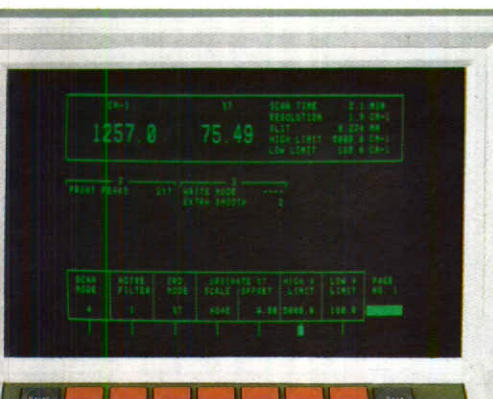


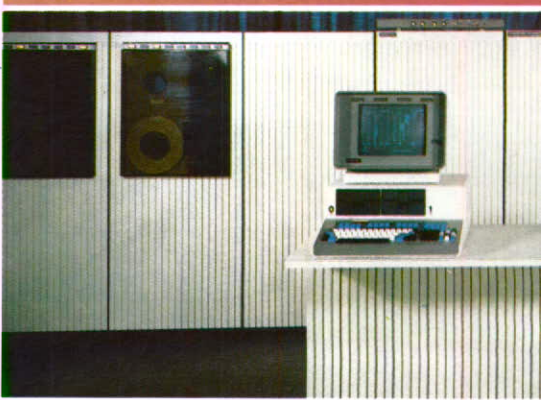
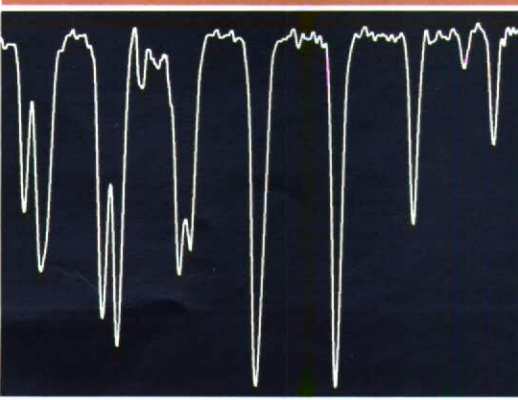
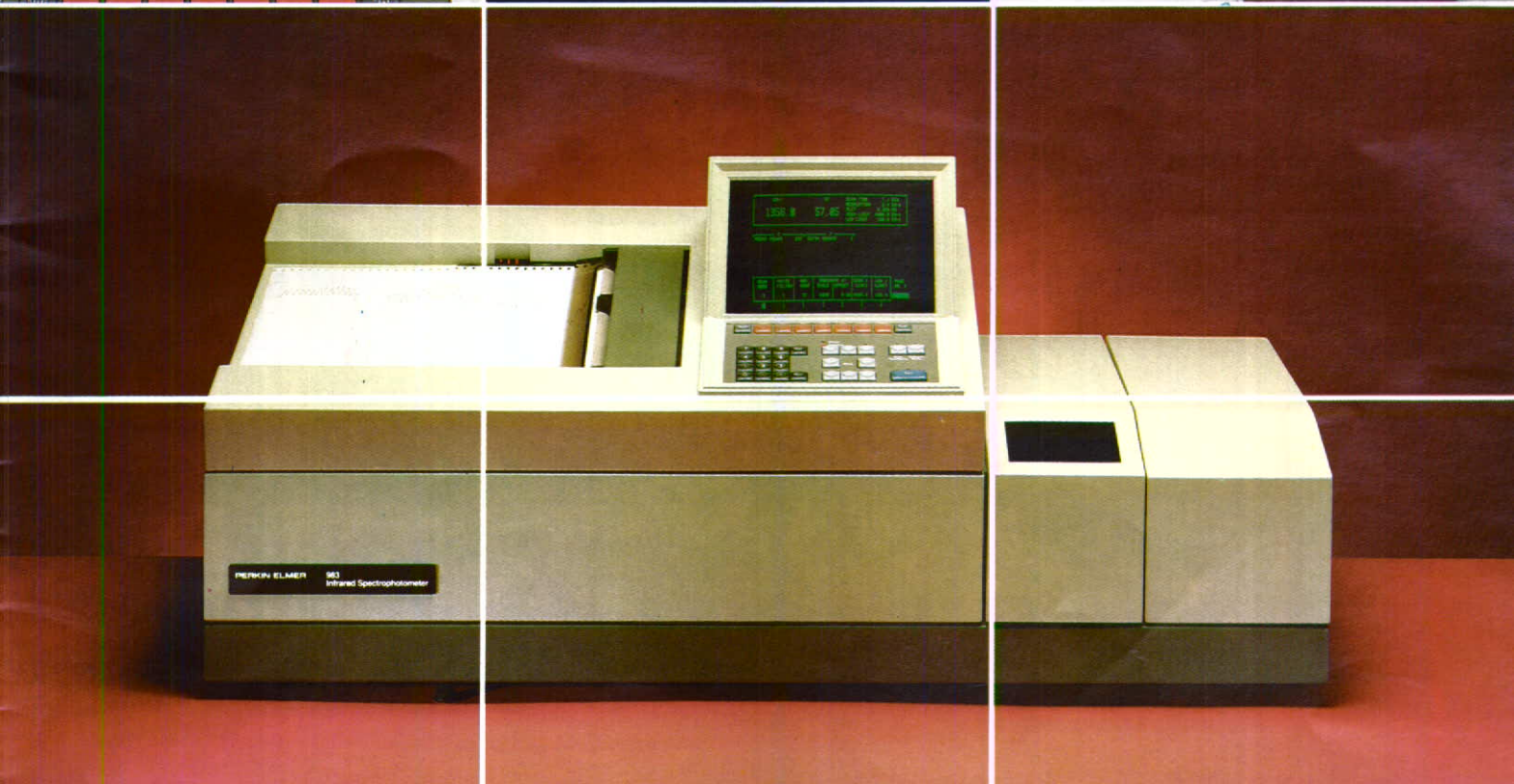
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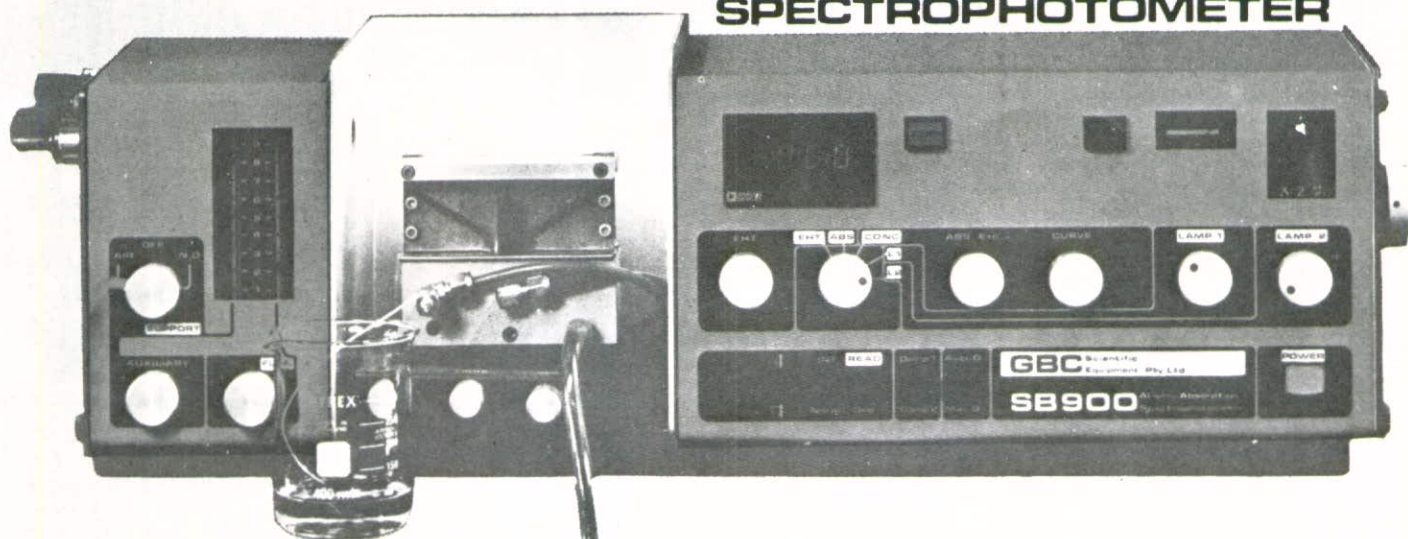


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CONTENTS

Guest Editorial

An assistant director general of the Department of Scientific and Industrial Research, Dr G W Butler, has supplied this issue's guest editorial dealing with marine exploitation26

Marine Geochemistry of Trace Elements: A Perspective

A member of the Department of Chemistry at the University of Otago, Keith Hunter, discusses the marine geochemistry of trace elements in the ocean28

Council News33

Marine Chemistry in New Zealand

Dr Geoff Glasby of the New Zealand Oceanographic Institute of the DSIR in Wellington, has carried out a review of marine geochemistry being conducted in the New Zealand region.35

Branch News40

University News40

Government Departments41

Obituary — Frederick George Soper42

General News43

The Sceptical Chemist44

New Products44

People48

Conferences48

Seminar48

Letter48

Conference Registration Form Insert

Challenges presented by marine exploitation

The world's marine resources are a challenging and fascinating field of study because they comprise one of the less well understood portions of our global heritage and because they have considerable potential for careful exploitation.

Thus the natural products chemist literally drools as he considers the interesting range of chemical compounds already known to be present in marine organisms and contemplates how much is still to be elucidated.

I recall an evening spent in New Jersey 10 years ago visiting Dr Bill Taylor — one of Professor Briggs' graduates of the immediate post-war era — when Bill showed me a handsome publication on natural products and the marine species in which they are found and speculated on the novel compounds which await discovery.

The biochemist also has fascinating fields to explore. For example the levels of biomass production are governed by the processes of nutrient cycling and the identification of which nutrients are limiting.

The delineation and understanding of the variations in primary productivity in the oceans is of great interest in relation to identifying zones with greatest fishing potential on a sustainable basis.

There are many unusual topics, such as the basis for luminescence in marine organisms, the adaptations which permit the accumulation of some elements to high levels in particular organisms and the luxuriant growth of strange organisms close to tectonic plate boundaries using chemotrophic energy.

The exploitation of marine resources offers many challenges to the applied chemist. Thus the prevention of corrosion of metallic structures is vital for ships and off-shore installations. The recovery of minerals and oil from the sea floor requires the development of specialised technology.

Particular care must be taken to prevent pollution of the marine environment and careful chemical monitoring is required, especially in enclosed seas and estuaries. The industrial pollution of the Baltic and Mediterranean Seas over the last 40 years are examples which emphasise the need for greater care in future.

The food technologist is concerned with the retention of nutritional and functional qualities in fish tissues and in ensuring the absence of substances deleterious to human health such as ciguatera toxin, mercury or high levels of long-chain wax esters.


If resources like the crustacean krill are to be exploited, then improved processing procedures to give marketable products must be developed. Food products such as alginates and carrageenans from seaweeds will be utilised to a greater extent.

With a long coast-line and responsibility for management of an exclusive economic zone of oceanic waters with an area 13 times the area of New Zealand, it is certainly appropriate that our chemists should accord the subject of marine chemistry high priority.

G.W. Butler



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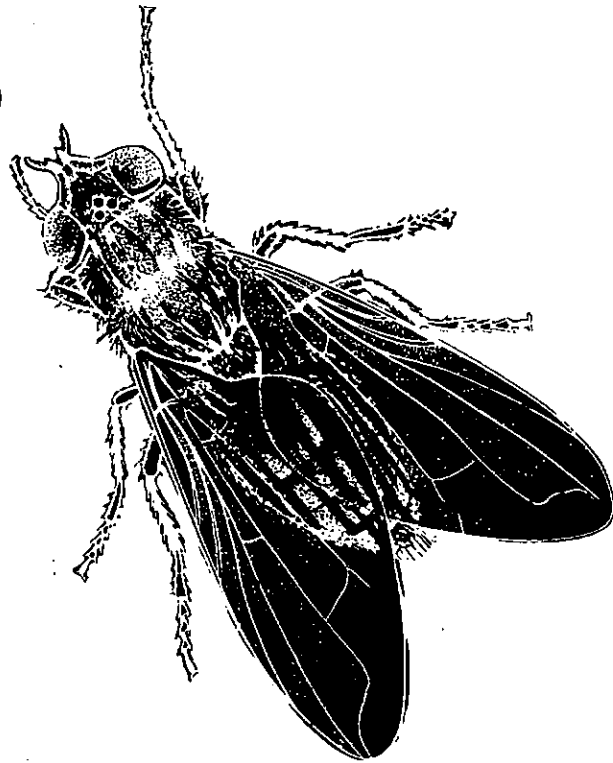
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Dr G.W. Butler is an assistant director-general at DSIR. He graduated from Auckland University and Lund University in Sweden, specialising in physical chemistry and plant biochemistry respectively. He worked at Plant Chemistry Division in Palmerston North from 1953 till 1965 on nitrogen and trace element metabolism in pasture plants and the relationship of this to ruminant nutrition. He directed Plant Chemistry and Applied Biochemistry Divisions from 1965 until 1974, when he moved to his present position. He is responsible for policy development in primary production, biological resources, human health and the environment.

He is a fellow of the Royal Society of New Zealand, the Institute of Agricultural Science of New Zealand and the Institute of Chemistry.



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Marine geochemistry of trace elements: a perspective

K.A. Hunter

Department of Chemistry, University of Otago

There is currently much worldwide attention devoted to understanding the geochemical behaviour of trace elements in the ocean. At least part of this interest may be traced to a need to understand the effects of toxic trace elements on the marine environment.

For any element, this requires knowledge of the transformations that take place between its different chemical and physical forms in the ocean, since these dramatically affect its availability and toxicity to marine organisms^{1,2}.

For the marine chemist, trace elements are a fruitful object of research because they are invariably the most reactive substances to enter the ocean and their study provides insight into the major oceanic processes influencing the behaviour of chemical substances^{3,4}.

In the field, the parameters important to the control of trace element behaviour cannot easily be varied at will by the experimenter, nor can they be realistically modelled in the laboratory. The conventional approach has been to make use of the systematic changes in different parameters provided by nature herself.

The spatial distribution in the ocean of the different forms of an element provides clues as to the inter-conversions taking place between these forms. When this is combined with a knowledge of mass transport and mixing rates based on various physical measurements, it is possible to deduce the rates of these transformations and to assess the magnitude of the sources and sinks influencing the element distribution^{3,4}.

