal issue. Two staff members are transferring from the Water Section at Gracefield to the National Water Centre based at the Research Centre. They are *Dr Richard Grasse* and *Geoff Mills.*

CONFERENCES

Plasma Proteins: Synthesis and Secretion
14-17 April 1984, Hanmer Springs, joint ABS/NZBS Specialist Meeting, topics include: Processing of Proalbumin, Compartmentation of Protein Synthesis, Biosynthesis and assembly of Fibrinogen, Role of Antichymotrypin, Molecular Cloning of Plasma Proteins, Synthesis of Plasma Proteins by Transformed Micro-organisms, Synthesis and Processing of Apolipoproteins.

Information from Dr I.C. Bathurst, Department of Clinical Biochemistry, Christchurch Hospital, Christchurch.

Trace Elements in the Eighties
6-8 August 1984, Massey University, enquiries to Max Turner, Soil Science Department.

NZIC and NZBS Annual Conference
20-24 August, Wellington. Enquiries to Graeme Gainsford, Chemistry Division DSIR.

IUPAC Physical Organic Chemistry Conference
20-24 August, University of Auckland. Contact Prof. Brian Davis, Chemistry Department.

OVERTASMAN

Deformation, Failure and Strengthening of Polymers
Seminar 23-25 May 1984, Monash University. Contact RACI Polymer Division P.O. Box 224 Belmont, Victoria 3216, Australia.

OVERSEAS

Asian Chemical Conference
29-31 March, Kuala Lumpur. Offers of papers on (a) Environment (b) University-Industry Interaction (c) Chemical Industries are requested urgently by the Organising Secretary Dr M. Mohinder Singh, PO Box 10150, Kuala Lumpur, Malaysia. Dr Singh will extend an official invitation to NZIC members who wish to contribute to this Conference which is a project of FACS (Federation of Asian Chemical Societies) of which NZIC is a member.

PAC CHEM 84
International Chemical Congress of Pacific Basin Societies
16-21 Dec. 1984 Honolulu. (See also Council News in this issue). The congress will include a 2½ day symposium on "Spectroscopic Techniques in Inorganic Chemistry". Contact Prof. I.S. Butler, Centre National de la Recherche Scientifique, Laboratoire de Chimie de Co-ordination, 205, Route de Narbonne, 31400 Toulouse FRANCE.

Milk Proteins 84
7-11 May 1984, Luxemburg. Contact Congress Secretariat, P.O. Box 399, 5201 AJ's-Hertogenbosch, The Netherlands.

IUPAC SPONSORED
Chemrawn 3 World Conference on Resource Material Conversion, The Hague, 25-29 June. "(Bio-) Chemical Process Bridges to meet Future Needs." Enquiries to QLT Convention Services, Keizersgracht 792, 1017EC, Amsterdam, The Netherlands.

International Symposium on Zeolites
3-8 September. Enquiries to Prof. Bojan, Dr Zaj, Boris Kidric, Institute of Chemistry, P.O. Box 380, Hajdrihova 19, 61001 Ljubljana, Yugoslavia.

8th International Congress on Catalysis
2-6 July 1984 Berlin. Contact DECHEMA 8ICC, P.O. Box 970146, D-6000 Frankfurt am Main 97, Fed. Rep. of Germany.

International Symposium on the Chemistry of Natural Products
9-14 July, Poland. Contact Symposium Secretariat $^{c}/_{o}$ Institute of Bio-organic

Chemistry, Polish Academy of Sciences, ul Noskowskiego 12/4, 61-704 Poznan, Poland.

International Conference, Analytical Chemistry in Development
21-24 Aug. 1984, Sri Lanka. Contact The Secretary, Organising Committee, CARD, Department of Chemistry, University of Colombo, P.O. Box 1490, Colombo 3, Sri Lanka.

Fifth International Conference on Organic Synthesis
27-30 Aug. 1984, Freiburg. Contact GDC, Abt. Tagungsorganisation, P.O. Box 900440, D-6000 Frankfurt am Main 90, Fed. Rep. of Germany.

Ninth International Conference on Raman Spectroscopy
27 Aug-1 Sept. 1984 Tokyo. Contact IXth International Conference on Raman Spectroscopy, c/o The Chemical Society of Japan. 1-5 Kanda-Surugadai, Chiyoda-ku Tokyo 101, Japan.

GENERAL NEWS

CHEMICAL PROCESSES IN NEW ZEALAND — VOLUME 2

The Editor is now seriously starting work on volume 2 and is looking for volunteers to participate in writing articles. Many articles in volume 1 involved a chemistry school teacher and a professional chemist writing up a particular process together. Where possible the editor would like to follow the same practice for volume 2. Thus he is asking for teachers and appropriate professional chemists to offer their services to consider the following topics. In some cases some background material has been collected and can be sent to volunteers.

If you can help please write to:
Dr J.E. Packer
Chemistry Department
University of Auckland
Private Bag
AUCKLAND

Topics (not already underway)
Fruit industry, Bile acids, Alcohol from whey, Wool scouring and grease processing, Fractionation of Tall Oil, Extracts from Bark, Chlorine Production, Domestic chlorine products, Environmental (Health) Laboratory, Geothermal chemistry, Battery manufacture (lead storage & dry cell), Fire prevention, Insect control, Anodising, Paints and Pigments, Dry cleaning, Nail polish, Geological chemistry, Printing Inks, Soft drink manufacture, Adhesives, Car products & undersealing, Photocopying, Antiseptics and Disinfectants, Textiles

DR WEISS TALKS ON SCIENCE PLANNING AND EVALUATION

Following his delivery of the key note address to the New Zeal;and Institute of Chemistry Annual Conference in Hamilton Dr D. Weiss spoke to an invited audience in Wellington on the subject of "Planning and Evaluation in Science." This talk was arranged through National Research Advisory Council at the suggestion of Dr D.E. Wright and drew a widely representative audience from Government departments and the business sector.

Dr Weiss is the current President of the RACI and heads the Planning and Evaluation Advisory Unit of CSIRO. The talk was held in a pleasant informal atmosphere in the NRAC Conference Room.

The main theme of the address was the emphasis on accountability and the needs for checks and balances within the individual CSIRO divisions. Dr Weiss made it clear that his group works at divisional level and does not deal with individual programmes or projects. He commented that, to his surprise, he has been unable to find this type of broad strategic planning existing anywhere in the world.

