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JOURNAL OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY

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CHEMISTRY IN NEW ZEALAND

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CONTENTS

Page

179 Nitrate Pollution of Groundwater in the Waikato Region *by H. L. Baber M.Sc. and Professor A. T. Wilson, School of Sciences, University of Waikato.*

184 Oil Pollution and Offshore Field Development *by A. M. Cundell Ph.D., Agricultural Experiment Station, University of Rhode Island, Kingston.*

188 Obituaries: *James Eric Allan, M.Sc., F.N.Z.I.C.*
George Stevenson Holmes M.Sc., A.N.Z.I.C., A.N.Z.I.M.
Leslie Wilkinson M.Sc., F.N.Z.I.C.

191 Reports:
A National Policy for Technology and Science, *by Dr. G. J. Wright.*
Education Priorities Conference, 15, 16 August, 1972, *by Dr. P. K. Foster.*

194 IUPAC, Aims, Structure and Mechanism.

197 Letter to the Editor: *"Institute Membership".*

198 News from Branches.

203 Notice of Jobling Award.

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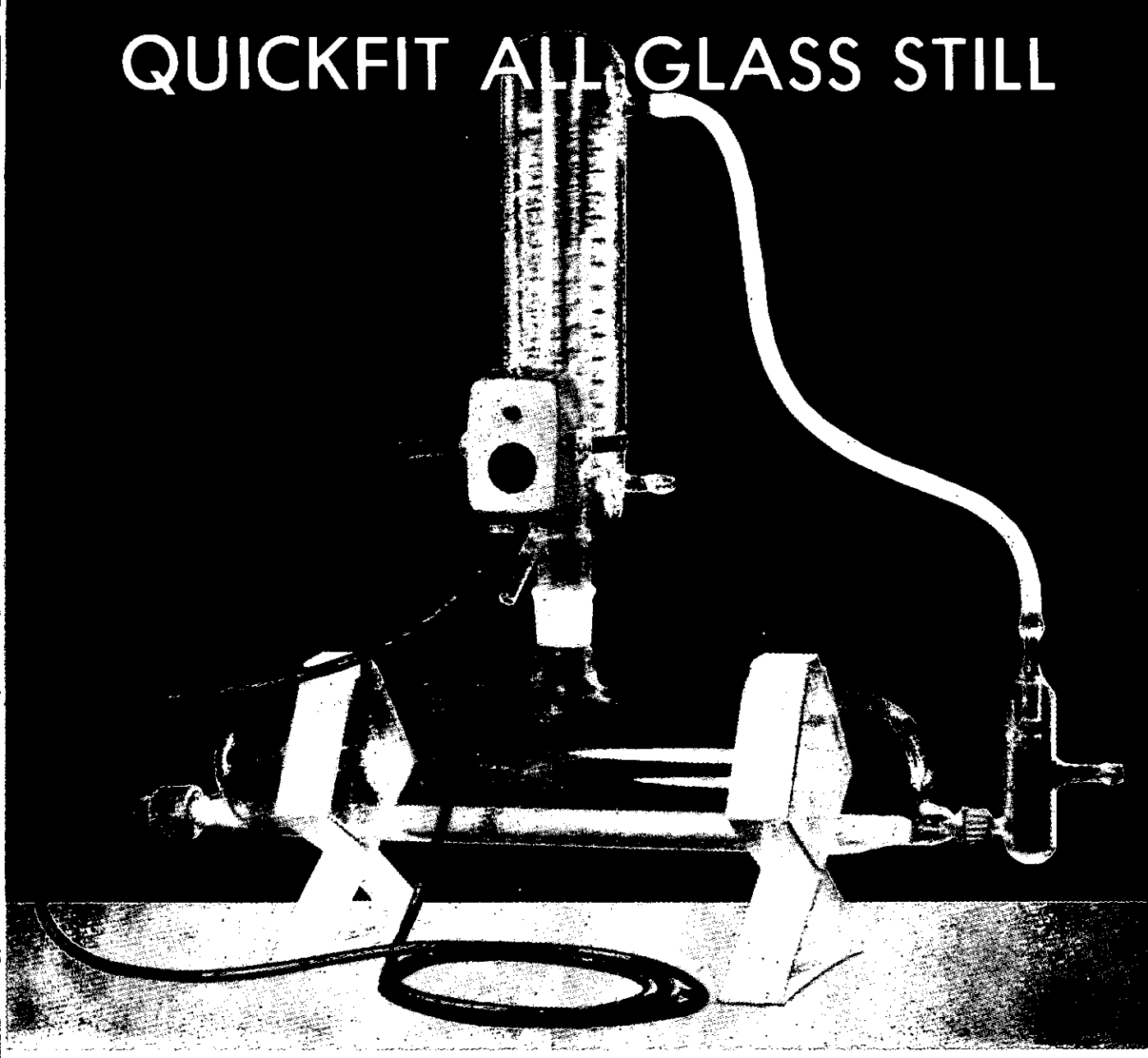