This type of experimental approach depends critically on the absolute accuracy of analytical data. Because of the problems that accompany trace analysis of an electrolyte like sea water, which has an enormous range of potential interfering substances, the development of suitably sensitive methods of analysis has become one of the main tasks facing marine chemists today^{5,6}.

It is now certain that the quality of most analytical work involving trace elements carried out on sea water and related environmental materials, leaves very much to be desired.

It is only during the last few years that reliable data have been consistently obtained and any real progress made in understanding the oceanic behaviour of trace elements⁵⁻³². The story of this progress contains many salutary lessons for all analytical chemists who study trace substances. It also makes clear the alarming fact that most of our present understanding of man's effect on the marine environment is based on meaningless information.

There are, of course, many trace or minor components of sea water whose behaviour is well understood³. These are without exception substances for which there are known to be no major problems of analytical accuracy.

Studies of these substances suggest that there are only a limited number of distinct geochemical or biological processes that can influence the distribution of dissolved substances in the ocean. Thus there ought to be many similarities in the behaviour exhibited by different chemical species.

Our present understanding of these processes is based largely on the vertical distribution in the ocean of similarly-behaving dissolved materials. This is because the rate of horizontal mixing in the sea is much greater

than in the vertical direction, producing much smaller concentration gradients.

Six types of behaviour based on depth-concentration profiles are presently recognised:

- (a) relatively constant composition as a result of low geochemical reactivity, with a distribution influenced only by dilution effects of runoff, precipitation, ice melting (e.g. Na, K, Ca, Mg, Cl, Br, SO_4^{2-});
- (b) mid-depth maximum caused by injection at spreading ridge crests (^3He);
- (c) mid-depth and near-bottom depletion caused by adsorption on suspended particles (^{210}Pb , ^{210}Po);
- (d) near-bottom enrichment caused by diffusion from sediments into overlying water (^{222}Rn , ^{226}Ra , ^{228}Ra);
- (e) surface water depletion and deep water enrichment caused by involvement in the cycle of biological growth in surface waters, sinking of dead organisms and decay/dissolution at depth (P, N, C, Si, IO_3^- , Ba);
- (f) surface water enrichment through downward deposition from the atmosphere (^{210}Pb , Th, CO_2 , bomb nuclides); conversely depletion in surface waters as a result of escape into the atmosphere (^{222}Rn).

In studies made prior to the last few years, most trace elements failed completely to show any similarity to these well-defined categories of behaviour. As a result, marine chemists devoted considerable time and effort to devising elaborate explanations for their deviant behaviour.

The results of this period were also characterised by a wide degree of scatter and by significant differences between the data of independent investigators, further contributing to a general sense of confusion.

Results published over the last few years, however, show much greater consistency and have converged onto a much narrower range of accepted concentrations that is typically an order of magnitude lower than previously accepted values. This state of affairs is illustrated by the results shown in figure 1 for dissolved copper in surface sea water published over the last 60-odd years.

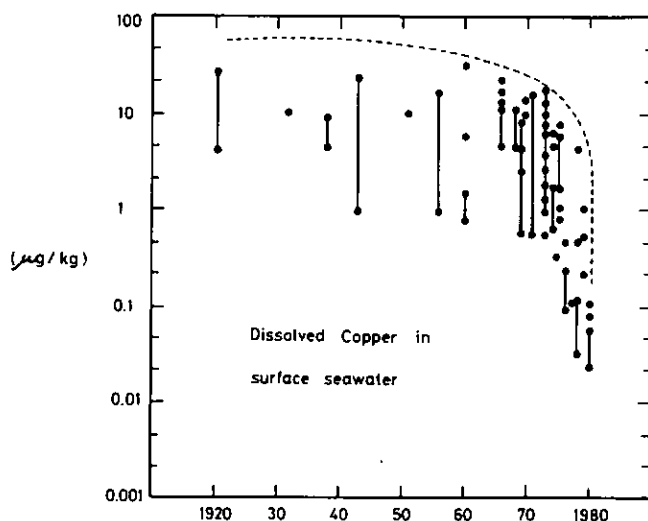


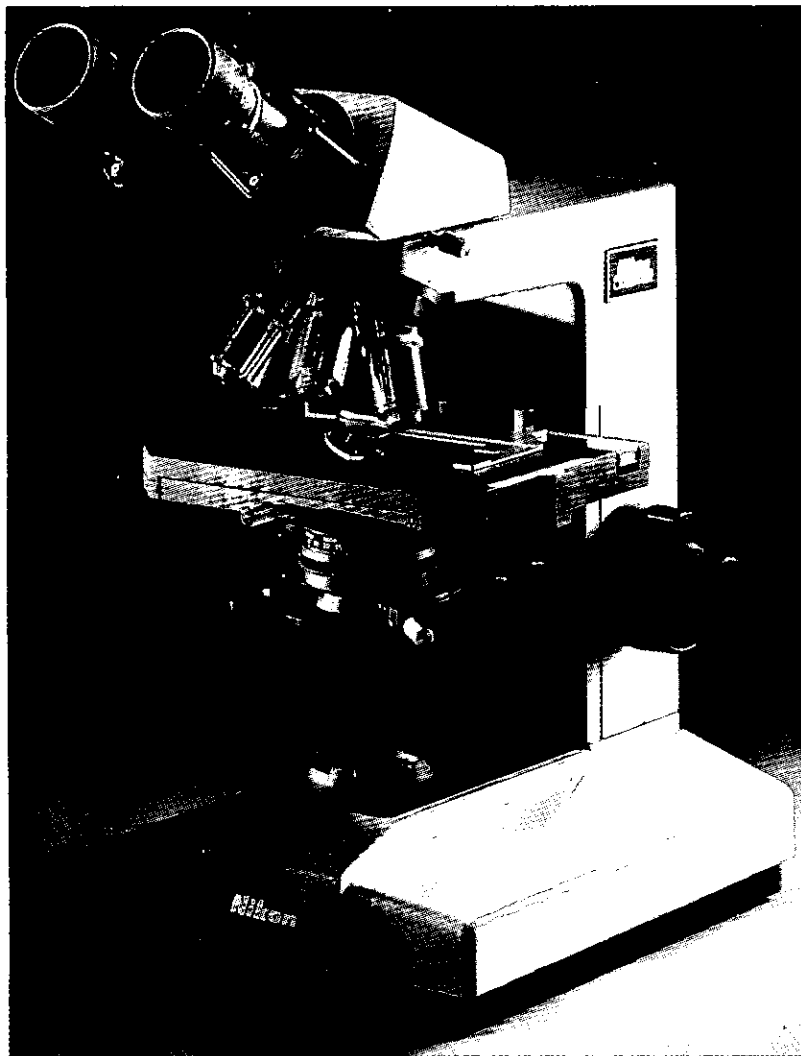
Figure 1: Published concentrations of copper in surface sea water over the last 60 years.

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A similar situation exists for most other trace metals that have been recently studied. Broadly speaking, the presently accepted concentrations of Pb^{5-8} , $Cu^{9-11,13,19,20,32}$, $Ni^{14,15,19,20,32}$, $Cd^{12,17,19,20}$, Zn^{18-20} , Hg^{29} , Se^{30} , Mn^{21-23} and Cr^{31} are at least a factor of 10 lower than most other published results.

The most important general conclusion to be made from this is that despite all the extensive precautions taken, the earlier studies must have suffered from gross contamination of samples prior to and during analysis.

Experience has suggested several sources for this contamination. Few materials conventionally used for sample storage seem to be suitable; glass and most plastics contain trace elements that are slowly leached into the sample during storage⁷. Handling of the sample in the field during and after collection allows further opportunity for contamination, because trace elements are continuously leaked out into the sea and the atmosphere by the ship, sampling equipment and the analyst himself (sewage, flaking paint, corrosion products, exhaust fumes, dandruff, fingerprints, lint, dust).

Many of these materials are highly enriched in trace elements and cause just as much difficulty back in the shore-based laboratory. In fact, the usual chemical laboratory is a regular cornucopia of airborne and surface contaminants.

Most of the recent work on trace elements in the ocean has been carried out in specialised clean laboratories with a filtered, laminar-flow air supply within which strict control of construction materials, clothing and lab procedures⁷ help to minimise sample contamination.

Recent experiences suggest that these advanced facilities and precautions are the bare minimum necessary for reliable analysis of trace elements in ocean water and related environmental materials. They do not however, guarantee reliable results. In particular, they do not remove the obligation to accurately assess the analytical blank arising from sources of contamination. This normally involves considerably more effort than the sample analysis itself.

Recent data for trace elements in the ocean from studies that meet these requirements, fall consistently into one of more of the behaviour categories already discussed, thus attesting to a reasonable degree of accuracy. The most common observation is a close correspondence between the depth profile of a trace element and those of one or more of the biological micronutrients: phosphate, nitrate and silicate. An example showing the close similarity in the behaviour of cadmium and phosphate for a deep water profile from the central North Pacific²⁰ is given in figure 2. In figure 3 are compared Cd and PO_4^{3-} measurements made by two independent groups of workers in several different areas of the Pacific Ocean^{12,17,19,20}.

The simple linear relationship between these two parameters probably extends to all areas of the world's oceans not affected by local Cd or PO_4^{3-} runoff and may be used to assess the reliability of future studies. Profiles of this general type (category 'e') have also been observed for Cu, Ni, Cr, Zn, Se and $Hg^{9-20,29-31}$. This indicates that there is a close similarity between the processes controlling the distribution of nutrients and many trace elements in the ocean.

The biological cycle of growth and decay which produces these characteristic depth profiles is one of the most rapid processes influencing the distribution of chemical substances in the ocean. It exercises complete control over the levels of plant nutrients and thus their availability for photosynthesis.

The basic features of this cycle are illustrated in figure 4 for phosphate. Sinking particles comprising dead surface organisms and their detritus transport 130×10^9 kg of P per year into deep waters, resulting in very

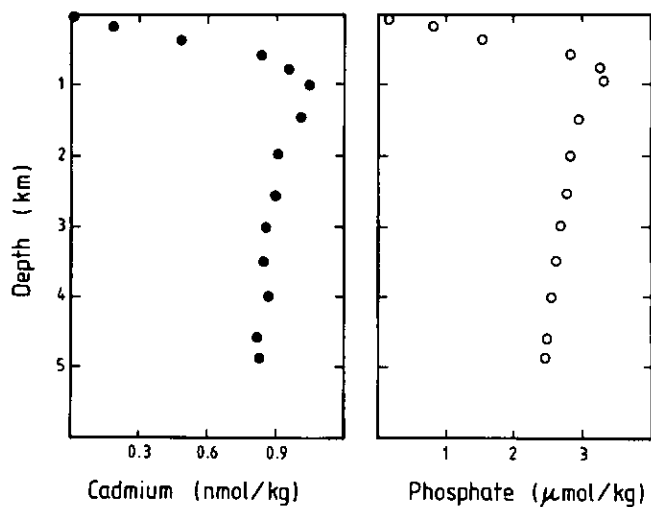


Figure 2: Depth distributions of dissolved Cd and orthophosphate in the central North Pacific. Redrawn from data in reference 20.

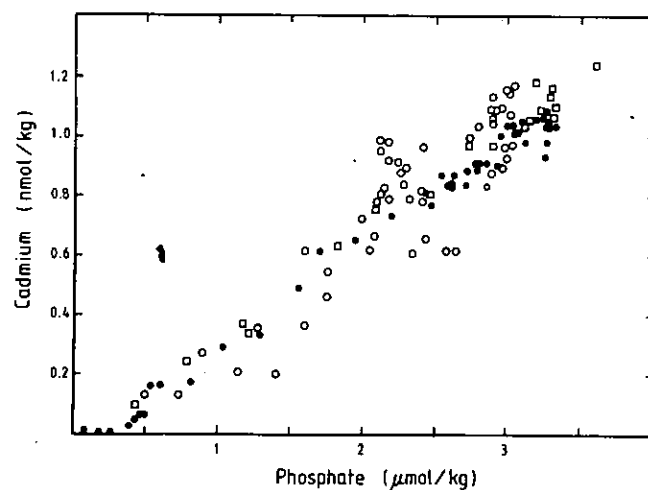


Figure 3: Correlation of dissolved Cd with orthophosphate for various oceanic water regimes (• reference 20, o reference 12, □ reference 17).

PHOSPHORUS CYCLE

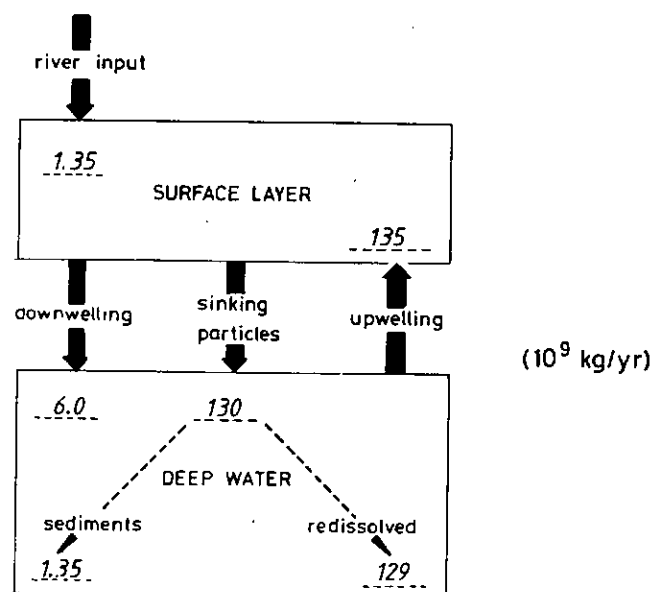


Figure 4: Phosphorus cycle in the ocean (fluxes expressed as 10^9 kg P per year). Adapted from reference 3.

low surface concentrations of PO_4^{3-} . All of the sinking material is slowly returned to solution by bacterial oxidation of organic tissue and dissolution of the hard parts (shells or exoskeletons). This gives rise to enrichment of PO_4^{3-} at mid-to-bottom depths. Only about 1 percent of the phosphorus transported in this way survives to become permanently buried in deep sea sediments. The rest is returned to surface waters either by diffusion or upwelling (in some areas of the ocean, deep waters are physically transported to the surface). This returning PO_4^{3-} completes the nutrient cycle. It is noteworthy that the cycle is a self-contained one; the small quantity of phosphorus contributed by rivers serves to balance the 1 percent removed annually to sediments³.

Like phosphorus, nitrogen is also associated mainly with the organic tissues of marine organisms. Thus the nutrient NO_3^- has a distribution generally similar to PO_4^{3-} . On the other hand silica is associated with the more refractory exoskeletons of diatoms and radiolaria. Accordingly, it is more slowly remineralised and has a deeper, more gradual depth profile³.