He pointed out that in securing an acceptance of the planning concept there must be full consultation and the process must be iterative. As in most countries, resources available in Australia must be conserved and effort must be directed carefully and with the full backing of the top executives of CSIRO.

In outlining the magnitude of the task he indicated that there are some 400 programmes within CSIRO and it has been necessary to set up groups to examine the individual science and technology needs. These groups aimed to report on the major issues, to state the underlying assumptions involved and to prepare an agreed statement for each sector.

He commented on the absolute need for research to be seen as being used locally and to have sound economic overtones.

Members of the National Research Advisory Council commented that the talk was helpful and, indeed, timely because NRAC is proposing to have a National Science and Technology Plan completed and in use as a basis for Government science expenditure by the beginning of next financial year.

N.Z. WATER SUPPLY AND DISPOSAL ASSN.

The above Association held its Silver Jubilee conference at Waikato University 30 Aug.-1 Sep. The Associations' strength is its multidisciplinary composition where operators, chemists, biologists, engineers get together from Government, Local Bodies, Regional Water Boards, Universities and manufacturing and supply companies.

At the AGM, *David Ogilvie*, Head Scientist (Water) with the Auckland Regional Authority was elected President.

Previous Institute Members who have been President of the Association are *M. Rands* formerly Chief Chemist of AFFCO, *Dr M.E.U. Taylor*, MWD Water & Soil Research Director;

GENERAL NEWS

continued

and *C. Denmead*, formerly Head of the Wastes Section MIRINZ.

Membership enquiries are welcome at the Association's address, Box 4088 Hamilton.

HEAVY METALS IN THE NZ AQUATIC ENVIRONMENT

Dr D.G. Smith (Ministry of Works and Development) is compiling a review of heavy metals in the New Zealand aquatic environment. The review aims to cover published and unpublished data with special reference to the relationships between levels of metals in the physical environment and levels in biota. It is hoped to identify gaps in the data pool and recommend studies to fill them. The implications for water management will be gauged and appropriate actions recommended.

The envisaged Chapter headings include:

Sources of Heavy Metals; Chemistry and Biology of Heavy Metals in Natural Waters and Sediments; Criteria and Standards employed for Various Water Uses; Analytical methods; Environmental Levels of Heavy Metals; Main Problem Areas; Research Needs; Management Implications/Systems.

The review will be published in the Water and Soil Miscellaneous Publication Series, hopefully towards the end of 1984. The main contributors will be *Dr Smith*, *Paul Kennedy* (Auckland University) *Dr Mike Larcombe* (Bioresearches) and *Dave Haden* (Cawthron Institute). Contributions have also been requested from a variety of likely sources throughout the country. The information required is analytical data on heavy metals in New Zealand fresh and marine waters, industrial effluents (including aerial emissions), sediments and biota.

Readers who feel they have same relevant information, but have not been directly contacted for a contribution, should forward it to Dr Smith at Water and Soil Division, Ministry of Works and Development, PO Box 12041, Wellington. Information on the analytical methods used, analytical quality assurance procedures, caveats as to the reliability of the data, sampling site/time/method etc should also be included.

ASPECTS OF POLYMER SCIENCE COURSE COMPLETED

The Polymer Group has just completed their biennial "Aspects of Polymer Science" course at the Auckland Technical Institute with the usual enthusiastic support of industry keeping interest high. The chairman of the group, *Neil Edmonds*, has taken up a 1 year exchange of duties with *Rob Shaw* of West Cumbria College in England. During his absence the Polymer group will be in the capable hands of *Rodney Norris*, of the Chemistry Division, DSIR Auckland.

HAMILTON AWARD 1984

The Hamilton Award is for scientific research carried out in NZ or the islands of the South Pacific over a five year period. The papers from this 5 year period must include the first investigation published by the author. Nominations, at least two copies of the relevant publications and a supporting statement should be sent to the Executive Officer, The Royal Society of NZ, Private Bag, Wellington by 31 December 1983.

COVER STORY

MACSYM 150

A powerful 16-bit system designed for measurement and control from the outside in.

The Macsym is based on Intel's powerful 8086, the most widely used 16-bit microprocessor in the world. For even more speed, the 8086 works in tandem with Intel's 8087 math co-processor. Instead of tying up the 8086 CPU with arithmetic (+, −, ×, ÷) or transcendental (sin, cos, log, etc) functions, the Macsym 150 shifts math calculations to the 8087 hardware, and so it can process data up to 100 times faster than single processor systems.

The basic Macsym 150 has 256K RAM expandable to 1 Megabyte on board, plus one 5¼ 320K floppy disk expandable to 10 Megabyte if a Winchester hard disk is used. Display can be monochrome or R.G.B. colour with easy-to-use graphics (640 × 240 × 8 colours).

Communications options are via IEEE-488, RS-232, RS-422, RS-423 and 20mA loops. 100 Series real world I/O cards can be fitted to the six slots in the rear of the Macsym 150. Data acquisition rates exceed 1,000 samples per second (when the 200 Series remote I/O front end is used, the sampling rate is increased to 33,000 samples per second burst mode).

The programming language is Macbasic 3 (an enhanced version of Basic) compiling programmes incrementally, line by line, as they are entered. As easy to use as Basic, it is much faster with the execution speed of a compiled language like Fortran, Pascal or PL/1.

The wide range of I/O cards allows the Macsym to be connected directly to a number of sensors in the field, or to various analysers and transmitters.

The Macsym is ideal for laboratory and research applications. Macsym 150's are currently to be used in New Zealand in research and development (for industrial processes), in data acquisition and evaluation in direct industrial applications, and in industrial control software development.

The Macsym 150 is a product of ANALOG DEVICES of Norwood, Mass., U.S.A., who have been represented by W. Arthur Fraser Limited for many years.

W. Arthur Fisher Limited maintains a Digital Systems Group to support micro-processor based products, both in terms of hardware and software.

For further information, circle 5 on the reader reply card.

NEW PRODUCTS

HPLC Connections

ALLTECH announce the availability of their new Direct Connect Universal Column Adaptor, which connects virtually any HPLC column to the instrument in just seconds, without bulky unions or additional connect tubing. The direct connect adaptor consists of a double sided Vespel ferrule/thread combination fitted inside a large, knurled stainless steel holder. This takes the place of the stainless steel nut and ferrule normally used to connect the column to the instrument. Since the Vespel ferrule does not bite into the tubing, it will move freely, adjusting to any stop depth. The adaptor is double sided; male on one side, and female on the other, allowing the adaptor to be simply turned around for different fittings. Finger tightening produces a leak-proof seal to 5000 psig. For further details circle 6 on the reader reply card.