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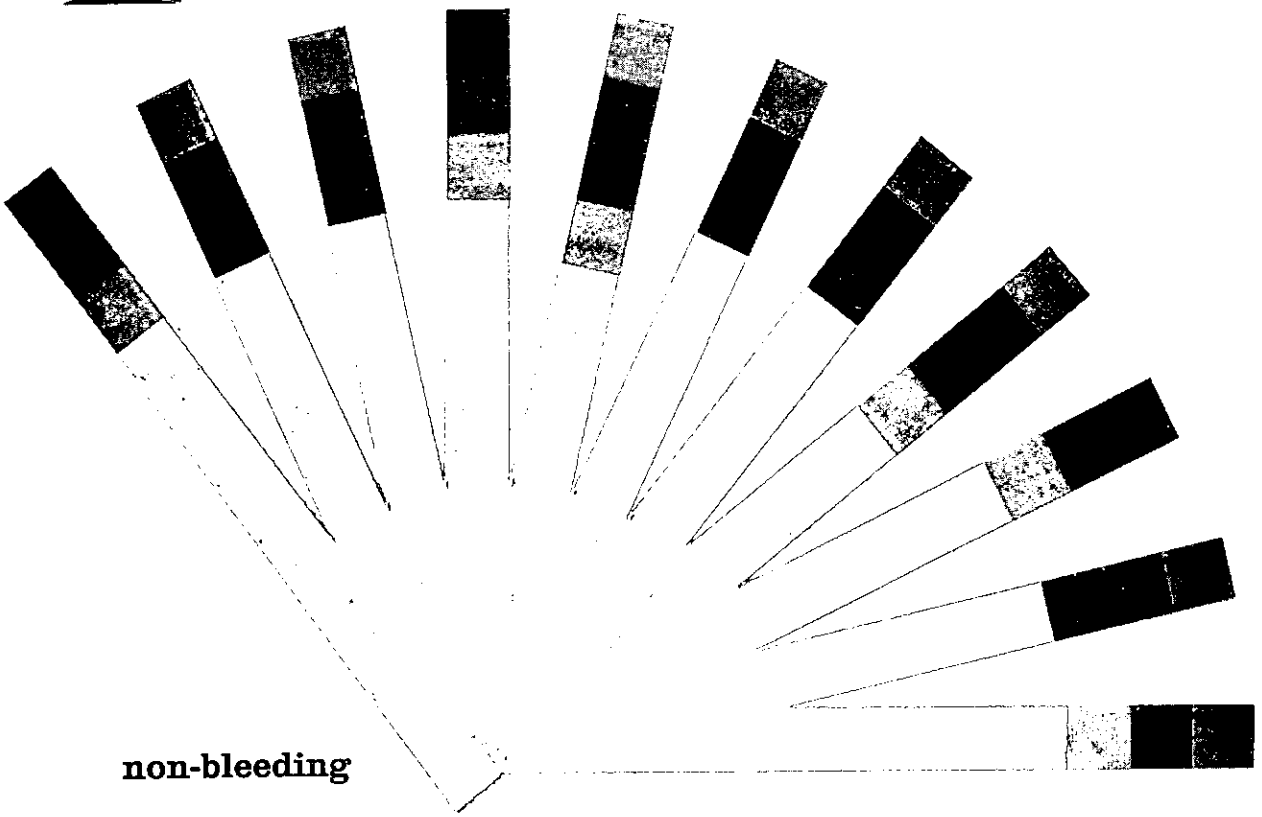

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NITRATE POLLUTION OF GROUNDWATER IN THE WAIKATO REGION

by H. L. Baber and A. T. Wilson
School of Science, University of Waikato, Hamilton

Probably the most topical and controversial subject being discussed in New Zealand today is the pollution of natural resources. Much has been said of the pollution of rivers and lakes by industrial, domestic and farm wastes although the sources and modes of travel of the pollutants are often overlooked. For example: it is often suggested that fertilizer phosphate is responsible for the eutrophication of lakes, but the implication that this phosphate is moving through highly fixing soil is difficult to reconcile with existing theories of soil chemistry.

It has been claimed that the prime source of nitrogen in our economy, namely clover, fixes 300 to 500 lb nitrogen per acre per year.[1] A steady state calculation based on the net average rainfall for the Waikato Region of 65cm[2,3] and assuming negligible denitrification, would imply that water draining down the soil profile would have a concentration of 51 to 86mg NO_3-N/1. Such a situation might be expected to produce groundwater considerably in excess of the 10mg NO_3-N/1 as recommended by the World Health Organisation for drinking water.[4]

For these reasons it was decided to investigate the levels of nitrate in bore waters in the Waikato area to see (a) if the levels of nitrate in groundwater exceeded those recommended by the World Health Organisation and (b) whether it was the nitrate, rather than phosphate, in underground streams that was flowing into surface waterways and lakes causing eutrophication and weed growth.