The correlation in figure 3 indicated that Cd is incorporated into the fleshy parts of surface organisms during photosynthesis and grazing. On the other hand zinc, which correlates with silica, appears to be incorporated into the harder parts of the organisms such as opal or calcite²⁰.

Some metallic elements do show mixed or more complicated behaviour. Nickel exhibits a shallow water regeneration cycle like that of phosphate in addition to a deep water cycle like that of silica, indicating at least two important Ni-bearing phases. Copper is characterised by removal in shallow waters in a similar way to phosphate²⁰ or nitrate¹³, complicated by intermediate and deep water scavenging by particles (category 'c') and near bottom injection from sediments^{19,20} (category 'd').

Recent oceanic profiles of lead show clear behaviour of category 'f', as they should if common Pb and radiogenic ^{210}Pb achieve complete isotopic mixing in the atmosphere⁸. These results also show the 30-fold contamination of remote areas of the global atmosphere by auto fuel lead pollutants that has been already documented for Greenland ice strata and lacustrine sediments^{7,8,25,26,27}. Manganese show almost unique behaviour in studies made so far²¹⁻²³. Its distribution is dominated by external sources of Mn (rivers, atmospheric dust, submarine volcanism and sediment resuspension) with only limited involvement in the biological cycle so important for the other trace metals.

Considering that most of these studies have been published only since 1978-1979, the progress that has been made in understanding the marine geochemistry of trace elements is startling. Very much more work remains to be done and the prospect for improving our understanding of ocean chemistry in this area are very bright. In the immediate future, it will be necessary to make similar studies of other oceanic water regimes in order to see how far the principles already found apply generally to marine systems.

New Zealand offers considerable logistical advantages for this type of research, since it is ideally placed for access to oceanographically significant areas of the world ocean (Antarctic Circumpolar Current, Subtropical Convergence). Moreover, much of the water, even close to the main islands, is largely unaffected by pollution, allowing study of essentially pristine systems.

During the last few years at the University of Otago, we have initiated studies of the marine geochemistry of several trace elements and now have a laminar-flow clean room devoted to this work. Most of our attention so far has been devoted to studying the behaviour of copper.

Results to date suggest that the characteristic behaviour of this element in offshore waters also extends to coastal regimes with one or two notable exceptions. In a semi-enclosed system like Otago Harbour, the diffusion of Cu from sediments dominates its distribution³². Although ter-



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restrial runoff is important in the cycles of Mn and Fe in coastal waters, it appears to have little effect on the Cu cycle outside areas that have a restricted rate of mixing with the main coastal water mass.

We do have some evidence, however, for the influence of this source on Cu surface water levels in the South Taranaki Bight obtained on a recent cruise of HMNZS 'Tui'. Figure 5 shows our collected results for Cu in surface and deep waters from that cruise, comprising almost 200 samples of water from the greater Cook Strait/South Taranaki Bight area³³.

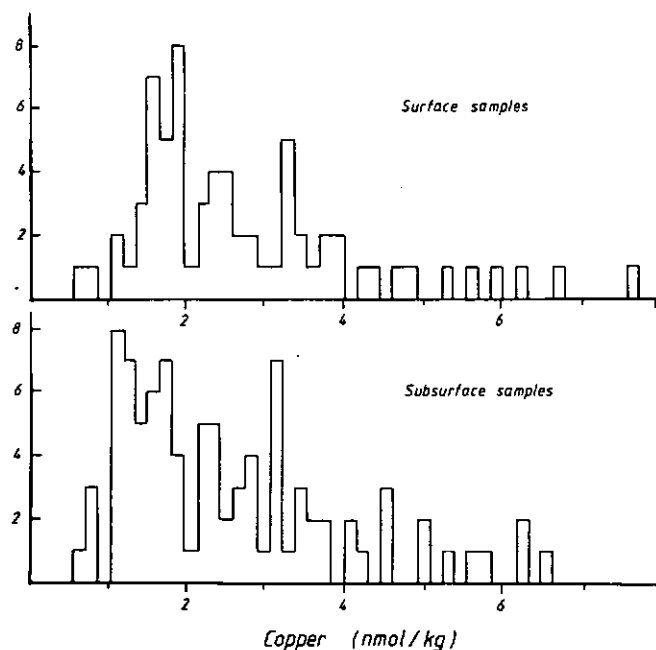


Figure 5: Frequency histogram of copper concentration in surface and deep waters of the South Taranaki Bight/Greater Cook Strait area (reference 33).

The majority of samples showed Cu levels in the same range as offshore waters^{9-11,15,18-20} indicating that enrichment of coastal water by any 'terrestrial effect' is minimal in these waters. Most of the higher concentrations are associated with localised enrichment of Cu, perhaps by runoff, or alternatively are a result of spurious sample contamination.

We experienced major difficulties in obtaining consistently uncontaminated deep water samples using conventional all plastic hydrographic samplers (Niskin type) and this accounts for many of the higher concentrations observed for subsurface waters. In future work we will be able to make use of more specialised sampling devices that have been developed for minimal trace metal contamination^{17,18}.

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Keith Hunter obtained his MSc in chemistry from the University of Auckland in 1973. As a Rutherford Scholar, he then studied under Dr P.S. Liss at the University of East Anglia, graduating with a PhD in marine chemistry in 1977. After a year as a research fellow in France, studying aspects of the chemistry of marine aerosols, he returned to East Anglia as a senior research associate working on the surface properties of suspended particles in estuaries. He took up his present appointment with the Chemistry Department of Otago in August 1979 and is now involved mainly in teaching analytical chemistry and also marine chemistry in the university's new MSc course in marine science. His present research interests include the marine chemistry of trace elements and the surface chemistry of suspended particles in the ocean.



Dr W S Simpson presided over full attendance at council's meeting in Wellington on February 9, welcoming the newly elected second vice-president, *Prof R D Batt* and also *Dr J H Garside*, Auckland, *Dr Joan McKenzie*, Otago and *Dr H J Percival*, Wellington, as new branch delegates.

Student Member Grade: council approved the changes in the rules required to establish the additional non-corporate grade of student member. These changes had been circulated to branch committees on December 23, 1981.

It is now the responsibility of branch committees to recruit student members possibly by appointing committee members to achieve this particularly amongst second year BSc and NZCS students. The subscription for student members is \$10. They will receive copies of the journal. On graduating BSc, or NZCS, student members must transfer to the appropriate grade for which they are then qualified. Members are asked to recruit student and other members.

The register published in the December 1981 issue of this magazine show only 21 technician and 44 associate members among a total of 1479.

Dr Simpson, in opening the meeting, suggested that council should attempt to identify and clarify for members and branches, issues of current and possible future concern. A high and broadly based membership of the institute in the profession is such an issue. The new grade of student member is designed better to provide for this.

Branch Subscriptions: council resolved that the principle adopted in August 1981 of a uniform branch subscription be endorsed. For the 1982/83 year the amount will be \$6.

Subscriptions: for the 1982/83 financial year beginning May 1, council resolved to raise subscriptions to \$44 for fellows and members, \$34 for associate members, \$26 for graduate and technician members and \$34 for local members. The corresponding figures for 1981/82 were \$36, \$26, \$18, \$20. If subscriptions are paid before the end of August a \$4 rebate is allowed.

An Auckland fellow or member will therefore pay before September 1982, \$40 including the \$6 branch fee, whereas in 1981 the corresponding payment was \$32 plus the \$5 branch fee — a total of \$37.

From the April 1982 issue "Chemistry in New Zealand" will cost \$1.50 a copy instead of \$1. This is a major but not the only increase in costs which the institute faces. The president stated that travel, telecoms and accommodation were significant items in the institute's budget, which were increasing more rapidly than the consumer price index.

Reference to p.186 December 1981 issue of "Chemistry in New Zealand" shows our subscription rates are considerably less than those in the UK, Canada and Australia.

The subscription for members overseas was set at 0.70 of the resident rate. With the rebate for prompt payment members and fellows will pay \$26.80.

Student Paper Competition: the Otago Conference Committee requested assistance in financing the costs of travel and accommodation for competitors in

the student paper contest. It was agreed to provide up to \$1000.

Chemex '82: council agreed to provide up to \$1000 for the Auckland branch to commission a professionally prepared stand at this exhibition to be held in Auckland, December 7 to 9 1982 in addition to the space rental. The possibility of incorporating the best chemistry exhibit from the National Science Fair in October is to be explored.

1982 List of Members: council agreed to publish a list of members in 1982 subject to sufficient advertising being received to cover the cost. Branches and members are asked to comment on the innovations in the 1981 list and to make suggestions for others.

Membership: *Dr E G Bollard*, currently president of the Royal Society of New Zealand and *Prof S R Siemon*, Melbourne, were elected honorary fellows.

Appointments: *D J Hogan* and *Mrs N E Wignall* were re-appointed as registrar and administrative secretary.

Dr A C Herd, Auckland Technical Institute, was appointed editor of "Chemistry in New Zealand" to succeed *S G Brooker*, who was congratulated on his second term of notable scientific journalism.

On the nomination of the Auckland Branch, *Dr A F Wilson*, New Zealand Forest Products, was appointed to the Membership Committee for the period January 1 1982 to December 31 1984 in place of *Prof A D Campbell*, who was thanked for his service. *Dr H J Percival* was reappointed NZIC representative on SANZ for a further two years.

Dr W A Temple (chairman), *Prof A D Campbell*, *Assoc Prof R M Grimmett* and *A N Scrymgeour* of the Otago branch are the new members of the Hazardous Chemicals Committee. The retiring Auckland committee, *A C Kennett* (chairman), *R H Hopgood* and *D J Ogilvie* were thanked for their work of considerable value to the public and the institute.

Drs H J K Powell (chairman), *J R Cretney* of the Canterbury branch and *J H Garside* and *A C Herd* of Auckland, are the new Publications Committee. Retiring chairman *Dr L Eyres* of Auckland and *S G Gray*, Dunedin, were thanked.

With the return of *Drs M Kingsford* (chairman) and *A F Wilson* to Auckland, the Wellington based Public Affairs Committee is now *Dr D M Bibby* (chairman), *Dr S I Smedley* and *G R Wright*.

Overseas Visitors: council approved \$400 towards the visit of *Dr John Faulkner* in March, returning from leave in Sydney to the Scripps Institute, La Jolla. Arrangements have since been made for the Auckland, Wellington and Manawatu branches to be visited by him. Local expenses it was considered should be borne by the branches. Council reaffirmed its policy that it did not pay travel costs for wives of visitors.

Although *Prof Rinehart*, USA, will not be coming to conference in Dunedin in August, a fellow countryman, *Prof Nelson Leonard* is expected.

Council agreed to provide \$200 towards the expenses of the visit of *Prof R G Bates*, University of Florida in June.

Subject to several conditions council was also prepared to assist to the extent

of \$200 to \$300 towards the cost of expenses within New Zealand of possible visitors, *Prof J Lewis*, Cambridge and *Prof Stone*, Bristol, who would be visiting Australia for an RACI Conference.

Prof J D McGee is to visit New Zealand in September-October as the Rutherford Memorial Lecturer.

Jubilee Conference: the report and balance sheet of the Jubilee Conference were tabled showing a profit of almost \$5700. It was agreed that \$1500 of this be sent to the Royal Society of New Zealand in repayment of its donation towards the cost of publishing "Chemistry in a Young Country" with a covering letter from the president.

Delegation to Standing Committee: with the agreement of the Membership Committee, council resolved to delegate to the Standing Committee of the Institute (president, general secretary and delegate from president's branch) the power to elect (1) graduate and technician members, (2) fellows, members and associate members, provided that the Membership and Standing Committees are unanimous.

Council also discussed the delegation to Standing Committee of financial authority up to certain limits for funding overseas visitors, publications and ad hoc requests. It is proposed to establish guidelines for the committee.

With the high cost of travel it is proposed to reduce council meetings from three to two per year in February and August (conference). Hence the need to establish principles for an executive secretariat to be developed from the present part time paid secretariat and Standing Committee for the business like handling of routine procedures and the prompt response to initiatives from branches and members.

AAVA — TCB Amalgamation: council was advised by the secretary of Authority for Advanced Vocational Awards, that its letter expressing opposition to a proposed amalgamation of the Authority with the Trades Certification Board was presented to a meeting of the Authority in November 1981.

A joint chairman of AAVA and TCB took up appointment in February 1982 and is to report to government in March on the feasibility of the suggested amalgamation.

Royal Society of New Zealand: *Dr Wright* (first vice-president) summarised the comments he had made on behalf of the Institute in support of the proposed changes in the status of agriculture in schools in New Zealand possibly resulting in amalgamation of three school certificate subjects into one.

The New Zealand Institute of Agricultural Science is to co-ordinate replies for transmission to the director-general of education.

Dr Wright also reported on a fellowship system under consideration and the purchase of a building into which the administration of the Royal Society will move, leaving the one in which the council meeting was held, for the library.

Federation of Asian Chemical Societies: *Dr Hnoosh*, president-elect of FACS and secretary-general of the Union of Arab Chemists, invited the president (or his representative) to attend the 7th Ara-

COUNCIL NEWS

bian Chemical Conference at Damascus March 28 to April 2 1982. Complete local hospitality was offered, but not air tickets.

The president has also received an invitation to a regional workshop on Chemistry, Industry and the Citizen to be held in Colombo, Sri Lanka, June 14 to 16 1982. The Institute of Chemistry, Ceylon, FACS and the Committee on Science and Technology in Developing Countries are the organisers. Members visiting Sri Lanka in June are asked to contact the president if they wish to take part in this workshop. Copies of the first issue of the FACS Newsletter have been received.

Penfold Report: at the request of the president, the Wellington branch has appointed the following Chemistry Syllabus Committee — *J B Butchers* (convenor), *W Freitag*, *D J Morrison*, *G Marwick*, *B A Milburn* and *Drs D C Weatherburn* and *C G Hughes* to report to council. The committee is to deal direct with the Department of Education and Universities Entrance Board, drawing their attention to the matters of concern in the Penfold Report and seeking a formally recognised involvement in curriculum development and other relevant matters.

RACI Green Paper: the president had sent to council and branches some notes to stimulate discussion on the role of NZIC in the 1980s, based on the RACI Green Paper circulated to council at the end of 1981. This summarises the work of the RACI's Institute Development Committee established in July 1980.

Dr Simpson invited *Dr Bibby*, chairman of the Wellington branch, who attended the morning session of the second day of council's meeting, to open discussion. This was wide ranging and constructive. Membership, publications, the Institute in public affairs and government, the promotion of the professional well-being of chemists, relations with other societies in New Zealand and abroad were some of the topics examined.