New C18 Column

ALLTECH's new VERSAPACK C18 HPLC column packing has similar characteristics to uBondapak C18, exhibiting the same selectivity and giving comparable results. VERSAPACK C18 is demineralized, has proprietary ultra-high temperature silanization ensuring minimum silanol activity, is completely endcapped, and has a unique particle shape which reduces back pressures by 40% over comparable irregular shaped particles. For further details circle 7 on the reader reply card.

GC Detector Elements

GOW-MAC INSTRUMENT CO., through their New Zealand distributors, ALLTECH ASSOCIATES N.Z., can furnish replacement detector elements for most Gas Chromatography instruments, including Beckman, Hewlett-Packard, Perkin-Elmer, Philips, Pye Unicam, Tracor Varian Aerograph. Full details are given in Bulletin SB-13, available from ALLTECH ASSOCIATES NZ or by circling on 8 the reader reply card.

NEW PRODUCTS

A UNIQUE BAKERBOND CHIRAL PHASE^{TM} (DNBLeu) HPLC COLUMN

A unique BAKERBOND Chiral Phase^{TM} HPLC column has been introduced by J.T. Baker Research Products. It is comprised of high enantomeric purity (*R*)-N-3, 5-Dinitrobenzoyl-L-leucine *covalently* bonded to specially treated 5-micron aminopropyl silica.

Recent studies by W.H. Pirkle and his colleagues at the University of Illinois indicate that this covalent chiral column is especially suited for separations of racemic mixtures of benzodiazepines and other similar pharmaceutical isomers. With this class of compounds, separation factors were improved 100% versus those obtained with other commercially available chiral phases and significantly lower capacity factors were additionally achieved. Further investigations on the capabilities of this chiral phase column are currently underway.

The BAKERBOND column is 4.6 x 250 mm and is offered as product number RP-7115-0.

Local agents: KEMPTHORNE MEDICAL SUPPLIES LIMITED, for further information circle 9 on the reader reply card.

HPLC PACKAGING GUIDE

Sci-Med (NZ) Ltd announce the publication of Technical Notes 1 "Commercial HPLC Packings — A Comparison", published by HPLC Technology Ltd.

The document describes in detail differences between the various HPLC packing materials commercially available. Comparisons between irregular and spherical, silicas, reverse phase, bonded phases and ion-exchange are made. Brief discussion is made of the 300A, 3 micron, ion-chromatography and chiral. Full technical details are given for the various materials.

Whether you are using self-packed or prepacked columns, careful choice is essential to ensure the best column packing for a particular application. For further information circle 10 on the reader reply card.

Bruce Fraser of Sci-Med with Shimadzu chromatography equipment at the Hamilton Conference in August.

New Gas Chromatograph from Hewlett-Packard

A new low-priced, high-performance gas chromatograph (GC) has been introduced by Hewlett-Packard Company.

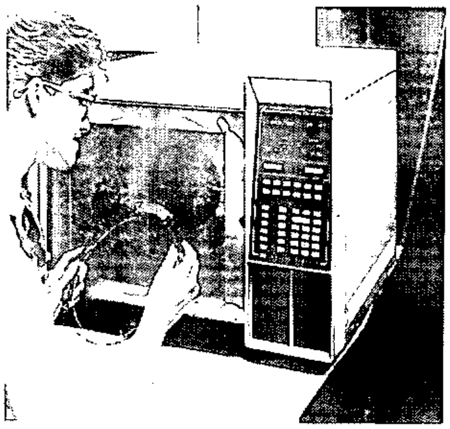
The HP 5890A GC is targeted primarily for routine chemical-analysis applications requiring research-grade results. These applications might include quality control, batch processing, methods development and educational research. Principal market areas include the pharmaceutical, chemical, petrochemical, foods and flavours, cosmetics, bioengineering and environmental industries.

Equipped with features normally found on gas chromatographs priced at NZ$20,000 or more, the HP 5890A has flow sensing; single-column compensation; bi-directional digital communications; power-fail protection; and service diagnostics, including a built-in test plot.

Other features include a packed-column injection port; split/splitless, split-only and on-column capillary inlets; and flame-ionization (FI); thermal-conductivity (TC); nitrogen-phosporus (NP) and electron-capture (EC) detectors.

The new single-column, thermal-conductivity detector (TCD) further enhances the performance capability of the new GC. Initially introduced for use with the HP 5880A GC, the single-filament, fluidic-switching design has been refined in the HP 5890A to a single-column TCD.

Users may choose packed and capillary columns or the new larger-diameter, thick-film, open-tubular HP Series 530u columns. These columns provide the inertness, durability and reproducibility of fused-silica capillary columns but offer high capacity — comparable to 3 to 5% loaded, packed columns. The columns can be used with the packed-column injection port with flow rates of 10-40 millilitre/minute and eliminate the need for complex capillary inlets. On-column injection with standard syringes can be made directly into the Series 530u columns installed in the HP 5890A.



Operational simplicity was a major consideration in every design aspect of the HP 5890A. The functionally organized keyboard permits quick performance of basic operations such as setting oven-programme parameters and heated-zone temperatures. The alphanumeric display also provides instrument status on a continuous basis.

Due to the reliability and serviceability improvements engineered into the HP 5890A, HP can offer customers a guaranteed uptime service contract of more than 99% for this newest member of HP's GC family.

For further information, contact the New Zealand distributors for Hewlett-Packard, Northrop Instruments and Systems Ltd, or circle 11 on the reader reply card.

N.Z.I.C. CHROMATOGRAPHY GROUP CAPILLARY COURSE

A three day Capillary Gas Chromatography Course was held at the Waikato Technical Institute 22nd-24th November, 1983. This began with an introductory lecture by *Peter Robinson*, and then participants were set the task of installation of a splitter and column. Installation of Scot Glass Capillary Columns proved to be a job for the expert!

The second day began with a lecture on injections and injection technique by *George Zabkiewicz* and this was the theme of that day's practical session. A later discussion and meal at a local Chinese Restaurant proved most enjoyable.

The final day was spent investigating effects of samples sizes, carrier and make-up gases and column types.

The strong emphasis on practical experience by the course was welcomed by the 15 participants. This course would be recommended to anyone intending to use capillary G.C., or improve their capillary G.C. technique.