Experimental: Samples were collected at random from farm bores in plastic bottles that had been impregnated with a small amount of iodine to inhibit bacterial growth[5] and while awaiting analysis were stored in the cold at a temperature of about two degrees centigrade. Where possible, samples taken from bores used, in part at least, for domestic purposes and analysis was completed within thirty-six hours of collection.

Initially the phenol-disulphonic acid method for the analysis of nitrate as outlined in "Standard Method for the Examination of Water and Wastewater"[6] was adopted. This was quite satisfactory but proved rather time consuming so a change was made to using the Ultraviolet Spectrophotometric Method outlined in the same publication. This method involved the measurement of the optical density of the sample at 220nm in a Hilgar Uvispek Spectrophotometer. As any organic matter present may also absorb at 220nm and nitrate does not absorb at 275nm, a second measurement is made at 275nm for the purpose of correcting the nitrate value. In fact, it was found that in most samples the amount of organic material was very small, and also as dilution was necessary for any sample greater than 10mg NO_3-N/1 no serious interference from organic matter was encountered in the analysis.

Results: The results of analysis of nitrate levels in bore water are summarised as follows:

From 87 different bores—

59 i.e. 68% were less than 10mg NO_3-N/1
28 i.e. 32% were greater than 10mg NO_3-N/1
20 i.e. 23% were greater than 15mg NO_3-N/1.

Of 75 of the above 87 bore water samples that are used for domestic purposes (see Fig. 1)—

48 i.e. 64% were less than 10mg NO_3-N/1
27 i.e. 36% were greater than 10mg NO_3-N/1
19 i.e. 25% were greater than 15mg NO_3-N/1.

Nine town and two factory supplies were tested and the results are as follows in mgNO_3-N/l—

Hamilton	0.2, 0.2	Putaruru	2.3, 2.3
Te Aroha	0.9, 0.2	Tokoroa	2.0, 2.0
Matamata	0.7	Ngaruawahia	
Morrinsville	0.6		1.0, 1.1
Cambridge	1.1	Matangi	0.9, 1.2
Tirau	1.3, 1.3	Horotiu	0.5

13 of the borewater sites were revisited and the results in all cases were substantially the same as the first result obtained.

In an independent survey of surface water in the Waikato area, Chapman and Green[7] found the highest level to be 0.38mg NO_3-N/l with an average value of 0.10mg NO_3-N/l.

Discussion: The implications of these findings are discussed under five headings—

(a) Effect on humans.
(b) Effect on animals.
(c) Implications on the total amount of nitrogen fixed by clover in current agricultural practice.
(d) Implications on current theories of eutrophication of rivers and lakes.
(e) Possible use of nitrate analyses of underground water in hydrology.

(a) *Effect on humans*

The World Health Organisation has suggested the maximum nitrate level for drinking should be 10mg NO_3-N/l (i.e. 10 ppm NO_3-N/l).[4] An excess of nitrate in the diet of a human has long been recognised as able to produce the disorder methaemoglobinaemia, which is an excess of methaemoglobin in the blood, the usual adult level being about 1.7%.[8] The result of oxidation of the ferrous iron of haemoglobin to the ferric state is methaemoglobin, being dark brown in colour to contrast to the purple of haemoglobin and dark red of oxyhaemoglobin. Methaemoglobin is unable to transport oxygen and a high concentration in the blood will cause cyanosis (blue skin and membranes) and dyspnea (laboured breathing).[8]

There are three main causes of methaemoglobinaemia.[9,10]

(1) Hereditary Methaemoglobinaemia: caused by the replacement of amino acids at different sites in the β chain of haemoglobin. These changes occur near the heme iron and results in it being more readily oxidised to methaemoglobin.
(2) Familial Methaemoglobinaemia: caused by the deficiency of a DPNH-methaemoglobin reductase in the erythrocytes of an afflicted individual and thus methaemoglobin tends to accumulate in the blood.
(3) Toxic Methaemoglobinaemia: due to the intake of oxidising agents such as chlorates, nitrates, nitrites, ferricyanides, quinones, peroxides, etc., and also after administration of drugs such as acetanilide, salicylates, phenacetin and sulphonamides, etc.

Nitrates present in well water have been found to cause methaemoglobinaemia in infants up to the age of 12 months.[10,11,12,13,14,15,16] It has been found that levels as low as 15mg NO_3-N/l[17] have been responsible for causing methaemoglobinaemia.

In Germany a study[18] of 745 cases of infant methaemoglobinaemia due to nitrate in well waters was conducted over the period 1956 to 1964. 97.3% of the cases were associated with water from private wells and in 83.8% the nitrate levels exceeded 22.5mg NO_3-N/l. Of the infants affected 97.7% were less than 3 months old, 53% had diarrhoea and 8.6% died. In the cases where methaemoglobinaemia occurred, one fifth of the infants were fed powdered milk and the remaining four-fifths were fed diluted cow's milk or diets for diarrhoea. Healthy infants aged, one, two or three months had different concentrations of methaemoglobin in the blood due to the drinking water, but infants older than 3 months had levels of methaemoglobin that were low and independent of the nitrate content of the water.