At the end of the day, the president, in summing up, urged that action flow from this discussion so that the Institute can be seen to be taking well thought through initiatives in making good use of members' enthusiasm, knowledge and subscriptions. He emphasised the concept that this action be through the branches and committees of council.

National Committee for Chemistry: during a short joint meeting of council with *Prof R C Cambie* (convenor) and *associate Prof P S Rutledge* (secretary), *Prof Cambie* outlined the work of the RSNZ National Committee for Chemistry which he said was better described as international. Its principal concerns are with international chemistry, particularly IUPAC of which *Prof A D Campbell* was elected a member of the governing body in 1981.

ELECTIONS

Honorary Fellows: *Dr E G Bollard*, president RSNZ, *Prof S R Siemon*.

Fellows: *Bowmaker*, *Graham Arthur*, BSc (Hons) PhD(Sydney) Chemistry Dept University of Auckland. (senior lecturer), *Carr*, *Malcolm David*, PhD(Lond) Chemistry Dept University of Waikato (reader), *Campbell*, *David Franklin*, BSc, Fraser High School, Hamilton (principal), *Daniel*, *Roy McIver*, BSc(Hons)

PhD(Leister) Dept of Biochemistry, University of Waikato (senior lecturer), *Devine*, *Carrick Erskine*, MSc(Cantuar) PhD(Otago). MIRINZ Hamilton (group leader), *Hooker*, *Ronald Owen*, BSc MNZIFST ANZIM. T J Edmond & Co Christchurch, (technical manager), *Locker*, *Ronald Harry*, MSc PhD(NZ) MIRINZ Hamilton (Biochemist), *Maclagan*, *Robert G A R*, BSc(Hons), (WA) PhD (ANU) Chemistry Dept University of Canterbury (senior lecturer), *Murdoch*, *John Douglas*, MSc(NZ) DipEd Cashmere High School, Christchurch (principal), *Naish*, *Geoffrey*, BSc Wellington Polytechnic (tutor), *Rosser*, *Maxwell John*, MSc(Monash) PhD(Auck) Kings College, Auckland (teacher), *Stevenson*, *Craig Douglas*, MSc(Well) PhD(Cantuar) Chemistry Div DSIR Gracefield (group leader), *Thom*, *Norman George*, BSc CEng MNZIE Dept of Health Auckland (regional scientist).

Members: *Brown*, *Mrs Catherine Clare*, BSc(Hons) (Otago) MNZIFST Cadbury Schweppes Hudson, Dunedin (chemist), *Fenemor*, *Dallas Ross*, MSc(Cantuar) Dept of Chemistry & Biochemistry, Massey University (PhD student), *Gopal*, *Pramad Kumar*, MSc(India) Dept of Biochemistry, University of Otago, (PhD student), *Haylock*, *Steven John*, BSc(Hons) (Massey) NZDRI Palmerston North, (research officer), *Lee*, *Hian Kee*, BSc(Hons) (Cantuar) Chemist Dept University of Canterbury (PhD student), *Nokes*, *Christopher John*, BSc (Hons) (Cantuar) Chemistry Dept University of Canterbury (PhD student), *Palmer*, *Kevin Charles*, MSc(Massey) NZDRI Palmerston North, (research officer), *Rogers*, *Donald Evan*, MSc(Well) Chemistry Divn DSIR Gracefield (scientist), *Rowan*, *Daryl Dryden*, BSc(Hons) PhD(Otago) Applied Biochem Div DSIR, Palmerston North, (scientist), *Sherriff*, *Robert Marshall*, BSc MNZIFST Cadbury Schweppes Hudson, Dunedin (industrial chemist), *Wilkins*, *David Joseph Henry*, LRSC. ATI Auckland (tutor).

Readmission as Members: *Carter*, *David Michael*, MSc(NZ) Dulux NZ Lower Hutt (technical manager), *Smith*, *David Glynn*, BSc PhD(Edin) Water & Soil Div MWD Wellington (scientist), *Sutherland*, *Mrs Gillian Patricia*, MSc(Hons) (Well) Science Information Div DSIR, Wellington (scientific editor).

Graduate Members elected as Members: *Betts*, *Anthony John* MSc(Auck) NZ Forest Products Auckland (industrial chemist), *Campbell*, *Dianne Raewyn*, BSc Dept of Medicine, University of Otago, (scientific officer), *Jameson*, *Paula Elizabeth*, BSc(Hons) (Cantuar) Botany Dept University of Otago (lecturer), *Lockhart*, *Kenneth Raymond*, MSc Otago Boys' High School, Dunedin (teacher), *McKeegan*, *Neil Stuart*, BSc(Hons) (Cantuar) Riccarton High School, Christchurch (teacher), *Mayer*, *Gregory Douglas*, MSc National Accelerator Centre, CSIR Pretoria, South Africa (research officer), *Monks*, *Simon Digby*, BSc Wellcome (NZ) Auckland (lab supervisor), *Schutt*, *Helene Anne*, BSc(Hons) (Cantuar) Chemistry Dept University of Canterbury (PhD student), *Sew-Hoy*, *Mrs Lim*, BSc(Hons) (Cantuar). Waitaki NZR Christchurch (works chemist), *Webley*, *Wayne Stephen*, BSc(Hons) (Otago) Chemistry Dept Univer-

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sity of Otago (PhD student), *Webster*, *Geoffrey Alan*, BSc 20 Tainui Drive, Havelock North, (analytical chemist), *Yeo*, *Khang Hong James*, MSc(Cantuar) Steroid Unit, Pathology Dept Christchurch Hospital (scientific officer).

Associate Member: *Goldsmith*, *John*, NZCS BP (NZ) Petone (chemist).

Technician elected as Associate Member: *Sidwell*, *David Ewart*, BSc Chemistry Dept University of Auckland, (technician).

Graduate Members: *Bradley*, *Mark Phillip*, BSc DipSci (Otago) Biochemistry Dept University of Otago (PhD student), *Dacombe-Bird*, *Paul William*, BSc(Hons) (Well), Pathology Dept, Wellington Hospital (scientific officer R & D), *Haines*, *Stephen Ray*, MSc(Well) Chemistry Dept, Victoria University of Wellington (PhD student), *Hewitt*, *Peter Lifford*, BSc NRM Feeds, Auckland (chief chemist), *Lyndon*, *Rex Murray*, BSc NZ Co-op Dairy, Hamilton (head of technical services dept), *Patel*, *Jayantilal Sukhabhai*, MSc(India), T J Spratt & Associates, Auckland (analyst), *Siddiqui*, *Ovais*, B Pharm Dept of Pharmacy, Medical School, Dunedin (graduate student), *Templeton*, *Matthew David*, BSc(Hons) (Otago) Dept of Biochemistry, University of Otago (PhD student), *Williams*, *Vincent Mark*, BSc(Hons) (Otago) Chemistry Div DSIR, Gracefield (scientist).

Technician Member: *Briggs*, *Paul Murray*, NZCS Rentokil, Auckland (chemist).

Deaths: *F G Soper* Hon Fellow Otago, *G W Stace* Auckland.

Resignations: *M A Gerritsen* (Manawatu), *R B Jansen* (Canterbury), *K W Kiddle* (Manawatu), *D J Layzell* (Auckland), *M E Malcolm* (Wellington); *D W Stanton* (Auckland) *M R Vujcich* (overseas).

Marine chemistry in New Zealand

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In their article on the changes and challenges in chemistry over the next 20 years, Butler and Ellis' state that "we have neglected the chemistry of our marine environment. There has been little work on chemical oceanography or on the chemistry of our fish products. This is slowly changing, with increased resources being allocated to fish processing in particular, but some of the land-based geochemistry effort is likely to transfer gradually to the marine environment. New Zealand organic chemistry has very much been terrestrial based and a greater interest is indicated in the different organic structures produced by marine organisms." These comments have stimulated much reflection by the present author and resulted in this review.

The idea that the chemistry of New Zealand's marine environment had been neglected was absolutely true in 1970 when I arrived in New Zealand. No professional marine geochemist or chemical oceanographer had ever been employed in New Zealand, nor was there any corpus of information from workers from other countries.

To my knowledge, no significant work had ever been carried out in the chemistry of New Zealand's seawater, studies on sediment chemistry was restricted to a very limited number of publications²⁻⁴ and geochemical surveys of manganese nodules revealed the South West Pacific to be the least-studied regions of the Pacific⁵.

This situation reflected New Zealand's geographic isolation and the high cost of bringing research vessels to the South West Pacific from the United States and Europe. It was against this background that work in the marine geochemistry of the New Zealand region began.

Before commencing, it is important to say something about the oceanic setting of New Zealand. New Zealand is an island group with a long coastline relative to its area and is more remote from its nearest neighbour than any other significant landmass on the globe. Its exclusive economic zone (EEZ), declared in 1977, is the fourth largest in the world with an area of approximately 4 million km², but the oceans around New Zealand extend far further than this.

Within the New Zealand region are ridges, saddles, plateaux, shelves, slopes, basins, fiords, sounds and harbours. The New Zealand offshore region therefore shows a complete diversity of physiographic and geologic settings. Further, the area is tectonically active and lies at the Indian-Pacific plate boundary which gives the possibility of studying the chemistry of submarine volcanism and geothermal systems^{6,7}.

In addition, New Zealand straddles the temperate latitudes (extending over 15°) and the surface waters range from the high productivity Antarctic waters to the biological "deserts" of the subtropical anticyclonic gyres of the mid-latitude region. New Zealand also acts as a significant barrier to water movement and forms the western boundary of the Western Boundary Undercurrent which transports bottom water from the Polar regions to the tropics.

In addition to the inherent scientific interest mentioned above, various resources (both biological and mineral) occur offshore. The New Zealand fishing industry is expanding rapidly and in 1980 yielded \$162 million in export receipts. In terms of mineral resources,

sand and gravel, ironsands, gold, phosphorite deposits and manganese nodules occur, although to date only minor silica sand deposits have been worked economically. Salt is also recovered commercially from seawater in evaporation ponds at Lake Grassmere near Blenheim. In addition, New Zealand is engaged in large-scale petroleum exploration, although this has involved only limited chemical studies^{8,9}.

In spite of the fact that New Zealand history has been dominated by agricultural development with only a limited maritime industry, the ocean environment around New Zealand is important as a natural laboratory and as a source of economic resources as well as having a political importance to New Zealand. New Zealand's remoteness from the major industrialised centres of the world and its desire for an independent path therefore demand a substantial New Zealand input of activity into the study of its surrounding oceans.

A more general discussion of the overall trends in marine geochemistry have been given¹⁰ and developments in this field in Britain and Japan have been reviewed^{11,12}.

Seawater Chemistry

Seawater is a complex medium. It has a high salt content (salinity about 35 percent) and ionic strength (0.7M) which make chemical analysis difficult. It has a wide range of element abundances ranging from the percent to the 10⁻¹² level. It contains particulate matter (much of which is of biological origin), which requires an understanding of colloid chemistry for the interpretation of some minor element data. It is also subject to movement on varying scales from waves, tides, eddies, and currents.

The boundaries of the various water masses are not straight forward and, as at the front lying over the Chatham Rise, can be complex. These factors make the meaningful chemical analysis of seawater difficult and emphasise that, to be significant, the chemistry of ocean waters must always be interpreted in light of the hydrology (or physics) of water mass movement in the oceans. In addition, recent studies have shown the importance of biological activity in cycling certain elements through the water column.

Basically, the elements in seawater can be divided into the following categories:

1. Major elements (such as Na, Mg, Ca, Cl, SO₄, etc.). These elements are generally conservative which means that, in normal open ocean situations, they maintain constant ratios to each other and to the total salt content (salinity) of the seawater. Apart from detailed studies of their concentrations¹³, analysis of these elements has little appeal to chemical oceanographers. More commonly, physical oceanographers measure the salinity of the seawater by conductance methods, which together with the water temperature, define the water density from which ocean water mass movement can be computed.
2. Nutrients. These include species such as silicate, nitrate and phosphate which are 'non-conservative' and whose distribution is con-

trolled by biological activity. Such species are often limiting in controlling the productivity of the oceans. The determination of the distribution of these species and the processes which renew them in the sunlit surface layers is therefore important for an understanding of the productivity of the seawater. Apart from regional patterns of nutrient distributions, upwelling is an important factor in bringing deep ocean water to the sea surface and stimulating productivity.

3. Trace elements. Trace elements are also generally 'non-conservative' and include such elements as Mn, Ni, Cu, Zn, Cd, Pb, and Bi which occur in the ppb ranges in seawater¹⁴. The distribution and flux of these elements is important but they have proved extremely difficult to analyse.

At these levels, the key problems are sample contamination (during the collection, storage, and chemical analysis steps) and the development of accurate methods of analysis. For some of these elements, partitioning between a 'soluble' and a 'particulate' phase is also important. It is only in the last few years, with the development of programs such as GEOSECS, that a meaningful understanding of the factors controlling the distribution of these elements throughout the water column has been achieved.

For a number of trace elements, the accepted concentration of the element in seawater has decreased over the years¹⁵, reflecting the influence of contamination and problems of developing satisfactory techniques for the analysis of microquantities of the elements in the presence of high salt contents.

As two examples of trace metal analysis of seawater, G. Klinkhammer of the University of Rhode Island has studied the distribution of manganese in Pacific Ocean seawater based on samples collected during the GEOSECS and MANOP programs¹⁶ by means of atomic absorption spectrophotometry, following the addition of a ⁵⁴Mn spike and phase separation.

L. Mart of KFA Julich has analysed Zn, Cd, Pb, Bi and Cu in seawater using differential pulse anodic stripping voltammetry (DPASV)¹⁷. In a series of three papers^{15,18,19}, this author has shown clearly the various sources of error possible in the trace element analysis of seawater and the precautions necessary to obviate them.

The improvement in analytical accuracy of seawater over the last decade has been called a revolution²⁰. Turekian²¹ has stated that the whole field of trace metal marine geochemistry would have been a completely dull one over the last 50 years if it were not for analytical errors. These papers, taken together, show clearly the sophistication necessary to obtain meaningful trace element analyses of seawater²².

4. Radionuclides. The distribution of radionuclides (both natural and man made) has been studied both to help explain the large-scale circulation of the oceans and the effects of atmospheric nuclear weapons testing²³. An early New Zealand worker in this field was T.A. Rafter^{24,25}.
5. Particulate matter. The study of particulate matter in seawater is becoming increasingly important because much of the particulate matter is biological in origin and it is a principal factor in cycling trace elements from the sea

surface to the seafloor. Flux calculations are important in these studies. The importance of particulate matter is shown by the increasing attention paid to it over the last few years²⁶⁻³³. An account of the biological implications of particulate matter has been given³⁴. Studies have suggested that the use of Landsat might be a possible way of studying the distribution of particulate matter off New Zealand river mouths.³⁵⁻³⁶

6. Anthropogenic inputs. Anthropogenic inputs of elements (commonly known as pollution) includes CO₂, radioisotopes, oil spills, sewerage, heavy metals and waste heat³⁷⁻⁴⁵. One of the best general accounts of this problem is given by Goldberg⁴⁶. With the low population, lack of industry and remote geographic location, marine pollution in New Zealand is restricted to limited point sources in coastal areas, particularly in enclosed areas such as estuaries and harbours.