N.Z.I.C. CHROMATOGRAPHY GROUP BASIC GC COURSE

November 15th, 9am, Waikato Technical Institute saw the beginning of the third N.Z.I.C. Basic Chromatography Course.

Each day would start with a one hour lecture by *Peter Robinson* followed by a two hour practical session. Several representatives promoting Chromatographic equipment also participated in these sessions. Techniques emphasised included optimising gas flow rates, column packing, temperature programming — generally how to optimise and maintain your G.C. and how to evaluate samples.

In the afternoon a one hour lecture with *George Zabkiewicz* would be followed by another two hours of practical teaching.

The 24 participants all seemed to enjoy it and not in the least the dinner outings or wine, cheese and discussions evenings.

The course was oriented towards practicalities and definitely recommended for current users and starters on G.C.

NUTRITIONAL FATS & OILS SPECIALIST GROUP

This recently formed Specialist Group of the N.Z.I.C. had its first meeting on the 15th November. The meeting was a joint lecture with the Nutrition Foundation and the guest speaker was *Dr Klaeui* of Roche Products who gave a most interesting talk on the nutritional application of Vitamins.

Future topics for lectures and seminars will include Evening Primrose Oil and Orange Roughy Oil. All those interested in keeping up with the activities of the Specialist Group contact *L. Eyres* at Abels Ltd.

Membership now numbers at 39 people and the group hopes to attract members from Industry, the Universities and Government Research Organisations.

INDUCTIVELY COUPLED PLASMA SOURCE MASS SPECTROMETRY

Contributed by:
Max Hall

Advanced Electronics Limited

Introduction

The ICP-MS appears likely to become an important new analytical instrumental technique. It provides the most significant benefits in those applications where rapid isotope measurements and/or highly accurate multi-elemental analysis in "difficult" matrices is required. Significant market demands is apparent in the following areas:

Life Sciences
Exploration Geochemistry
Environmental Sciences
Large general purpose analytical laboratories

Operating Principles

Plasma source mass spectrometry links together two well developed tools already familiar to analytical scientists, the plasma torch and the mass spectrometer.

The combination has been developed into a sensitive, selective, convenient and rapid analytical tool by Alan Gray of the University of Surrey and Alan Date of The Institute of Geological Sciences in London.

The sample under investigation is introduced, typically in solution, into the inductively coupled argon plasma at atmospheric pressure. The sample is rapidly dissociated and ionised and the resulting atomic ions are analysed in a high performance quadrupole mass spectrometer.

This technique has several important advantages over conventional mass spectrometry.

The sample is introduced into the plasma at atmospheric pressure as a solution, via a nebuliser, consequently sample handling techniques are very simple. There is no need for the vacuum locks, long delays, and exhaustive sample preparation stages customary in high vacuum techniques. It is therefore practical to analyse samples very rapidly with a high level of automation. Furthermore, after sample introduction, equilibrium is reached in a few seconds and entire spectra can be recorded in about one minute. After sample introduction ceases the ion signal drops rapidly. It is possible to process samples at the rate of about one every two minutes, which is much faster than conventional multi-element mass spectrometric techniques and compares favourably with other analytical methods.

The plasma torch produces ions that are almost entirely atomic and mostly single charged; this results in mass spectra which are particularly easy to interpret. No background peaks arise from impurities in the vacuum system of the mass spectrometer although background signals from the plasma gas and water in the solutions are seen.

The technical accomplishment which has made possible the development of ICP-MS is the interface between the atmospheric pressure, high temperature environment of the plasma and the vacuum, room temperature environment of the mass spectrometer.

In this interface atomic ions produced in the plasma are sampled through a water cooled aperture and are transmitted by means of a lens system with high efficiency into a quadrupole mass spectrometer.

The Plasma Torch

An ICP torch forms the basis of the ion source.

Samples enter the central channel of the plasma as a finely dispersed mist which is rapidly desolvated and vapourised. At a temperature exceeding 8000K vapourisation and dissociation are virtually complete during transit through the plasma core. Elements with a first ionisation energy less than 10 eV are fully ionised. Doubly charged ions are observed for elements with second ionsiation energies below 15.76 eV, which is the ionisation energies for Ar+. No higher ion species are seen. Energy spread of ions at the mass analyser is about 7 eV. Molecular ions are formed during extraction between argon and its impurities and water and these form the background spectrum. Analyte species only occur in molecular ions as a few percent of monoxide for a small number of elements.

Sample introduction is usually achieved with a crossflow nebuliser which is the most common way of introducing solutions into the plasma. Under certain circumstances it is also possible to use slurry samples if high accuracy is not required. An aerosol is formed from the sample with drops typically a few microns in diameter and transported in argon carrier gas into the plasma. Typical sample uptake rates are between 1 and 4 ml/min.

Two further methods of sample introduction may be used.

Hydride generation

This option enables improved sensitivities to be selectively obtained with the following hydride forming elements As, Bi, Pb, Sb, Se, Sn, Te and can also be used for ultrasensitive analysis of Hg.

Electrothermal vapourisation

Electrothermal vapourisation is used for liquid, or sometimes solid samples, which are placed onto a carbon rod that is progressively heated by passing a large current through it from a programmed power supply. The sample is first desolvated and then vigorously heated to evaporate the elements of interest. These are swept into the plasma by a stream of argon carrier gas.

Ion Extraction

Ions are extracted from the central channel of the plasma flame through sampling apertures of cooled copper or nickel cones. A molecular beam is formed in the first vacuum stage, at a pressure of about 1 torr, and passes through a 1 mm diameter skimmer in to the high vacuum stages containing the ion optics and the quadrupole mass analyser.

The Mass Spectrometer

A quadrupole is used as the ion analyser which has been specifically optimised for use with the plasma source. It operates at a high scanning speed that allows data on the entire mass range to be acquired in fractions of a second.

Data Acquisition

Ions are detected by a high gain, single channel electron multiplier. Fast ion counting is used to acquire data from the spectrometer in order to utilise the inherent sensitivity, linearity and dynamic range of the rest of the system.

The electronics package includes a pre-amplifier, amplifier/discriminator, high speed counter and fast histogram data store. Final data manipulation and display is performed by a computer system.

Isotope Ratio Measurement

Isotope ratio determinations are important experimental probes which are useful in many, widely ranging, application areas. However, their more widespread use has been severly restricted through the limitations of the existing analytical techniques. It has been apparent for some time that there is a very strong demand for a general purpose instrument with good cost/performance characteristics. ICP-M5 allows, for the first time, the measurement of isotope ratios for many applications in a rapid and cost-effective manner. Furthermore, the technique utilises analytical methods which are simple enough to give reliable results in non-specialist laboratories. It should be stressed that, since separation techniques are not required in the sample preparation, it is possible to determine the isotope ratios of many elements effectively simultaneously.