Some of the reasons put forward to explain the greater susceptibility to nitrate of infants include:

(1) Foetal blood is more easily oxidised to methaemoglobin than is adult blood.[14,19]

(2) Often diarrohea accompanies methaemoglobinaemia and this is thought to be due to an invasion of the upper parts of the intestine by various bacilli usually found in the lower regions of the bowel. *E. aerogenes, C. freundii* and *E. Coli*, the bacilli in question, all possess the ability to reduce nitrate to nitrite.[20]

(3) Burden[21] considers that the high fluid intake in proportion to body weight is a significant factor.

(4) In one study methaemoglobinaemia occurred only in infants who had a low free acid content in the gastric juice (i.e. > pH4).[15]

(5) Difference in the capacity of the oxidation reduction systems in different individuals.[22]

However, most researchers in this field agree that nitrite rather than nitrate is responsible for causing methaemoglobinaemia. Thus some mechanism is responsible for the conversion of nitrate to nitrite but this is not at all well understood.[10]

In conclusion to this section it can be appreciated that infants being fed on a dried milk preparation reconstituted with water containing a high nitrate level are being exposed to the danger of developing high levels of methaemoglobin in their blood. A case has also been reported of an infant developing this condition while being breast fed by its mother who was drinking water with a high NO_3- content.[23] To minimise the effects of nitrate in drinking water the World Health Organisation has recommended that nitrate levels do not exceed 10mg NO_3-N/1.[4]

(b) *Effect on animals*

Little has been reported in the literature concerning the effect of high levels of nitrate in water on animals.[21] However, much has been written on the effects of nitrate/nitrite in feed to cattle, sheep and pigs. Indeed, many cases of methaemoglobinaemia are recorded in the Waikato Region towards the end of summer though, at present, these are associated with high levels of nitrate found in the herbage used for feed.[24]

High nitrate levels in feed have also been associated with a decrease in thyroid function,[25] vitamin A and E deficiencies,[26] and also with abortions due to foetal anoxia from methaemoglobin formation.[27,28]

Dodd and Coup[29] found that 16.6g NO_3-N fed as turnip tops proved fatal in 9 hours to a 350kg cow as was 22.2g NO_3-N fed as Redroot, whereas 5.0g NO_3-N as Redroot was not. A cow drinks, on average, 45 litres of water per day. If the water has 50mg NO_3-N/1 this would result in the intake of 2.3g NO_3-N/1 per day. Therefore it is clear that high levels of nitrate in water could be a significant factor in the formation of methaemoglobin in cattle. Also it appears that animals are more susceptible to methaemoglobin formation by nitrate when they are being fed on a low quality diet.[30]

Thus at the end of summer, often the quality of the pasture is down and the concentration of nitrate is high in both plants and water, and perhaps also the cow has been 5 months in calf, the risks of methaemoglobinaemia and other nitrate associated disorders would be the greatest.

(c) *Implications on the total amount of nitrogen fixed by clover in current agricultural practice.*

Estimates of the amount of nitrogen fixed by clover in our clover/grass agriculture are obtained by determining how much fertilizer nitrogen must be added to a pure grass sward to produce the same dry matter production. The implications of these experiments are that clover under New Zealand conditions can fix very large quaitities of atmospheric nitrogen, 300-500 lbs nitrogen/acre/year.[1] European agriculturalists often doubt these figures. The results in this paper provide an independent calculation of the amount of atmospheric nitrogen fixed by clover. Assuming steady state conditions, negligible denitrification, knowing the net rainfall[2,3] and the nitrate concentration of the groundwater it is possible to estimate the amount of nitrogen fixed/acre/year.

By averaging all the concentrations above 15mg NO_3-N/1 (refer Section (e)) the average groundwater concentration is found to be 26.4mg NO_3-N/1. Thus it can be calculated that clover is fixing, on average, about 150 lbs of nitrogen/acre/year. A concentration of 58mg NO_3-N/1 in groundwater indicates that in some areas as much as 340 lbs nitrogen/acre/year is being fixed by clover, which confirms that under New Zealand conditions clover can fix very large amounts of atmospheric nitrogen.

As will be discussed later (in section (e)) the concentration may vary throughout the year and it would be necessary to obtain the results for a year to work out how much nitrogen is being fixed.

(d) *Effect on current theories of eutrophication of rivers and lakes.*

As mentioned earlier, for some time now the controversy over nitrates versus phosphates as the chief cause of eutrophication in rivers and lakes has continued with doubtful evidence on both sides. The results of this paper would support nitrate as the main factor, for the following reasons:

(1) Nitrates, but not phosphates, can travel through the highly fixing volcanic ash soils of the Waikato region.

(2) A source of nitrate from underground water supplies is shown to exist which must ultimately drain into rivers and lakes.

(3) The nitrate concentration in the surface waters of the Waikato is much lower than the ground waters from which they are derived. The difference appears to be due to the removal of nitrates by the flourishing aquatic plant life found in the rivers and lakes.