Of importance are human and animal sewerage, fertiliser run-off, chemical and trade waste, oil spills, and hot water discharges from power stations. Marine pollution appears to be minor compared to that in other areas of the world⁴⁷. Perhaps the main long-term concern lies in the possible disposal of high-level radioactive wastes in the Pacific Ocean, principally by the United States and Japan, the implications of which have been dealt with elsewhere⁴⁸.

In addition to seawater chemistry, the chemistry of pore waters (in the sediments) is important as this controls the flux of elements across the sediment-water interface^{49,50}. The sequence of chemical reduction in the pore waters of deep-sea sediments has recently been unravelled by Froelich⁵¹ (cf. 52).

To date, relatively little work has been carried out on the chemistry of seawater in the New Zealand region. Brass and Turekian⁵³ reported on strontium and alkalinity variations in South Pacific seawater and Reid⁵⁴ and Warren⁵⁵ on nutrient distributions at various depths in seawater based on a transect from Australia to South America as part of the SCORPIO expedition. Early studies of marine microbiology in the New Zealand region were carried out by Skerman^{56,57}.

The GEOSECS program has resulted in a number of publications of particular relevance to the South West Pacific⁵⁸⁻⁶¹. Taylor⁶² determined nutrient levels in the Hauraki Gulf and Zentara and Kamykowski⁶³ relative nutrient levels in the South Pacific. Suess and Ungerer⁶⁴ studied the composition of particulate matter in seawater collected south of New Zealand. Edmond⁶⁵ studied the dissolution of carbonate and silicate in the deep ocean.

More recently, studies on the nutrients and productivity of seawater around New Zealand have been undertaken by Dr J.M. Bradford of the New Zealand Oceanographic Institute⁶⁶⁻⁶⁹. These investigations mark the beginning of a serious attempt to study the productivity of the seas around New Zealand, a factor which is becoming more important with the development of the New Zealand fisheries industry since fish abundance and productivity may be related⁶⁶.

Francis and Fisher⁷⁰, for example, have tried to estimate the potential production of the New Zealand deep-water fishing area based on the total annual primary production of the region. The paper by Heath and Bradford⁶⁷ shows the relative importance of oceanic circulation (or physics), bathymetry and nutrient levels in controlling the primary production of seawater in the subantarctic region. Of particular importance is the identification of areas of upwelling

where productivity is enhanced^{66, 7-76} and of the further phenomenon of warm-core eddies⁶⁹.

In addition to straight chemical studies of seawater, the analysis of heavy metals in fish⁷⁷⁻⁸², in molluscs⁸³ and in mussels⁸⁴ and of pesticides in marine organisms⁸⁵⁻⁸⁷ have been undertaken. Chemical aspects of water pollution have also been considered⁸⁸⁻⁹⁸. The nutritional composition of some New Zealand fish has been determined⁹⁹ and a method for the extraction of agar from seaweed developed¹⁰⁰.

The chemical composition of particulate matter of South Island surface waters has recently been studied by L. Carter and C.S. Nelson (pers. comm.) (cf.¹⁰¹). Chemistry Division, DSIR, has been concerned with the analysis of nutrients in seawater as part of the environmental survey of Pauatahanui Inlet¹⁰² and of trace metals (Cu, Zn, Pb, and Cd), as part of an offshore environmental survey of the proposed Tarankai gasoline plant (C.D. Stevenson, pers. comm.)

Nutrient studies of coastal inlets, particularly with regard to pollutions problems have been studied by the Cawthron Institute¹⁰³⁻¹⁰⁷. Dr K.A. Hunter (Otago University) has commenced a project to investigate systematically the relationship between nutrients and selected trace metals (Cu, Ni, Zn, Cd, Cr) in the frontal convergence system off Otago Peninsula¹⁰⁸. The ultimate aim of Hunter's work is to understand the nutrient role of trace elements in ocean productivity and the usefulness of these metals as oceanographic 'tracers'.

Chemical studies of seawater in the United States and Europe are now becoming increasingly sophisticated. In the United States, for example, the entire ferromanganese nodule program has been incorporated into the MANOP project, a project designed to put a 'bottom lander' on the seafloor at five selected sites in the Pacific in order to study the flux of elements across the sediment-water interface (and therefore the relative rate of supplying of elements from seawater and pore waters of the nodules)¹⁰⁹.

Studies of particulate matter in seawater are also becoming more elaborate and traps have been designed to collect this material for chemical studies¹¹⁰.

Perhaps the most ambitious project, however, is GEOSECS in which seawater samples have been collected throughout the world oceans (including the South West Pacific) and a wide range of chemical species analysed in order to understand much more fully the chemical characteristics of the world's water masses^{111,112}. Merely to have visited R.V. *Melville* when it was in Wellington was to gain an insight into the sophistication and scope of this project.

Bearing all this mind, it is my view that, considering the very limited resources available in this field in New Zealand, there is little point in competing with such projects on analysis and modelling of trace metals in seawater. Rather, efforts should be directed towards measuring the nutrient budget of the water around New Zealand in order to help understand the productivity cycles there and to monitoring pollution in the New Zealand coastal environment marginal to urban centres.

SEDIMENTS

As previously stated, knowledge of sediment geochemistry in the South West Pacific was virtually non-existent in 1970. In 1971, Nayudu¹¹³ presented a paper on the analyses of a large number of sediments from the Southwestern Pacific Basin.

From 1970, the New Zealand Oceanographic Institute initiated studies to understand the geochemistry of shelf sediments around New Zealand and Antarctica. These included the Bay of Plenty¹¹⁴⁻¹¹⁶, the southern fiords¹¹⁷ and the Ross Sea¹¹⁸. Such was the situation then prevailing that it was necessary to carry out both

bathymetric and sedimentological surveys in both the Bay of Plenty and the fiords before the geochemical data could be meaningfully interpreted.

Part of the interest in the Bay of Plenty was to study the effect of submarine geothermal activity south of Whale Island on the chemical composition of the sediments, although no enrichment of trace elements due to this effect could be detected. The sulphur isotopic composition of barite of possible hydrothermal origin from the Lau Basin has also been studied¹¹⁹. In addition, Glasby¹²⁰ presented analyses of three sediment cores from the S.W. Pacific.

As an outcome of the study of manganese nodule distribution and geochemistry in the Southwestern Pacific and Samoan Basins (see later), a large number of sediment samples became available. This permitted a study of the major¹²¹, minor¹²² and rare earth^{123,124} element distributions of the sediments. Mossbauer studies have also been carried out on these sediments¹²⁵.

These studies have resulted in a considerable increase in our understanding of how the element composition of sediments varies across a large oceanic basin. In this respect, the Southwestern Pacific Basin serves as an excellent natural laboratory to study such sedimentary processes.

At present, the following geochemical projects are being undertaken at the Oceanographic Institute to help understand the sedimentary environment around New Zealand.

1. A study of the distribution and geochemistry of metalliferous sediments in the Lau Basin and Havre Trough. A five week cruise on R.V. *Tangaroa* was undertaken in 1981. Sufficient material was also collected to attempt a regional geochemical synthesis. This cruise was undertaken in conjunction with Imperial College, London.
2. The geochemical mapping of the South West Pacific sediments for major elements¹²¹ will be extended to include trace elements.
3. In 1980, R.V. *Sonne* undertook a traverse from Tahiti — East Pacific Rise — Wellington to study the distribution of manganese nodules and sediments. In conjunction with Dr P. Stoffers (University of Heidelberg), it is intended to study the geochemistry of sediments and micronodules collected during this cruise.
4. In conjunction with Dr J.H. Johnston and K.E. Knedler (Victoria University of Wellington), a study of Mössbauer spectra of marine minerals and sediments from the South West Pacific is being undertaken to investigate how iron is incorporated into the various phases making up marine sediments.
5. A reconnaissance survey of sediments from New Zealand lakes, harbours and sounds is being undertaken.

The initiation of these projects show the widening scope of marine sediment geochemistry in New Zealand.

MARINE MINERALS

Economic-grade minerals may be considered simply as geochemical anomalies (i.e., they contain higher contents of certain elements than normal). Geochemistry can therefore be considered to be an important tool in their discovery and evaluation. In addition, in the case of authigenic minerals, geochemistry can give a considerable insight into the mineral genesis.

Of the marine minerals around New Zealand, the distribution of iron sands on the west coast have been mainly petrologically studied¹²⁶. Relatively little work has been carried out on the geochemistry of the Chatham Rise phosphorites, although their P¹²⁷, U¹²⁸ and

minor element¹²⁹ contents have been determined. The palaeoenvironmental factors influencing the genesis of phosphorite, glauconite and manganese deposits in the immediate New Zealand region have been discussed¹³⁰.

The most studied marine mineral around New Zealand from a geochemical standpoint are manganese nodules. Two cruises of R.V. *Tangaroa* in 1974 and 1976 led to the study of the distribution, morphology, mineralogy and composition of nodules in the South-western Pacific^{122,131,132,134} and Samoan¹³³ Basins. Similar studies were undertaken in the South Penrhyn Basin by CCOP/SOPAC¹³⁵. Maps of the distribution of Mn, Fe, Ni, Cu and Co in nodules throughout the Pacific were presented by Glasby and Lawrence¹³⁶ and the factors controlling these distributions reviewed¹³⁷. The nodule work carried out in the South West Pacific has been recently reviewed in detail^{138,139}.

For the last two years (1979-81), the author has been an Alexander von Humboldt Fellow at RWTH Aachen in which the object of the work was to compare the distribution, geochemistry, genesis and economic potential of nodules in the South West Pacific with that of nodules of the equatorial Pacific and Peru Basin using material collected by German research vessels.

This work taken collectively has shown that most of the South West Pacific nodules form beneath the low productivity subtropical anticyclonic gyre. They are therefore formed dominantly by the direct deposition of elements from seawater and have no additional source of elements from the dissolution of biogenic tests *in situ* in the sediment column. They therefore have an Mn/Fe ratio of about unity, low Ni, Cu, and Zn contents and δMnO_2 as the principal manganese oxide phase.

By contrast, nodules from the equatorial Pacific high productivity zone have an additional source of trace metals such as Ni, Cu and Zn derived from such diagenetic processes in the sediment column. A hypothesis linking element supply to nodule growth rates, composition, and mineralogy has been developed based on this work.

While at Aachen, a joint German — New Zealand program was written by the author in order to study the manganese distribution along a transect Tahiti — East Pacific Rise — Wellington. This cruise took place in 1981 aboard R.V. *Sonne* (cruise SO-14). Preliminary results showed the occurrence of nodules displaying very high abundances ($> 20 \text{ kg.m}^{-2}$) and moderately high grades (Ni + Cu $> 2\%$) at 42°S about 2,000 km east of New Zealand.

These preliminary results indicate that the nodules are quite different in character from the Southwestern Pacific and Samoan Basin nodules previously studied and named by Meylan¹²² the "Cook Islands Facies" and that the higher grade of these nodules may reflect the fact that these nodules lie beneath the edge of the circum-Polar high productivity zone. These nodules appear to be the most promising so far found in the New Zealand region from an economic standpoint. In spite of the fact that these nodules are remote from New Zealand, occur in deep water ($> 5,000 \text{ m}$), and lie in a region noted for its bad weather, it is clear that there should be further investigations of these nodules.

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Dr Geoff Glasby joined New Zealand Oceanographic Institute in 1970 from Imperial College, London. He has led major cruises of R.V. Tangaroa to the Southwestern Pacific Basin (1974), Samoan Basin (1976) and Lau Basin (1981). Between 1978-1981, he was an Alexander von Humboldt Fellow at RWTH Aachen. He has been awarded the ICI Prize of the New Zealand Institute of Chemistry (1977), the Research Medal of the New Zealand Association of Scientists (1977) and the degree of Doctor of Science by Victoria University of Wellington (1981).



BRANCH NEWS

Auckland

The first meeting of 1982 was held jointly with the Auckland branch of the Oil and Colour Chemists Association. *Mr Trevor Nash*, technical manager of Hickson's Timber Impregnation, gave a very informative talk on Wood Preservation and Preservative Chemicals, with particular emphasis on the waterborne systems used in New Zealand. Prior to the well attended meeting held at the Waipuna Lodge Hotel, members had the opportunity to indulge themselves in an excellent buffet dinner.

The March meeting of the branch was addressed by *Dr Ken Wooldridge*, pharmaceutical research manager for May and Baker. Dr Wooldridge gave an interesting description of the steps involved in producing a new pharmaceutical product and illustrated his talk with an example of a range of drugs for asthma treatment recently developed by his company.

According to Dr Wooldridge the lead time from initial conception to final marketing of a new product may take in excess of seven years and the overall cost has been estimated at close to £90 million.

A feature of the talk was a description of the significant role that structure—activity relationships played in determining the direction of research and in speeding-up the over-all development process.

On March 25 a symposium on Chemistry and the Undersea World 1982 was organised jointly by the NZIC Auckland branch and the Chemistry Department of Auckland University.

The Auckland branch prizes for 1981 have been awarded to *Mr Hamish McDonald*, top stage three chemistry student at Auckland University and *Miss Jan Siegers*, top chemistry five student at the Auckland Technical Institute. Miss Siegers is a technician at Chemistry Division of the DSIR.

Manawatu

The first meeting on the 1982 program was addressed by *Dr Donald F Nelson*, recently retired government analyst of Auckland. His subject, The Experience of the Government Analyst with Special Reference to Forensic Science, covered a wide field of interesting enquiries which included both criminal and non-criminal investigations.

Dr Nelson stressed the need for careful observation of materials, the difficulties of comparing materials and deciding their origin and problems with the presentation of evidence of lay-people juries.

Wellington

Dr F B Shorland, past president NZIC and recipient of many awards, gave a talk on 50 years of Chemical Investigation of Biological Phenomena at the February meeting of the branch.

In his address, Dr Shorland discussed relevant research on fish oils, animal fat, the theory of animal fat composition, fatty acid composition and plant taxonomy, the discovery of a role for Vitamin E and the relationship of cholesterol and lipids in coronary heart disease.

He also provided many other chemical

insights into biological phenomena, including mutton odour in lambs and conversion of wool to food.