Precision

For solutions at concentrations of about 10 ug/ml and lower the observed precision values are determined by counting statistics. In practice this means that relative standard deviations on isotope ratios for major isotopes can be determined better than 1% in a few minutes. For solutions at higher concentrations there is an experimentally observed limit to the precision at levels of 0.1% for most elements.

Limit of Detection

Detection limits for most elements in aqueous solution are below 1 ng/ml (3 sigma blank equivalent concentration) when the nebuliser is used for sample introduction. In general this is somewhat better than in ICP Optical Emission. However, for the halogens (other than fluorine) the alkali metals, and the heavy metals, the detection limits are significantly better.

Inductively Coupled Plasma Source Mass Spectrometry was developed as a practical analytical technique by A.L. Gray and Alan R. Date under a research contract funded jointly by the Institute of Geological Sciences (NERC) and the Commission of the European Communities (DG XII).

REFERENCES:

1. A.L. Gray and Alan R. Date, *Int. J. Mass Spect. and Ion Phys., 46* 7,(1983).
2. Alan R. Date and A.L.Gray, *Int. J. Mass Spect. and Ion Phys., 48,* 357,(1983).
3. Alan R. Date and A.L. Gray, *Analyst, 108,* 159,(1983).

For further information, circle 12 on the reader reply card.

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For further information circle 13 on Reader Reply Card

NEW PRODUCTS

Sulphur Gas Analysis

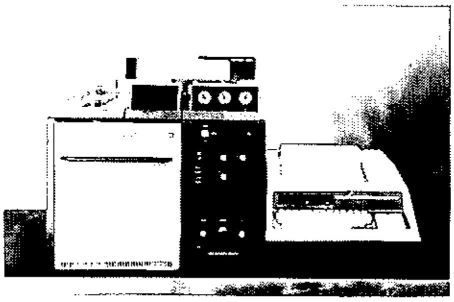
Pye Unicam have developed a purpose-designed version of their well-proven PU 4500 modular gas chromatograph family to meet the need for analysis of sulphur gases in the low parts per million concentration. The instrument joins a rapidly increasing series of dedicated instrumentation being launched by the company.

Sulphur gases such as H_2S, COS, SO_2, the mercaptans and sulphides are closely monitored in various industrial spheres.

In many modern chemical processes, like the new OXO route to organic aldehydes, they are undesirable because they can rapidly poison the precious metal catalysts used, and must therefore be removed.

On the other hand, the alkyl mercaptans in particular are friends to the gas engineer and the public, because with their unique and unmistakable smell they can be added as 'safety' odorants to natural gas, which has no smell of its own.

The PU 4500 sulphur gas analyser is designed to analyse traces of these gases in the most efficient manner possible. It is fitted with the highly sensitive Pye Unicam flame photometric detector, which is specific to sulphur compounds.



Special-grade PTFE piping, used throughout the analyser, eliminates problems arising from metal surfaces absorbing the sample components and preventing accurate quantitative analysis. Each instrument is supplied complete with a PTFE column, optimised for the particular gases of interest to the customer, who can choose a manual or automatic gas sampling valve, with PTFE sample loop.

Other options widen the instrument's field of application. For instance heated valves can be included for sampling condensable gases and for column back-flushing to remove unwanted heavy components.

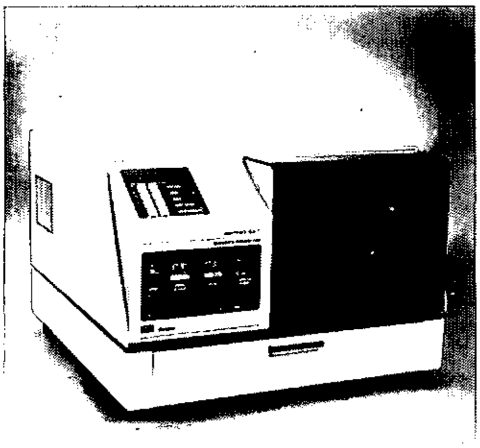
Automatic operation with timed event control, together with accurate and repeatable data handling is provided for by a CDP4 computing integrator, supplied as an integral part of the package.

For further information, circle **14** on the reader reply card.

New Waters HPLC System

A fully integrated high performance liquid chromatography system designed for reliable, repetitive analyses is being introduced by Waters Associates.

Waters QA-1^{TM}Analyzer is an easy-to-operate, fully automated HPLC system designed to perform repetitive analyses unattended 24 hours a day with reproducible results. The new 340 series analyzer allows operators to easily set and lock in system parameters with a special method cartridge which can be re-set at any time. Operators simply load up to 96 samples, set the number of samples to be analyzed, and press the start button.

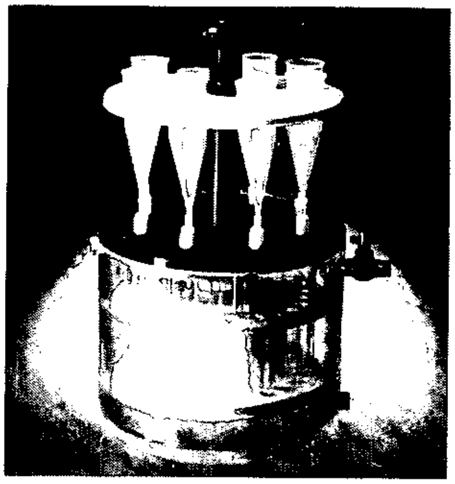


In addition, the compact system accepts any HPLC column or cartridge, takes up half the bench space of a conventional HPLC system and provides a permanent record of results.

For more information about Waters new 340 Series QA-1^{TM}Analyzers and other products contact Alphatech Systems Ltd, or circle **15** on the reader reply card.

MULTI SAMPLE PREPARATION

Waters Associates new Sep-Pak Cartridge Rack enhances the speed and ease of sample preparation and clean-up using Waters SEP-PAK Cartridges. The combination of the SEP-PAK Cartridge Rack and SEP-PAK Cartridges form the most versatile sample preparation and clean-up system available for many analytical techniques such as: HPLC, TLC, RIA, GC, UV, GC/MS.