(e) *Possible use of nitrate analysis of underground water in hydrology.*

From the nitrate concentration found in groundwater supplies it is proposed that the supplies can be classified into two categories:

(1) Nitrate concentrations between (0 to 10 or 15mg NO_3-N/1). These could be free draining aquifers in which the water is being continually changed. The very low levels (i.e. 0 to 1mg NO_3-N/1) are probably attributable to a surface water supply where the nitrate concentration has been considerably lowered by either aquatic plant growth and/or dilution. The higher levels of nitrate would depend on the position of the balance between the amount of nitrate being leeched into the aquifer and the rate at which the water in the aquifer is changed.

(2) Nitrate concentration greater than 10 to 15mg NO_3-N/1. These would be isolated, perched, aquifers at lesser depth, charged by water draining from highly productive farmland. Under these conditions the nitrate concentration would be expected to increase especially during periods of low rainfall.

Conclusion: The results presented in this paper suggest that some groundwater supplies in the Waikato are now badly polluted by nitrate. The nitrate most probably originates from the highly productive clover/grass system of agriculture used in this region, where the clover can fix many hundreds of pounds of nitrogen per acre per year.[1]

Polluted groundwaters are currently being used for domestic purposes in the Waikato and this is clearly undesirable. The problem might be readily overcome by sinking deeper bores or obtaining alternative supplies (i.e. river or rainwater). A much more serious problem is the eutrophication of the lakes and rivers in the region which results when this groundwater finds its way into these bodies of water. This problem could only be overcome by some change in agricultural practice, such as zero grazing where the animal excretions could be sprayed on the land. This would distribute the animal excretions more uniformly, where the nitrogen might be more readily held in the herbage-animal cycle.

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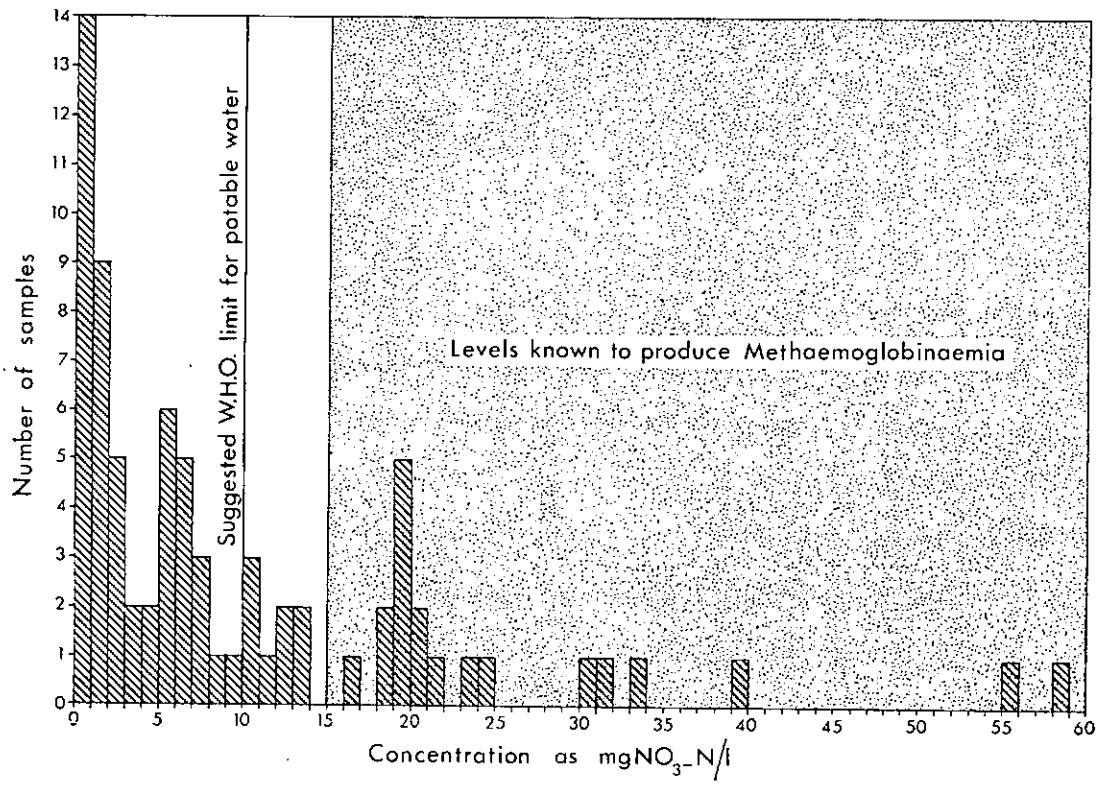

Fig. 1. Nitrate-N content of bores used for domestic purposes.

OIL POLLUTION AND OFFSHORE FIELD DEVELOPMENT[1]

by A. M. Cundell, Ph.D.

The development of offshore oil fields is accompanied by the possibility of oil pollution of the marine environment. There are some thirty nations with offshore oil and gas production with aggregate reserves of approximately 85,000 million barrels or 20 per cent of the world's total petroleum reserves. The U.S. Department of the Interior has estimated that by 1980 about 30 per cent of the oil and 40 per cent of the gas requirements of the United States will come from American offshore fields (1).