Canterbury

The February meeting of the Canterbury branch was addressed by *Professor Robin Ferrier* (Chemistry Department, Victoria University). In his talk entitled Excursions into Pharmaceutical Chemistry, he dealt with current research at Victoria University into the synthesis of potentially useful prostaglandins from glucose and the problems in an isolated country of getting overseas pharmaceutical companies to

take an interest in such work.

Otago

At the March meeting *Prof G Peterson* who recently returned from study leave in Cambridge gave a talk entitled New Methods for Studying Nucleotide Sequences in DNA — a Progress Report on an Exciting New Phase in Molecular Genetics.

W J Fairbrother won the NZIC Otago branch prize in 1981 for the best science student in first year chemistry at Otago University. *A D McClintock* won the Inglis Memorial prize for the best third year chemistry student.

UNIVERSITY NEWS

Auckland

New appointments to the Chemistry Department are *Dr M Banwell*, a Canterbury graduate and *Dr R Howe*. *Dr Penny Lecouter* (nee Cameron) an Auckland graduate who has been at Capitan College, Vancouver, is now a part-time temporary lecturer.

Dr Allan Easteal, who has been at the Australian National University, Canberra for the past year, has taken up a three year appointment at ANU to continue work in the diffusion unit under the direction of *Dr Roy Mills*, a Canterbury graduate.

Dr Maruta Zvagulis from McMaster University, Ontario, who has been on a post graduate fellowship, is to continue at Auckland as a temporary lecturer.

Assoc Prof Addy Pross of the Ben Gurion University of the Negev in Beer-sheva Israel is at present visiting the chemistry department and lecturing on quantum organic chemistry. A native of Israel, he took his degrees at Sydney and did further post doctoral research in England and Israel.

Massey

Professor R D (Dick) Batt has received continuing financial support from the Medical Research Council for his research into alcohol and acetaldehyde metabolism in humans.

Dr Ted Baker has received a research grant from the Medical Research Council for his work in determining the three dimensional structure of human lactoferrin by X-ray crystallography.

Dr Bill Hancock has been awarded a research contract by the Development Finance Corporation to investigate the potential of isolating peptides and proteins from various sources by high pressure liquid chromatography. Possible commercial applications of this technique will be considered. Dr Hancock will be attending the International Atherosclerosis Meeting in West Berlin (June 13 to 18) and the Gordon Conference on Lipids in New Hampshire (June 21 to 26).

Dr David Husbands presented the first departmental seminar for 1982 on the subject Metabolism of Phospholipids in Animal Cells. Dr Husbands discussed the synthesis and metabolism of phosphatidic acid, the control of phosphatidate synthesis and aspects of his work on the breakdown of phospholipids in lysosomes.

As reported in the last issue, *Prof Neil Waters* from Auckland University's Chemistry Department has been appointed vice-chancellor of Massey University, to take effect from the beginning of next year. His wife and greatly valued member of the editorial committee, *Assoc Prof Joyce Waters*, expects to continue her crystallography research at Massey.

Canterbury

Professor Cuth Wilkins, professor of Inorganic Chemistry since 1965, retired in January after 37 years in the Chemistry Department. A separate article on his career will appear in the next issue of the journal.

Two new staff members have joined the Chemistry Department this year. *Dr Vicki McKee* is a graduate of Queens University Belfast and prior to coming here was a research associate at the University of Southern California. Her particular interest is bio-inorganic chemistry. *Dr Peter Steele* is a Canterbury graduate who spent two years at USTL in Montpellier (France) and a period at the University of Sydney before being appointed lecturer in organic chemistry.

R D Gillard (University College Cardiff) is in the Department until April as an Erskine Visitor. A noted speaker, his series of lectures while here has included such intriguing titles as The Gentle Art of Murder and Is God Left Handed — A Molecular Approach.

Visiting Lecturers in the department this year are *Dr Greg Simpson*, (Imperial College London) a graduate of the University of Sydney whose field is organic synthesis and *Professor Othman* (Centre for Foundation Studies in Science, University of Malaya) who is an inorganic chemist.

Dr Murray McEwen has been awarded an Erskine Fellowship to visit laboratories in Britain and the United States from May 2 to June 12 this year and *Professor Leon Phillips* will be presenting a paper at the International Symposium on Chemical Kinetics in Ibaraki (Japan) in June.

Mr Dick Nokes, one of the Department's senior technical staff, retires in April. He had been with the staff since 1954.

Two academic visitors are currently in the Department of Chemical Engineering. *Prof Bob L von Berg* of the School of Chemical Engineering at Cornell University, Ithaca, NY, is spending a year's sabbatical leave with the department. He is assisting in teaching the final year design class and following up his own research

UNIVERSITY NEWS

interests in desalination and liquid-liquid extraction.

Prof Reid C Miller, University of Wyoming, Laramie, is present for six months. While here, he is working with *Prof A G Williamson* on heats of mixing calorimetry of paraffin/hydrocarbon mixtures. He will also teach a course to final year chemical engineering students, on thermodynamics of natural gas mixtures.

Otago

Dr G F Laws of the Department of Pharmacy is on study leave working with *Prof Parfitt* of the Department of Pharmacy, University of Bath.

GOVERNMENT DEPARTMENTS

Dairy Research Institute

The DRI at Palmerston North is to have its laboratory space expanded by 72 per cent by the addition of a 2650 square metre extension to the present building. The board of the DRI gave consideration to the extension in June 1980 and approval in April 1981.

Construction started in May 1981, the final contract was signed in December 1981 and, at the present rate of progress, the extension will be ready for occupation by December 1982.

The extension will have a basement and three floors, each of about 650 square metres; the top floor will house the library, information services and two seminar rooms. The remaining floors will house R and D sections of the Institute while the basement will be largely used for storage and services.

The growth of the Institute over the last 15 years is a reflection of the industry's embarkation into product diversification and access into new markets as a consequence of British entry into the EEC. This has meant that there has had to be a much greater appreciation of the end uses of our dairy products and how their manufacture can be manipulated to best suit that end use.

Sheelagh Wilkinson has been appointed to a research officer position in the Whey Products Section where she is working on topics related to whey protein usage. She recently obtained her PhD from the Department of Food Technology at Massey University.

Philippa Lorimer, a research officer in the Product Evaluation Section, has resigned and the position taken by *Debbie Read* (nee Black), a graduate from the Food Technology Department at Massey University.

Barry Old, who obtained a PhD in Chemistry at Waikato University, has been seconded from the Dairy Board to NZ Pharmaceuticals for an initial period of two years. He is currently situated in the DRI where he is investigating, by library research, the possible exploitation of dairy materials, such as skim milk or whey, by extraction of their minor constituents.

Soil Bureau

Dr Cyril Childs attended the International Soil Science Society Congress held in India in February. He presented work on

D G Ferry, research officer with the Medical Research Council Toxicology Research Unit has recently completed his PhD studies. The subject of his investigation was The Measurement of Drugs in Biological Fluids.

Dr D B Myers of the Wellcome Research Institute has recently returned from study leave in Australia. He worked at the Institute of Medical and Veterinary Sciences and in the Department of Pathology in Adelaide. His studies concerned bone pathology and the change from acute to chronic inflammation in animals. He has brought back with him knowledge of new techniques in collagen typing and assays for degradative enzymes in joints.

the Mossbauer spectra of samples from a slope sequence of soils from siliceous sediments in Fiji and also took part in a conference tour of soils north of Delhi, up to the Upper Ganges river and the foothills of the Himalayas, near the Pakistan border.

Dr Kevin Tate has been appointed section leader for the Biochemistry Section.

BRANZ

Dr John Duncan addressed the NZIE Conference in Christchurch on BRANZ work on corrosion of metal fasteners in timber and reported at the Australasian Corrosion Association NZ Branch meeting in March on his impressions of the International Congress on Metallic Corrosion in Mainz, West Germany, which he attended as NZ delegate to the International Council in September 1981.

Dr Peter Foster attended a meeting of the board of the International Council of Building Research and Documentation (CIB) in Lisbon in March. He will be following up contacts in England on building controls and automated information systems and visiting Malaysia, Singapore and Papua New Guinea with a view to furthering acceptance in these countries of NZ building materials and systems.

DSIR Chemistry Division Wellington

Mr Stephen Bloor of the Forensic Section, has been awarded an NRAC study award to attend the University of Oklahoma to complete a PhD in Marine Natural Products Chemistry.

Nigel Eggers, from the Pharmaceuticals Section, has transferred from Gracefield to Chemistry Division Auckland.

Dr Alan Browne has resigned and moved to the Department of Chemistry Ohio State University in Columbus, Ohio.

A new Varian XL200 Fourier Transform NMR spectrometer equipped for cross-polarization Carbon-13 NMR of solid samples with magic angle spinning is being installed. It is intended to extend the scope of the instrument to handle liquid samples at a future date. This instrument will be available to offer a service to laboratories throughout New Zealand.

Dr D R Crump of the Natural Products Section, is extending his work on sex pheromones in a cooperative project with the Zoology Department, Massey University.

In the Department of Human Nutrition

Prof M F Robinson has received a substantial three year program grant from the MRC to continue investigations of the nutritional importance of trace elements, especially selenium, in New Zealand residents.

Dr J M McKenzie has received a three year MRC project grant to continue an investigation of the nutritional importance of zinc, copper and cadmium in New Zealand residents.

Dr B E Guthrie has received a supplementary grant to her project grant to continue development of methods of assaying chromium status in man.

Dr R Mues from the University of Saarbruchen, West Germany was recently working in the Natural Products Section on aspects of chemotaxonomy.

Dr W Passl has been appointed to coordinate quality assurance for the three Chemistry Division laboratories.

DSIR Chemistry Division Christchurch

Miss Lynette Farr, an honours graduate from Canterbury, has joined Chemistry Division in the Toxicology Section. She replaces *Mrs Barbara Thomson* who is now overseas.

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OBITUARY

FREDERICK GEORGE SOPER (1898-1982) CBE, BSc Hons, PhD, DSc, (Wales), Hon DSc, (Otago), FRSNZ, FRIC, Hon FNZIC.

With the death of Emeritus Professor F.G. Soper CBE on January 1 1982, the New Zealand Institute of Chemistry lost a former president (1946-47) and one of its most distinguished chemists, teachers and university administrators.

Frederick Soper was born in Trefnant, Denbighshire in 1898 and received his education in North Wales. In 1915, at the age of 17, he won a scholarship to the University College of North Wales, Bangor. After a year at the university he entered an Officer Cadet Unit and was commissioned in the Royal Garrison Artillery in December 1916, serving in Italy and Egypt before being demobilized in February 1919.

Following a period of intense study on his return to Bangor, he was awarded a BSc with first class honours in chemistry in June 1920 and was appointed to a lectureship in physical chemistry under head of department, K.J.P. Orton, FRS. Academic honours followed rapidly with a PhD in 1924, a DSc in 1928 and promotion to a Senior Lectureship.

When Frederick Soper arrived in Otago in July 1936 to take up the Chair of Chemistry in succession to Professor J.K. Ingliis, he had already achieved distinction as a scientist. He brought with him a wide knowledge of all branches of chemistry and a great enthusiasm for research in his special field and in applied chemistry.

As a lecturer to students at all levels he excelled. But it was his lectures, to the big first year classes of about 300 students which gave him particular pleasure. They were models of clarity and each major point was illustrated by an appropriate demonstration. These demonstrations, prepared and rehearsed with characteristic thoroughness assisted by the senior technical officer, H.G. "Harry" Gilbert, were presented with a flair that was only possible for a brilliant experimentalist completely confident in his skill.

His lectures attracted increasing numbers of students into advanced chemistry and his enthusiasm for research soon led to the growth of a very active research group with which he proceeded to extend the work on reaction mechanisms stemming from his earlier association with Orton. Detailed studies of the halogenation in aqueous buffer solutions of a variety of amides and phenols yielded a number of interesting mechanisms and revealed a range of halogenating agents.

Frederick Soper had the capacity to inspire intense loyalty and affection in his staff and took a genuine interest in them, giving them encouragement and confidence. He was a generous person delighting in the progress and success of his students and staff and modest of his own achievements. With characteristic foresight he had prepared for the sharp increase in student numbers that the post-war years would bring. He had convinced the university council of the need to enlarge the Chemistry Department and provide additional laboratory and lecture room accommodation and additional staff. When

enrolments started to rise sharply from 1945 onwards, his department was able to accommodate the increase smoothly and efficiently.

Two important innovations introduced by Frederick Soper into the Chemistry Department were the microchemical laboratory for which the senior lecturer in chemistry C.L. Carter assumed responsibility and which in due course was developed to provide a microanalytical service for the whole country, and a course in applied chemistry. The importance of applied chemistry among the department's activities has grown with the years and it is now an integral part of the honours course.

His talents for organisation and leadership were quickly appreciated outside the university and in 1937 he was appointed director of the New Zealand Wool Manufacturers' Research Association and a laboratory was established in the Chemistry Department.

The early work of the laboratory was concerned largely with improvements to the scouring process and with anti-shrink finishes involving chlorination. His earlier studies with Orton, which included N-chlorination, assisted in the understanding of the chlorination of the wool fibre. In 1950 the directorship was taken over by Dr L.F. Storey. The laboratory is now established adjacent to Lincoln Agricultural College.

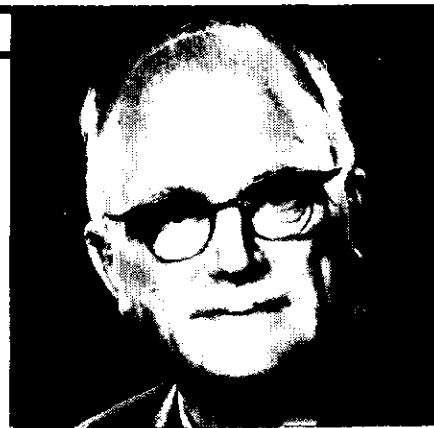
When the stresses of war produced many problems in a country which was at that time under-developed industrially, he was appointed deputy-director for scientific developments (Chemical) for the DSIR and chairman of the chemical panel of the Defence Science Committee. The panel was set up to advise on matters relating to the supply of chemicals and ways in which shortages could be overcome and problems solved.

Under Frederick Soper's leadership it tackled these problems with energy and imagination. The work of this panel and the contribution of its chairman have never been fully appreciated.

Among projects undertaken was one concerned with defence against war gases. Samples of all the common gases were made in the universities and the Dominion Laboratory, including its Auckland branch. These were used for training purposes and at Otago University supplies of war gas antidote were produced. Gas masks for the civilian population were manufactured in quantity and the testing of the finished product carried out at Canterbury University.