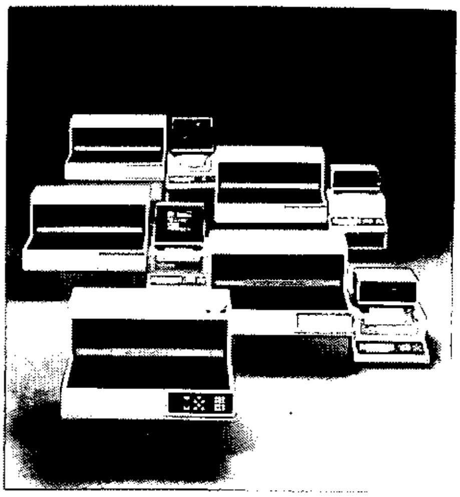
The unit allows simultaneous preparation of up to 8 samples. You can extract, fractionate and collect up to 3 fractions from your sample in seconds. Typical sample clean-up time is 75% faster than traditional methods, taking around 3-5 minutes. Solvent consumption can be reduced up to 90% compared to liquid extraction methods. Recoveries are typically greater than 90% with accuracy unmatched by traditional methods. Local agents: Alphatech Systems Ltd, circle **16** on the reader reply card.

BENCHTOP LIQUID SCINTILLATION COUNTERS

Beckman Instruments, Inc.'s new LS 5800 Series Liquid Scintillation Counters offer multi-user capability, versatility of sample handling and simplicity of operation. The modularly designed benchtop systems are used in research laboratories in universities and colleges, industry, government and hospitals.

There are five models in the series — the LS 1800, LS 2800, LS 3800, LS 4800 and LS 5800. The new Versa-Rack^{TM}Sample Changer provides racks, standard vials and miniature vials with a sample capacity of 336 to 648 depending on the mix of vials used.

Instrument features include CRT or MARQUEE displays, select format for data output, Two-Phase Monitor, Random Coincidence Monitor, interrupt, H# with Automatic Quench Compensation and Quench Compensation Factor, spectrum search and RS 232C output.



Accessories for the LS 5800 Series include a Single Photon Monitor and special application PMTs. Beckman also offers a complete line of cocktails and vials for use with the instruments.

Local agents Alphatech Systems Ltd, for further information, circle **17** on the reader reply card.

Watson Victor agents for JASCO

Watson Victor Limited have obtained the "JASCO" Analytical Instrument Agency, allowing them to compliment their product range, particularly in the areas of UV/VIS and lower cost I.R.

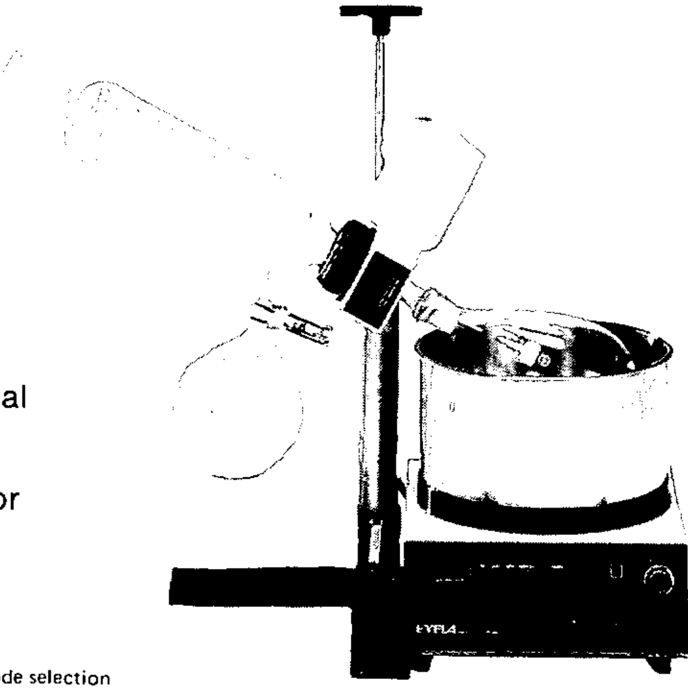
The Japan Spectroscopic Co., Ltd, "JASCO" is a pioneer in the manufacture of infrared spectrophotometers. As well as I.R. Spectraphotometers, JASCO's analytical instrument range includes UV/VIS spectrophotometers, instruments for fluorescence, emission, absorption, optical rotation, circular dichroism and Laser Raman.

If you have an interest in any of these fields, please contact WatVic for further information, or circle **18** on the reader reply card.

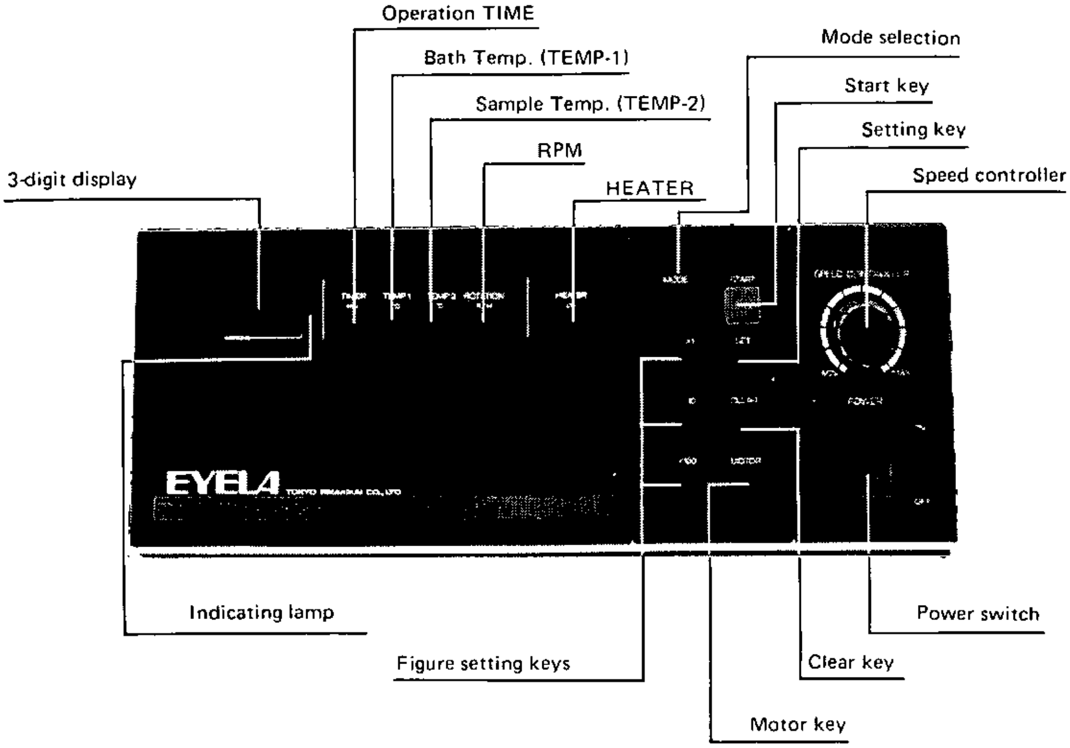
NEW

FROM EYELA

the NE Series of rotary vacuum evaporators.