The most notorious example of oil spillage in an offshore field was the blowout at Union Oil Well Platform A, three miles offshore from Santa Barbara (2) on January 28, 1969. The inability of the oil company to control and contain the flow of crude oil led to an accumulation of oil at sea which was driven ashore during a westerly storm on the night of February 4. Oil pollution was most obvious as deposition in the intertidal zone on mainland beaches and as oil-soaked sea bird populations. However, longer term damage was difficult to assess because the beaching of oil occurred during the unusually high freshwater runoff due to the rain storm. Also imperfect knowledge of the prespill ecological conditions such as the species diversity, number of each species and seasonal fluctuations meant lack of comparative data for the assessment of damage. It was suggested that the marine environment within the Santa Barbara channel could be less susceptible to oil pollution because of its long history of exposure to natural oil seepage.

Natural gas production from the Maui field in the Taranaki Bight could begin by the mid 1970's. Maui 3, the Shell BP Todd Oil Services strike yielded 42-43mm cfd of natural gas and 2500 bpd of condensate. At the cost of an estimated $170 million for the construction of a production platform and pipeline the site could be developed as one of the fifteen largest gas fields in the world (3).

Many observations on American conditions are pertinent to the proposed New Zealand offshore field. The discovery of natural gas and condensate last year in the Tetco Sable Island E-48 wildcat well (Mobil Oil Canada Ltd.) 100 miles southeast of Cape Canso, Nova Scotia, was the first announced strike on the Atlantic Seaboard (4). Controversy surrounds the proposed development of offshore fields within the Northeastern coastal region. Little is known about the environmental effects of oil pollution within waters originating from the cold Labrador current. Divided jurisdiction between International, National and State authorities for the regulation of the development of the natural resources of the continental shelf also complicates the issue, but the lack of alternative natural gas supplies should encourage the rapid development of this Canadian offshore field and exploration within the Gulf of Maine.

Oil is dispersed in marine environments by evaporation, especially of the low molecular weight fractions with boiling points below 150°C, emulsification by wave action and the sinking of the remaining denser residual fraction (5). Crude oil is made more miscible in seawater than refined oil as it contains natural surface active agents. As these surface active agents are oil soluble they encourage the formation of a thick water-in-oil emulsion commonly termed "chocolate mousse". Cold seawater tends to congeal oil and as the soluble fractions are leached out, its density increases

[1] Contribution No. 1445 of the Rhode Island Agricultural Experiment Station.

to the point where it sinks. Lumps of crude oil residue termed "coquina oil" which have been at sea for a number of weeks and fresher sticky oil can be observed polluting ocean beaches in many parts of the world.

In an oil pollution survey of the United States Atlantic Coast (6) it was found that onshore winds and currents tended to bring oil ashore presumably from leaking hulls and bilge and ballast tank cleaning operations on the high seas. Oil adheres to coral, limestone and boulder beaches; whenever sand is polluted it is often covered over within the space of two tides and the sand becomes permeated with oil.

The coastal areas of Buzzards Bay, Massachusetts, were contaminated by a spill of some 300,000 gallons of No. 2 fuel oil on September 16, 1969. Analyses by Dr. Max Blumer (7) of Woods Hole Oceanographic Institution suggest that pollutant hydrocarbons are incorporated into marine organisms and may be bio-concentrated in a manner similar to organo-chlorine pesticides. The implication of these findings are largely unknown.

Oil is destroyed by auto-oxidation and biodegradation. Under favourable conditions bacterial oxidation occurs at a rate ten times that of physical oxidation (8). Oil-decomposing marine micro-organisms have been demonstrated in water and mud samples collected in harbours, bays and estuaries in areas of known pollution. Most isolation procedures involve incubation of enrichment cultures with crude oil as a substrate above 25°C; thus the isolates are mesophilic micro-organisms. In a recent review of the microbial degradation of crude oil and petroleum products, Professor Claude E. ZoBell (9) of Scripps Institute of Oceanography stated that it was not known whether psychrophilic marine bacteria contribute to the decomposition of oil. ZoBell emphasized that no data was available on the rate of oil oxidation in marine environments within —2° to 14°C. However, preliminary investigations in the Department of Plant Pathology-Entomology, URI, has led to the isolation of psychrophilic marine bacteria which can degrade fuel oil at 8°C.

What are the dangers in the development of offshore fields on the New Zealand's continental shelf? The value of imports of mineral fuels, lubricants and other petroleum products into New Zealand for the year ended June 1970 was NZ$59 million. The security of supply and price especially since the recent increased OPEC prices makes local oil production more attractive. However, the consequences of developing new resources are generally unknown. Without the knowledge of the environmental impact of offshore production in the Taranaki Bight it is impossible to incorporate the possible cost of damage to the environment within the cost-benefits analysis of the industry. Furthermore, the ecology of the marine habitat and an estimate of the value of natural resources such as the fishing grounds and recreational beaches within the area must be known if criteria for assessing the liability over and above the cost of clean-up procedures are to be established in the event of an oil spill.