Smoke for concealment in both attack and defence was another wartime service requirement which was met by work in Auckland and Dunedin. Large crystals of Rochelle salt were required by the navy for their sonar equipment and some massive crystals were produced at Otago. There was no lack of projects and this account is far from complete but it does give an indication of the work undertaken by the Chemistry Panel.

Not long after his arrival in Dunedin, Frederick Soper became involved in the administrative tasks which fall inevitably upon the shoulders of those professors energetic enough and able enough, to carry them. He served as dean of the



Faculty of Science, chairman of the Professorial Board and member of the council and as a member of the Academic Board of the Senate of the University of New Zealand.

He was elected Fellow of the NZIC in 1937, was twice president of the Otago branch and president in 1947 of the council. He was elected a fellow of the New Zealand Royal Society in 1949 and served as fellows' representative for several years on the council of that society, being elected its deputy president for 1962-63.

In 1946 he was the New Zealand delegate to the Royal Society Empire Science Conference in London, in 1951 leader of the New Zealand delegation to the Unesco Conference in Paris and a delegate to Conferences of Universities of the Commonwealth in Montreal in 1958 and London in 1963.

It was his standing with lay and academic colleagues alike, as a wise, effective, democratic and above all, a modest and humane administrator, which led to an invitation in 1953 from the University Council for him to accept the vice-chancellorship of Otago University, a position rendered vacant by the resignation of Dr Robert Aitken.

His 10 years of office covered the transition period when the universities shook off the shackles of the federal system and became autonomous institutions. Under his leadership the campus in its present form began to take shape. Possibly most significant of all was the announcement in 1962 by the University Grants Committee of its five year building plan which included among many other buildings, new accommodation for the Chemistry Department.

During the ten year period of his Vice-Chancellorship, the total numbers on the student roll had risen from 2071 to 3192, and the foundations well and truly laid for the continuing increases that the sixties would see. There was also evolution and expansion in academic courses and the creation of new courses.

Without the active support of his wife, Eileen, he could not have achieved all that he did. They were a perfect team and at no time was this more apparent than in their gracious and friendly entertaining of colleagues and visitors, in their home when he was professor and in University Lodge when vice-chancellor.

After his retirement in 1963, when he became an Emeritus Professor of the university, Frederick Soper continued to serve the university as a member of the Research Committee of the University Grants Committee. He continued to serve

technology as a member and vice-chairman of the executive of the New Zealand Woollen Mills' Research Association, education as chairman of the Nuffield Foundation's New Zealand Advisory Committee and medical research as a member of the Medical Research Council.

He served Dunedin City in countless ways for four decades and possibly the contribution which gave him particular pleasure and Dunedin reason to be grateful, was his energetic support of the Art Gallery and his presidency of its council. In 1950 his services to the university and community were recognized by the award of the CBE.

The glow which Frederick Soper brought to his teaching extended to everything he undertook and for 27 years he adorned the university by his presence. After his retirement his interest in and concern for the university and the Chemistry Department never waned. He was a frequent and warmly welcomed visitor to the department, delighting in keeping abreast of progress in all aspects of chemistry.

His questions were as penetrating and his interest as intense as they had been when he headed the department. Frederick Soper was a gentleman, much loved by his colleagues, kind, cultured, of the highest integrity, having great personal charm and a keen interest in people and things. He was a gifted conversationalist and had a host of friends in all walks of life.

R.E.C.

GENERAL NEWS

IDENTITY FOR CONSTRUCTION JOB

JVII (pronounced JV two) is the name developed specially for the main construction consortium or joint venture which has been formed to undertake the country's biggest-ever construction job — the expansion of the oil refinery at Marsden Point near Whangarei.

The project manager for JVII, Henk Dokter said the organisation's name must be well established because it was a real entity. It was a joint venture involving Badger-Chiyoda, initially contracted to assist Shell Internationale Petroleum Maatschappij in the Hajue, Holland in preparation of the project specification; then later named as the main contractor for engineering, procurement and construction for the expansion; and five of New Zealand's largest and best-known construction companies.

They are Fletcher Construction, McDonnell Dowell, Robert Stone, Wilkins and Davies and Downer and Company. Together these companies will complete a project which will be one of the first planks in the government's energy policy, designed to make New Zealand 50 per cent self sufficient in liquid transport fuels by the mid 1980s.

Combined with the synthetic petrol plant in Taranaki, which will produce a gasoline blending stock to make a third of the country's petrol supplies, the completed Marsden Point refinery will produce and bring with them undesirable side-

additional petrol, plus the important middle distillates such as diesel and aviation fuels.

The expanded refinery will also provide greater flexibility in the source of supply of crude oil, considerable savings of overseas exchange, a better balanced range of imported finished transport fuels and a reduction in the lead content of petrol.

TASMAN CONDUCTS TALC TRIAL

A trial was conducted in Tasman's newsprint mill recently involving the addition of finely divided talc to pulps going to the paper machines.

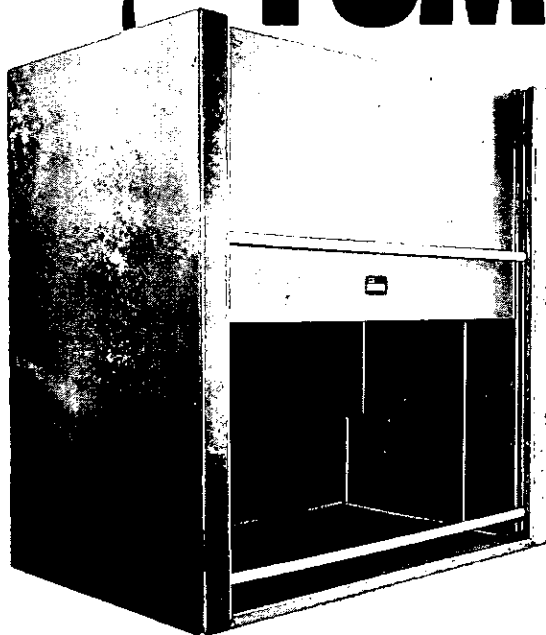
Pine logs contain resinous material which must be stabilised or made harmless for newsprint to be successfully produced.

Traditionally pitch control is achieved by chemical dosage with alum and caustic soda.

These chemicals are, however, costly effects such as corrosion and foaming.

The talc trial is an attempt to radically change paper-making chemistry so that costs can be reduced and machine operation improved. The talc used came from Western Australia. The results of this initial trial are promising according to Tasman and it is intended to proceed further using a more finely ground talc together with a chemical additive to assist retention in the newsprint sheet.

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On conference

The organisers of the Jubilee conference can be congratulated on the biggest and best show ever. The plenary speakers were, with one exception, world-class. What a pity, then, that so few of the other speakers put an equivalent effort into their presentations!

The principles of visual presentation of data are well-known and simple, yet audiences suffered incomprehensible slides personalised shorthand on blackboards and a new low in presentation — the copy-generated overhead transparency. In one fell swoop the potential flexibility and spontaneity of the overhead projector were thrown away for poor-quality — black on dirty-fly-blown-white. If you must use this abhorrent technique, at least check that the typescript is legible and that all the information will be on the screen.

I sat through several talks read straight from the text. That by Professor

MacGlashan as enthralling but the others were not. The crime of reading verbatim from a text is compounded, in my view, if the reader is a university staff member; lecturing should be his stock-in-trade and he should be showing his non-university colleagues how to do it. One senior university staff member read from his notes and ran several minutes over time; another used no visual aids whatever.

Poster sessions are relatively new and both organisers and authors must work harder to improve this method of presentation. Posters are not a second-class way of presenting research work, but a way of packing more information into the limited conference time. To stress this, posters and talks could be selected from submitted papers on a random basis.

Posters should not be sited away from the main stream of the conference and presenters and audience should not have to struggle to meet each other, or even have to miss lunch to do so! Posters should go to the audience, as generally the audience will not go to the posters.

Enough whingeing. How can we improve future conferences? Guidelines could be sent to all contributors with a request to follow them. Ban copy-generated transparencies. Blackest poor or arrogant speakers and award prizes or commendations for the best performers. Select invited speakers on the basis of their ability to communicate, rather than selecting a topic and then looking for a (hopefully) warm body to stand in front of an audience.

The annual NZIC conference is the window on chemistry in New Zealand.

It is our responsibility to display our wares well.

Anon.

Should anyone be interested in contributing to this column anonymously or otherwise, please forward their contribution to Dr Mike Kingsford, 9 Egremont St, Belmont, Auckland 9.)

NEW PRODUCTS

NEW pH METERS FROM BECKMAN

Beckman Instruments, has introduced a new line of pH meters that is said to offer automatic routine analysis; conveniently located inputs and readouts; spillproof controls; complete diagnostic and test routines; and electrode response monitoring.

The pH Series includes four lightweight, durable pH meters. The top-of-the-line pH 70 and 71 provide manual and automatic functions through microprocessor control to meet both routine and special needs.

The pH 60, designed for production and quality control, includes all of the automatic functions of the pH 70 and 71, but none of the manual functions, to minimize procedural steps.

The smaller portable pH 30 is designed for basic pH and mV measurements in corrosive environments ranging from chemical and plating industries to student laboratories.

All of the pH Series meters come in a corrosion-resistant case with a rod and holder, buffers, translation insets, condensed operating guide, instructions, BNC keeper cable and a choice of one electrode.

Local agent is Watson Victor, Well-



ington.

HIGH-PRECISION MICRO PIPETTERS

High precision digital (adjustable) micro-pipetters developed by a British firm are claimed to virtually eliminate the problem of inaccurate metering caused by expansion of delicate internal components due to the transfer of heat from the operator's hand.

This problem is particularly acute when pipetters are handled continuously over long periods while measuring/dispensing small quantities of liquids repetitively.

Called Volac, the pipetters are available in five size accommodating, between them, volumes ranging from 5 microlitres to 5 ml. All are designed for one-hand operation and incorporate stainless steel pistons with PTFE seals to ensure efficient lubrication free operation and a long service life with little maintenance. The factory sealed upper body incorporating the handle is of glass-filled polypropylene, a material which offers a low expansion coefficient when exposed to heat, in addition to strength and resistance to chemicals. The lower body is made of polypropylene and nylon.

Providing the main contribution to the instrument's high precision in dispensing the same volume of liquid repeatedly is a steel expansion-compensating cage which is connected to the piston's stroke-governing mechanism.

A three stage push button projecting from the top of each pipetter controls the whole operating cycle, including automatic ejection of the filling tip from the nozzle whenever necessary.

The push button rotates on a click-stop mechanism which regulates the piston stroke via a ratchet and micrometer screw. Each clockwise click represents a 0.2 per cent increment of the instrument's

total capacity. The volume selected appears in digital form in a recessed frame on the instrument's handle.

Tests with the complete range of pipetters have shown precision figures varying between ± 1.5 per cent at 5 microlitres and ± 0.4 per cent at 5000 microlitres.

The manufacturer is John Poulsen of Barking Essex and the New Zealand agent is Smith Biolab, Auckland.

SOLID STATE DETECTOR

Rapid, accurate and simple analysis of gas/air ratios are said to be able to be achieved with a lightweight, solid state detector available from the Plant and Equipment Company.

The analyser, manufactured by The Analytical Development Company, in England, is designed to measure the concentration of a heteroatomic gas or vapour in mixture of gases. It is thus able to determine the concentrations in air of carbon monoxide, carbon dioxide, sulphur dioxide, the oxides of nitrogen, organic gases and water vapour.

The carbon dioxide (for instance) in the gas absorbs energy from a hot wire source and so reduces the amount reaching an infra-red detector. An optical filter ensures that the detector responds only to carbon dioxide. Solid state detector unit and electronics ensure that readings remain unaffected by vibration. A sampling pump is fitted within the instrument and sample flow through the analysis cell is shown on a 0.2-1.2 l/min flow indicator on the front panel.

The standard range covers from 0 to 10 per cent while five other optional ranges can also be supplied. Nett weight is six kilograms and prices range from \$3400 to \$4700 depending upon digital or meter readout and single or dual range.

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NEW PRODUCTS

NEW HP GAS CHROMATOGRAPH

Hewlett Packard has introduced a new gas chromatograph which it claims provides operational simplicity, an innovative oven design for qualitative capillary performance and chromatographic excellence.

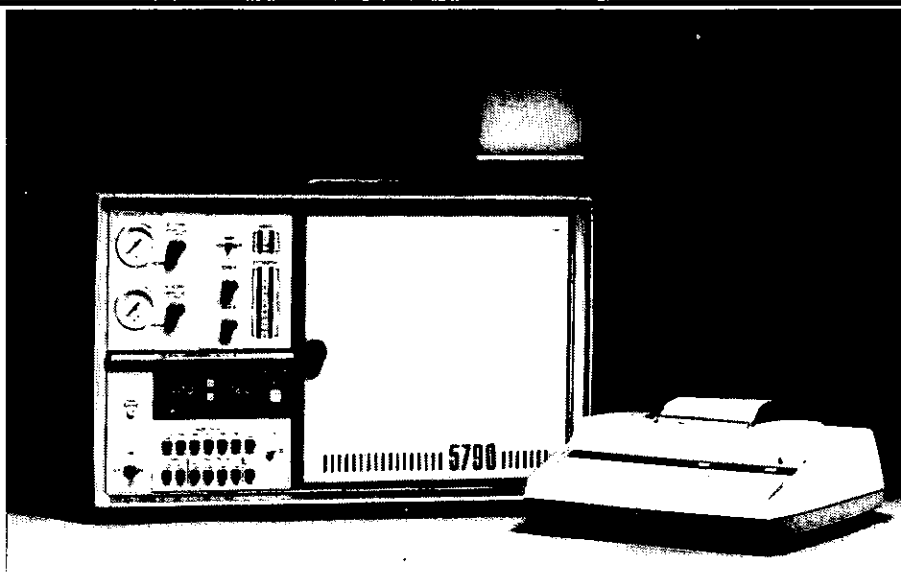
Special features of the HP 5790A gas chromatograph include push button control, digital display, RS-232C compatible, built-in diagnostics and a direct approach to interfacing for recorders, integrators and data systems.

The chromatograph controller permits the operator to select and modify analysis parameters at a push of a button. Setpoint and actual values are shown on the digital displays.

Other controller capabilities include: storage of eight GC analysis methods for fast and accurate setup; memory protection; keyboard lock for security; stop-watch for elapsed time and its reciprocal to simplify the calculation of flow rates; valve control for splitless capillary operation or automating a single valve; diagnostics continuously monitor the instrument and provide accurate, troubleshooting information.

The HP 5790A's oven-within-the-oven accommodates fused silica capillary columns for accurate thermal control. This makes retention time reproducibility of ± 0.005 minute possible.

The oven is calibrated to $\pm 0.05^\circ\text{C}$ of



absolute temperature at 130°C for accurate correlation of multi-instrument data.