- ★Microprocessor controlled with digital display of preset and actual conditions.
- ★Unique action jack for effortless raising and lowering of evaporator assembly.
- ★Unit complete with water bath/control module.



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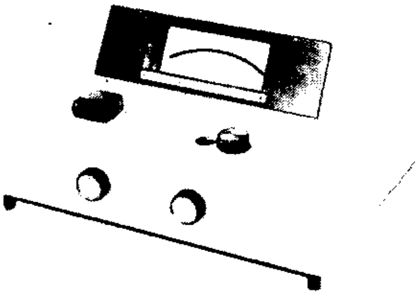
For further information circle 19 on Reader Reply Card

NEW PRODUCTS



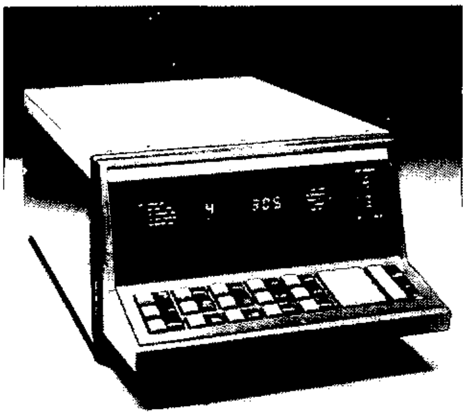
Spectronic Spectrophotometers

Smith Biolab are agents for the well known Spectronic Spectrophotometers. Ranging from the low-priced Spectronic 20 to the ditigal UV/Vis Spectronic 21 model UVD, these instruments are renowned for performance at low cost.

For further information, circle 20 on the reader reply card.

NEW DIODE-ARRAY UV/VIS CHROMATOGRAPHY DETECTOR WITH PROGRAMMED WAVELENGTH SCANNING

Analysts using liquid chromatography are offered new problem solving methods by a new diode-array multichannel detector just announced by Pye Unicam.



PU 4021 intelligent ultraviolet/visible detector combines the latest advances in UV/VIS spectrophotometry with the powerful separation medium of HPLC. It is a simply operated, compact keyboard instrument giving the chromatographer choice of detection on two different wavelengths or pre-programmed scanned-wavelength detection over a range of wavelengths — all backed by a host of microprocessor-based supporting facilities.

Whilst a conventional variable-wavelength UV detector can be tuned to only one wavelength at a time, and wavelength 'scanning' is thus only possible laboriously and using considerable skill, the PU 4021 enables an operator to select a whole program of up to nine different wavelengths on which the instrument will monitor consecutively, automatically changing wavelength at pre-programmed times. A vast quantity of information can thus be accumulated in one single operation, not only saving time, but with significantly improved precision especially when examining unstable compounds.

The automatic wavelength scanning system is based on a linear array of UV/VIS-sensitive photo diodes, sampled by a high-speed, microprocessor controlled scanning system which surveys the whole array many times each second. The stored charges on these diodes are thence switched sequentially to form the detector output.

A 'summed absorbance' feature enables the operator to select the wavelength band-width over which the diode outputs are scanned (up to 200 nm). Using this method of scanning the detector can be programmed to monitor a sample where the absorbance maxima of the component compounds are unknown.

Spectrum store and plot routines are other features which add further sophistication to the PU 4021. In place of the cumbersome conventional technique of stopping the flow in order to perform spectrum scanning, the operator can easily acquire UV and visible spectra at any point on a peak as it passes through the detector flow cell.

Hard-copy results on a chart-recorder or printer-plotter can be obtained simply by pressing a 'plot spectrum' key. By this means either all or any selected spectra can be plotted out at the end of the run.

An 'absorbance ratio' facility provides an excellent means of quantitatively assessing peak purity. This section of the software operates on any stored spectrum and calculates the ratio of absorbance values corresponding to any two selected wavelengths. The ratio is output as a digital display on the front panel.

An RS232C interface option provides for full computerised control, using the Pye Unicam PU 4850 video chromatography control console or any small laboratory or standard personal computer.

A full program of self-test diagnostics, including video fault indication and signature analysis facilities, completes the PU 4021's impressive array of user-orientated features which extend to easy servicing — right down to component level.

For further information, circle 21 on the reader reply card.

HPLC APPLICATION NOTE: CEREAL PROTEINS

J.T. Baker Research Products now offers a BAKERBOND^{TM}HPLC application note of interest to chromatographers and chemists in the agricultural and food industries: "Reverse Phase HPLC of Cereal Proteins".

The note contains technical data on the methodology and analytical conditions used, plus the actual "trace" obtained, with the BAKERBOND Wide_pore^{TM}C_{18}HPLC column for a sample of gliadin proteins.

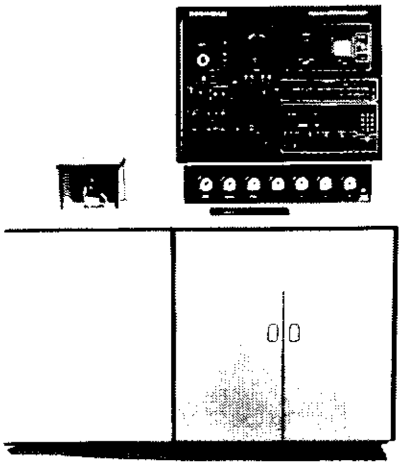
The chromatographic "fingerprint" of over 50 cereal proteins shown in the note illustrates the usefulness of Baker's large diameter, octadecyl-bonded HPLC column for identifying different cereal grain types and then predicting their utility in bread-making and the like.

To obtain a free copy of the cereal protein application note, contact Kempthorne Medical Supplies Ltd or circle 22 on the reader reply card.