Prevailing onshore winds and the northward convergence of the West Wind Drift and the Eastern Australian Currents (10) will mean that any oil spilled may be deposited on the Taranaki and Cook Strait beaches. Maui condensate, which is of low specific gravity with a paraffinic base and a predominance of low boiling point fractions (11) would be more readily dispersed than high residue crude oils containing asphaltenes or paraffin waxes. However, its aromatic content (25-30 per cent by weight) may be toxic to marine organisms, especially since the absence of a prior history of chronic oil pollution will mean the habitat will have a low tolerance to petroleum. The surface temperatures on the New Zealand continental shelf ranges from 20°C in the north to 13°C in the south during the summer with about a 4°C seasonal fluctuation (12) and hence the destruction of oil would be moderately slow.

Provided strict adherence to safe operating practices is observed, offshore operations should not be extra-hazardous if conducted with proper precautions such as adequate casing of the well, use of drilling fluid-monitoring devices, emergency stockpiles of drilling mud to seal the well if a blowout occurs, mandatory inspection and weekly blowout practice and the provision of a disaster contingency plan (13). In producing wells, the installation of subsurface safety devices together with their regular inspection and checks that they will close the wells in, will further reduce the risk of a blowout. The best possible clean-up techniques in the event of a blowout are the containment of the spill with a boom followed by the application of a sorbent such as chalk or straw which absorbs the oil and either sinks to the bottom or is removed by a mechanical clean-up device (14).

Unfortunately, booms are not practicable in open waters when conditions are adverse and the use of chemical detergents would be necessary to disperse the spill long before it approaches the shore. Experience gained during the "Torrey Canyon" disaster (15) showed that detergents are often toxic to marine organisms and can cause more ecological damage than the original oil spill. Water based ionic detergents are superior to solvent based non-ionic detergents as they promote the formation of oil-in-water emulsions which disperse the oil and may even encourage bacterial degradation.

The enactment of the National Environmental Policy Act of 1969 in the United States made it mandatory for commercial companies developing new resources or products to file an environmental impact statement. Other important legislation applicable to oil pollution is the Water Quality Improvement Act of 1970 which imposes certain obligations on the owners and operators of offshore facilities in that they must notify Federal authorities of the discharge of any oil, are subject to a civil penalty of up to $10,000 for each known discharge and, even more important they must reimburse the U.S. Government for costs of removing oil from the waters and shoreline unless the spillage was caused solely by acts of God, war or third parties. Liability is unlimited in cases of willful misconduct. Under the Act, a Federal permit is required to conduct any activity which may result in discharges of oil into navigatable waters, a National Contingency Plan was to be prepared and Federal contracts and grants authorized for research into water quality control.

To sum up, petroleum serves an ever increasing proportion of New Zealand's source of energy requirements. The development of offshore oil fields will not only conserve overseas exchange but will encourage the development of new industries. However, overseas experience and internal expertise must be applied to the comprehensive evaluation of the environmental impact of offshore oil production within New Zealand waters. To this end, research programmes on aspects of oil pollution specifically related to local conditions should be initiated. The possibilities of oil spillage resulting from a blowout or handling mishap cannot be discounted and the regulations and technology to cope with such catastrophic events must be in existence when offshore production begins.

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METRIC CONVERSION TABLES

N.Z.S. 6502 *Metrication factors and tables for conversion to S.I. Units* has been published by the Standards Association of New Zealand. The standard will supersede N.Z.S. 488.

It has been prepared as a companion volume to N.Z.S. 6501P *The International System (S.I.) Units and their application* to provide conversion factors from the various units of measurement in current use to units of the S.I. It is based primarily on the information given in B.S. 350 *Conversion factors and tables,* but has been re-arranged to reduce the length as far as possible while preserving optimum usefulness.

Conversions to S.I. units only are included on the basis that the reverse tables are of less usefulness. Copies of N.Z.S. 6502 are available from the S.A.N.Z. Sales Section at $4.50 each ($4.80 by post).

N.Z.S. 6503P Metric units for specialized fields.

Section 1 *Introduction* and Section 82 *Publications* of N.Z.S. 6503P *Metric units for specialized fields* will be published shortly at 30c each (50c by post).

N.Z.S. 6503P consists of a number of sections to which additional sections will be added as demands arise. Each of these will provide an authoritative version of units to be used in that particular field, and will be useful for organizations running courses on the metric system.

Section 1 *Introduction* is a very short summary of the more frequently used units listed in N.Z.S. 6501P and of the rules for their use. A list of common conversion factors is included.

The various sections of N.Z.S. 6503P will be available separately, with standard perforations to fit a loose leaf binder. Special reductions in price may be given for orders of reasonable quantities of any section.

Section 82 *Publications* has been prepared for writers, typists, teleprinter operators, editors, and printers who are concerned in producing material and with its reproduction in the printed form.