It also features proportionally-controlled intake and exit vents for smooth, near ambient operation. Accurate temperature control from near ambient 425°C in 1°C increments and temperature programming with 0.1°C resolution further enhance oven performance.

Rapid cool-down and re-equilibration increase sample throughput for maximum efficiency. Adding to the versatility of the

HP 5790A are automatic repetition of runs at specified intervals and display of run time and cumulative elapsed time between runs.

Five detectors are available: single or dual FID, dual NPD, TCD, FPD and ECD.

Hewlett Packard's journal, *The Analyser*, gives information on its spectrophotometric and chromatographic instrument lines as well as application hints. To get on its mailing list write to Hewlett Packard Australia through its New Zealand agent Northrop Instruments, in Wellington, Auckland or Christchurch.

BECKMAN ADDS pH METER MODELS



Increasing the versatility of electrochemical instrumentation in the industrial laboratory, Beckman Instruments has added the microcomputerized pH 41, 43, and 63 pH Meters to its line of pH Series pH Meters.

Designed for routine plant and laboratory measurements, the pH 41 pH Meter is said to provide simple, precise operation and a rugged mechanical design. Features include pushbutton automatic standardization, automatic determination of electrode stability and self-diagnostics for electronic parts.

The pH 43 pH Meter enables standardization of any buffers, standard or otherwise, in any range and in any order. It allows for manual or automatic temperature compensation and temperature readout. The meter provides absolute or relative mV readings independent of the pH standardization. Features include standardization versatility, automatic determination of electrode stability, self-diagnostics for electronic

parts and testing of the electrode for proper function.

Both the pH 41 and pH 43 pH Meters read pH, millivolts and temperature (with the optional ATC probe). The Auto Read can be turned off to enable pH and potentiometric titrations.

The pH 63 pH Meter has only three operational keys for complete automation of pH measurements in the quality control laboratory. The instrument has direct temperature readout (with the optional ATC probe) and an "off" control for its automatic stability indicator, so that pH adjustments or titrations can be performed easily.

All of the lightweight, durable meters offer automatic routine analysis, conveniently located inputs and readouts, spillproof controls, complete diagnostic and test routines and electrode response monitoring. All feature a touch-control panel with international symbols translated into seven languages on an inset panel.

New Zealand agent is Watson Victor.

SPECTROPHOTOMETER WITH WIDE RANGE

Warburton and Franki is the agent for the Perkin-Elmer Model 983 ratio recording double beam Infrared Spectrophotometer.

The spectrophotometer covers the range 5000 cm^{-1} to 180 cm^{-1} with an f4.2 filter grating Littrow monochromator, four gratings all operating in first order and thermocouple detector.

A patented electronic dual chopping system is said to eliminate the effect of sample emission and the automatic wavenumber corrector ensures calibration at all scan speeds.

Recorded spectra are printed on a Flowchart thermal printer, together with instrumental conditions, annotated axes and peak table. Control of the instrument is via softkeys. An interactive visual display unit shows scan conditions and guides the operator.

Readouts are continuously updated with respect to wavenumber, ordinate (percentage T or Abs value), remaining scan time, slit widths and resolution.

Slit program, scan time and noise filter are integrated, giving seven scan modes varying from 0.5 cm^{-1} to 10 cm^{-1} resolutions. Each of these can be varied by changing the noise filter, giving a total of 35 basic scan conditions available for either transmittance, absorbance or emission. Single beam recording is also possible.

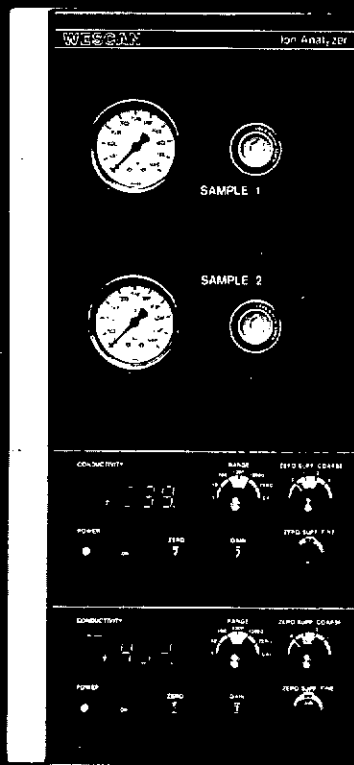
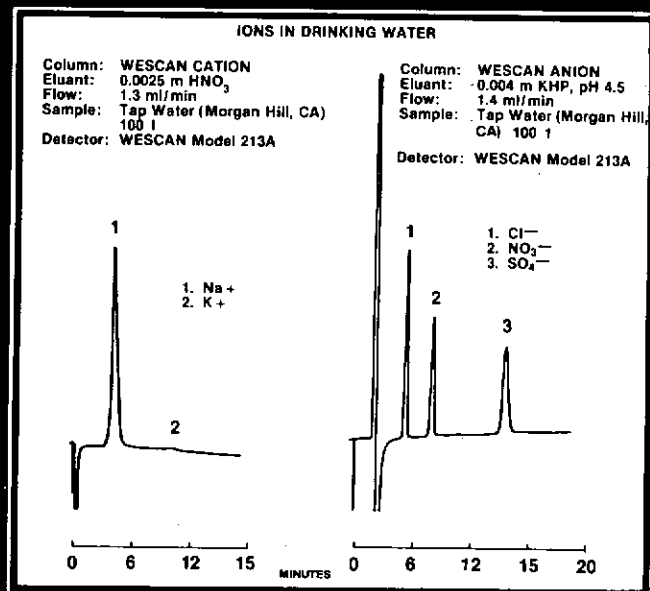
The basic instrument includes a full range spectral memory and data handling facilities, which include digital smoothing, spectral subtraction, accumulation, expansion in absorbance (ABEX) and auto full scale replots.

The instrument is full purgeable. The Model 983 can be connected to the Perkin-Elmer data station and most computers, via either RS232C or IEEE488 outputs with the appropriate accessory interface. A multisampler interface is fitted as standard. All standard sample holders and accessories can be used in the standardised sample space.

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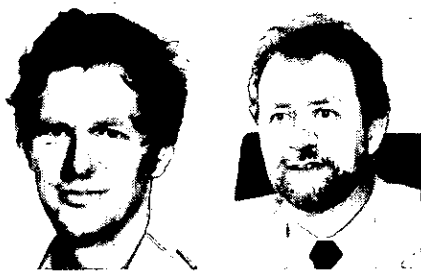
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Dr D Parry

R Harvey

Dr Selwyn Maister has returned to Christchurch Polytechnic after a year's leave at Norwich City College in the UK. He reports that the New Zealand Certificate in Science course compares more than favourably with its UK counterpart, the newly introduced TEC course.

Mark James has resigned from his position of product development officer Unilever (NZ) from early March to travel overseas. He will be replaced by Anne Haines (formerly Anne Stanley-Hunt) who has previously held positions in the laboratory and quality control areas.

New Zealand Industrial Gases announces its appointment of Roger Harvey BTEch as regional manager southern,

responsible for NZIG operations in the South Island. He has been with NZIG for 10 years and recently returned from London after a three year secondment to BOC Limited, with particular involvement in distribution management.

Dr David Parry of the Chemistry, Biochemistry and Biophysics Department at Massey, has been awarded a DSc by the University of London for his work on the structure and function of fibrous proteins. Appointed to Massey in 1973 his protein studies have involved both electron microscopy and more recently, the development of computer techniques for analysing amino acid sequences. Dr Parry was awarded the ICI Prize in 1981.

The retirement of Dr Donald Nelson as government analyst, Auckland, was marked by a very pleasant function held at the Royal International Hotel on February 3. Tributes were paid by Mr Walton, commissioner of police, Mr Winkel, crown prosecutor, Auckland, Dr Leary, head of the Chemistry Section and Dr Kear, director general, DSIR.

In his reply Dr Nelson described some of his experiences in the forensic work of the DSIR and put in a strong plea for the retention of this work within the Chemistry Section, because of its library

and analytical facilities and because of the interaction with chemists working on other lines.

He also recounted how he had to sell his home to get finance for his course in criminalistics at the University of California, where he was the first to gain a doctorate.

On behalf of the colleagues in the DSIR and other well-wishers, Dr Kear presented Dr Nelson with a silver coffee service and some photographic equipment, while Commissioner Walton handed over a police badge and cuff links.

Pine Chemicals NZ has appointed Ken Alderton as general manager of its wood chemicals processing plant at Mt Maunganui.

Alderton, was previously Sydney divisional manager for Farley Lewers (NSW) Pty, an Australian concrete and related products company.

Pine Chemicals has also appointed Murray Nancekivell as marketing manager.

Nancekivell was formerly a technical and marketing executive with ICI (NZ).

The new \$18 million plant — a 50-50 joint venture between Tasman Pulp and paper and NZ Forest Products — is expected to go on stream late next year.

CONFERENCES

The registration form for the 1982 NZIC conference in Dunedin in August is included in this issue.

The New Zealand Organisation for Quality Assurance is holding its annual conference in Auckland May 19 to 22. For further information contact Tony Stevenson, Auckland Industrial Development Division, DSIR.

The New Zealand Institution of Engineers and the Royal Society of New Zealand are sponsoring and organising a 1982 conference *Water in New Zealand's Future*. To be held at Auckland University August 24 to 26, topics to be covered include, water resource management, coastal and inland water quality management, urban and rural water supply practices, wastewater treatment and disposal

practices, environmental considerations. Further information is available by writing to Water Conference 1982, Centre for Continuing Education, University of Auckland, Private Bag, Auckland.

The 15th Pacific Science Congress, sponsored by the Royal Society of New Zealand and the University of Otago, will be held in Dunedin, February 1 to 11, 1983.

The theme is conservation, development and utilization of the resources of the Pacific. The general symposia include energy in agriculture and among the specialist sections are solid earth sciences, marine sciences, nutrition and science education and communication. Further information from the secretary general, 15th Pacific Science Congress, PO Box 6063, Dunedin.

SEMINAR

The vice president of Mercury Instruments of Fairfax, Cincinnati, Dan Fulton, was here recently for seminars on Mercury equipment at Auckland, Bell Block, Lower Hutt and Wellington. The seminars were attended by representatives of gas undertakings in Hamilton, Levin, New Plymouth, Auckland, Wanganui, Hawera, Palmerston North, Hutt Valley and Wellington the Ministry of Energy and the Natural Gas Corporation and the series was arranged by Thorn EMI measurement and appliances.

Fulton, who joined Mercury in 1970 after 20 years with another US measurement equipment manufacturer, says his company owes its existence to the swing to natural gas in USA.

"The last town gas producer of any consequence stopped production in the early sixties, although our modern gas industry started to evolve 30 years earlier. By the time Richard Hannan formed Mercury in 1966, our gas industry was already a high-

pressure-high-volume business," said Fulton.

"We now export to all the natural gas countries — our first overseas customer was the West Midlands Gas Board in UK. Ninety-five per cent of our production is for the gas industry — the rest, mainly chart recorders, goes to firms which need a permanent record of what happens in their process plant. We see ourselves as makers of monitoring equipment — none of our products actually does anything to the gas — merely records its characteristics and calculates flow meter corrections."

Commenting on the problem of applying NX19 tables to flows at very high pressures, Fulton said that the University of Oklahoma was carrying out research which should lead to publication of extended tables by late 1984, a development which should be most helpful to meter engineers.

LETTER

Dear Sir,

The February 1982 edition of journal had an article on the introduction of charging for scientific services by Department of Scientific and Industrial Research. In Ministry of Agriculture and Fisheries we have been able to shrug off the task of charging for our services.

On April 1 1981, the Department of Scientific and Industrial Research implemented the policy of charging for its services on an hourly rate. The previous writer in this column was rather upset at having to charge for services. Our own Ministry of Agriculture and Fisheries laboratory worked under the burden of charging the dairy industry for 40 years.

The Dairy Industry Regulations 1938 introduced a levy on the dairy industry for the cost of quality assessment. The levy was charged on the basis of weight of product manufactured. Each product attracted a different levy which was set annually by regulation. The charges were calculated by adding total expenditure on salaries and equipment, which had to be allocated to each product type. Considerable time was spent by scientists, science technicians and administration staff on accumulating this data. All income was paid directly to the consolidated fund, with none being available for expansion of services.

The 1978 budget removed a number of statutory levies on the agricultural industries including the dairy industry levy. So although I can commiserate with Dr Aldridge of Chemistry Division at least he knows that some of the Department of Scientific and Industrial Research levy is available for expansion.

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Scientist,
Ministry of Agriculture
and Fisheries,
Auckland.

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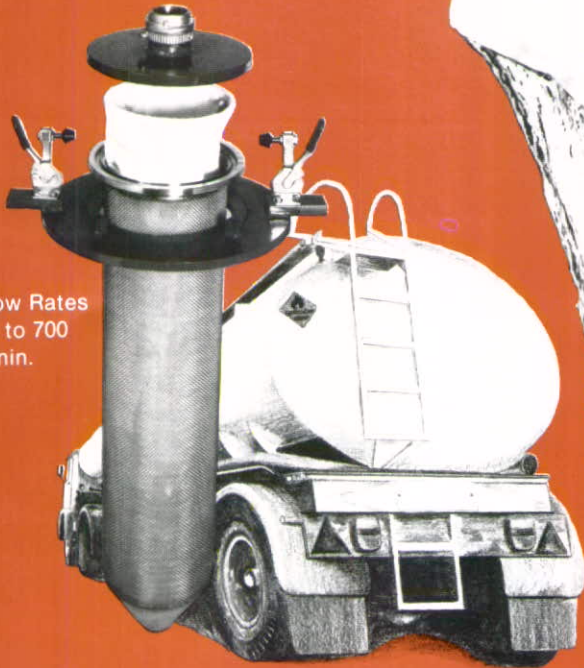


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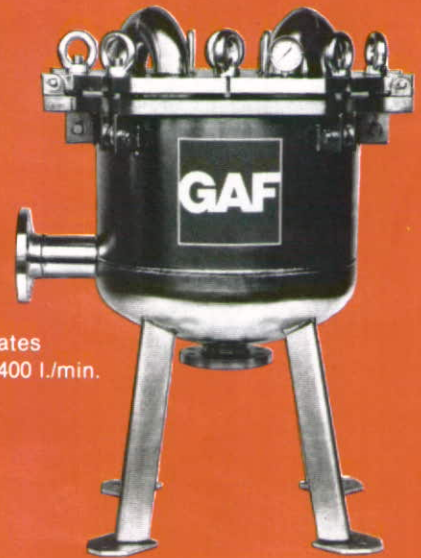


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