PROTEIN/PEPTIDE SEQUENCER

Beckman Instruments, Inc.'s System 890M Protein/Peptide Sequencer automatically converts ATZ amino acids to PTH amino acids for analysis on an HPLC system. Sensitivity is down to 200 picomoles over 20 cycles. The system offers a wide dynamic range of sensitivity, from micro-sequencing of picomole quantities to the analysis of large nanomole samples.

Microprocessor control provides ease of programming, storage of up to eight programs, precise replication of every program command and linking and switching of programs.



System 890M enables sample application subroutines, reduced cleavage times and double coupling programs. The user can select manual or fully automatic operation.

An integral cold trap efficiently condenses reagent and solvent vapors. This feature eliminates the contamination of vacuum pump oil by volatile vapors.

Local Agents Alphatech Systems Ltd, for further information circle 23 on the reader reply card.

APOLOGY

We draw readers attention to P.123 October issue, Watson Victor Advertisement, 'Tomorrows Technology Today'.

1st line of bold type should read — Nicolet S—100: *not S—199.*

We apologise for any inconvenience this error may have caused.

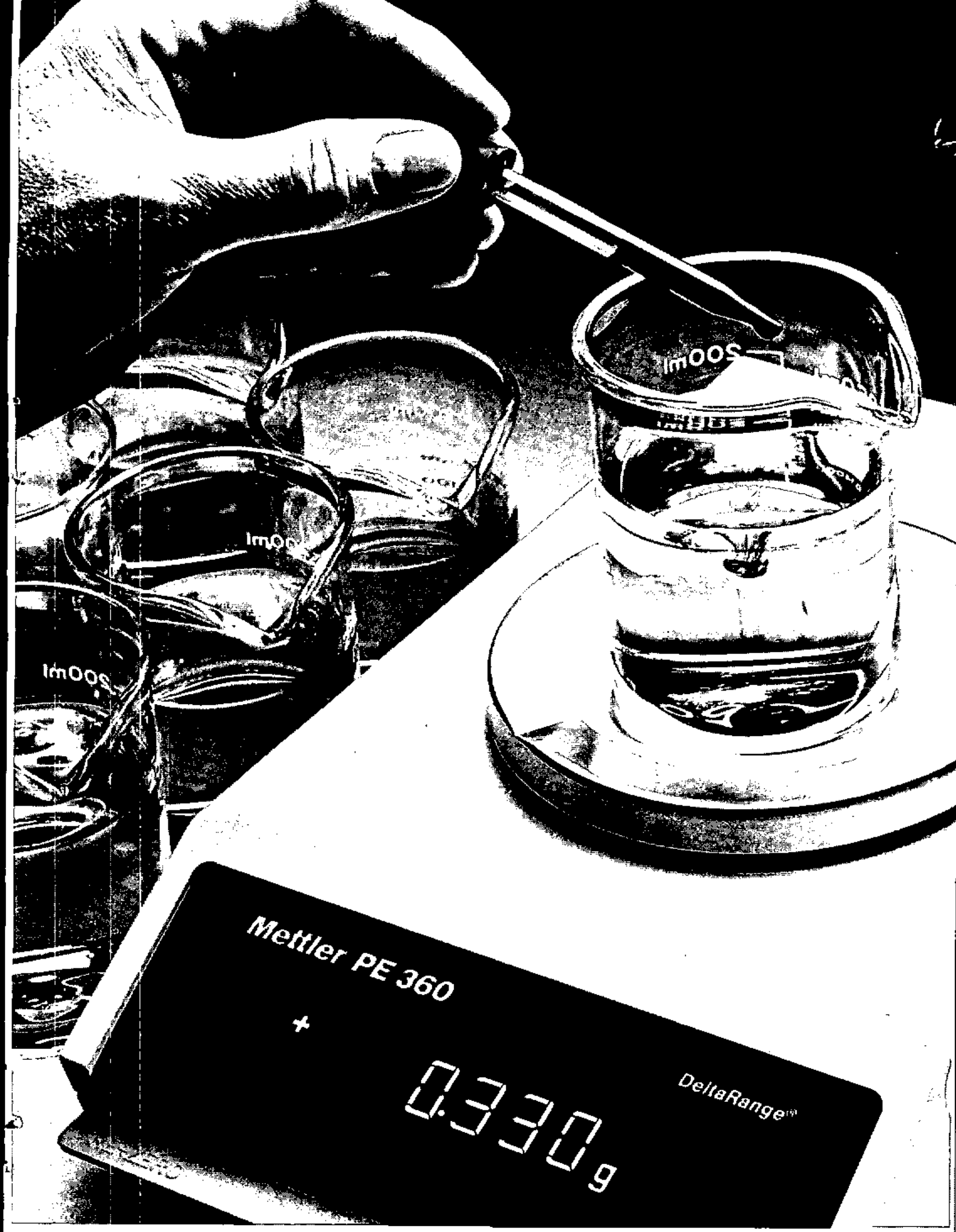
Crossword Answers

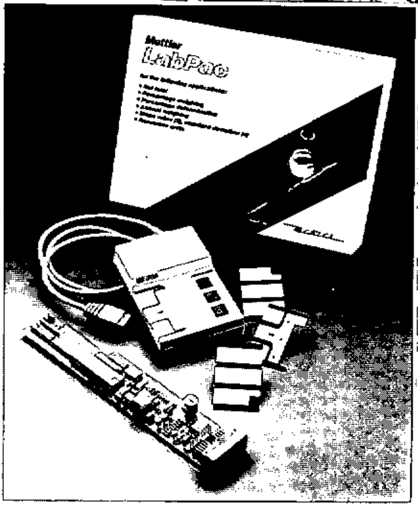
ACROSS

1 Fluoresce, 8 Diluent, 9 Lab, 10 Eder, 11 Trifen, 13 Tracer, 14 Frit, 17 Fat, 18 Rhodium, 19 Carcinoma.

DOWN

2 Lallemantia, 3 Ores, 4 Esters, 5 Californium, 6 Edge, 7 Oban, 12 Ferric, 13 Tuff, 15 Temp, 16 Horn.





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The PE LabPac also incorporates a data output, which allows you to interface with computers and other peripheral equipment.

LabPac interfaces with the new PE balances.

There are six new balances in Mettler's PE series. Readability ranges from 0.001 g to 0.1 g and capacities go up to 6000 g.

Each of the new PE balances features automatic calibration, a microprocessor controlled integration cycle and DeltaDisplay, which allows you to hit target weights quickly and accurately.

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

For further information circle 49 on Reader Reply Card

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