Further sections will be developed by the Physical Measurement Sectional Committee of the Standards Association.

Copies of these standards are available from the Sales Section, Standards Association of New Zealand, 6th Floor, World Trade Center, 15-23 Sturdee Street, Wellington 1 (Private Bag, Wellington).

OBITUARIES

JAMES ERIC ALLAN
M.Sc., F.N.Z.I.C.

FIRST VICE PRESIDENT, N.Z.I.C.

In the untimely death of Eric Allan, New Zealand has lost one of its most valuable scientists. Although he worked in an apparently restricted field his achievements in this field were outstanding and the results are a major contribution to analytical chemistry.

Eric Allan graduated B.Sc. from Otago University in 1939 and joined the Dairy Division, Department of Agriculture in 1940. After about 3½ years with a Radar/Technical Unit of the N.Z. Army he returned to the Dairy Laboratory, Wallaceville. A rehabilitation bursary enabled him to complete his M.Sc. at Victoria University. In 1950 he transferred to the Extension Division of the Department of Agriculture to set up and control a spectrochemical laboratory at Rukuhia Soil Research Station, Hamilton and spent a few months at the Dominion Laboratory, Wellington to gain experience in spectrography.

The pioneering aspects of his new task gave him a goal toward which all his faculties from then on were directed. Before long plant and soil solutions were being analysed for major constitutents by the Lundegardh technique, an operation later automated. As a side line a double beam flame photometer was built for soil analysis for calcium and potassium and a triple beam instrument (including sodium) for plant analysis. Spark emission methods for trace elements were actively investigated and used.

In 1955 Dr A. Walsh published his paper describing a hollow cathode lamp and its probable value as a method of analysis by atomic absorption. Eric Allan was immediately interested as analysis for magnesium was unsatisfactory by other methods but likely to be particularly amenable to atomic absorption. No instrument was available so he combined his own knowledge of spectroscopy and flame photometry to devise a workable modification of the spectrograph. He designed and built the stabilised power supply required and then proceeded to pursue fundamental research into the problems of this new technique. The scope of his papers which followed covered a wide field of both theoretical and practical aspects, and it was largely due to them that atomic absorption became established as an acceptable analytical tool and that commercial instruments were developed and became available throughout the world. The only person who knows the full worth of Eric Allan's contribution to atomic absorption is Dr Alan Walsh, F.R.S. who developed the hollow cathode lamp and who became a close friend and colleague.

In all this work Eric Allan relied only on the literature and his own abilities. He read widely and critically and his remarkable

memory was a ready reference to any relevant paper. He thought deeply into his subject and designed and carried out critical experiments to establish the fundamentals of the new technique.

As well as continuing with basic research Eric Allan was always aware of the practical application of the technique. As a chemist he devised the methods necessary to prepare solutions suitable for flaming and new methods of concentration of trace elements to achieve maximum sensitivity.

Despite his position as a world authority on most atomic absorption techniques he remained modest and unassuming but bore a personal and professional dignity. Well liked by all, he was particularly admired by the small staff with whom he worked.

Eric Allan was an Associate and later a Fellow of the Institute for many years. He regularly attended local meetings and served as local Secretary, Chairman and Conference Secretary.

He died in Hamilton on 5th October, 1972 after a short illness, at the age of 53. He was survived briefly by his wife Helen who died on 10th October, 1972. They are survived by five children and four grandchildren.

The death of J. E. Allan is obviously a great loss to his friends and colleagues in New Zealand. I write to say that his many Australian friends feel an equal sense of bereavement. Eric Allan had come to occupy a unique place in the Australian spectroscopy fraternity. His outstanding contributions to atomic absorption spectroscopy had earned him the highest of reputations and we always made great efforts to entice him to each biennial Australian Spectroscopy Conference. His papers and his lectures were ample evidence of his quality but his influence on the subject extended far beyond his publications. He had an unerring instinct for picking the area in which a contribution could be made and in private discussions with us he had a profound influence on the direction of Australian research work. His ability to be completely objective about all aspects of the subject was exceptional and we soon came to realize that all his experimental facts were beyond question. Equally impressive was his burning desire to exploit any advance in the technique for the benefit of soil research in New Zealand. His dedication was complete.

I believe the development of atomic absorption spectroscopy has depended largely on the close and wonderfully informal collaboration of Australian and New Zealand scientists. That this union was so fruitful and so thoroughly enjoyable to all concerned was largely due to Eric Allan's outstanding abilities and admirable personal qualities. He was held in the highest esteem by all of us who had the good fortunate to collaborate with him. In a real sense we feel we have lost a colleague who is quite irreplaceable. I have lost a dear personal friend.

A. WALSH,

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Clayton, Victoria,3168, Australia.

GEORGE STEVENSON HOLMES

Mr Holmes, who had been an Associate of the Institute since 1944, died on 7th September, 1972 after a brief illness aged 51. He was an Canterbury graduate and at one time served on the Canterbury Branch Committee and as Branch Editor.

After completing an M.Sc. in Chemistry Mr Holmes spent some time in Australia in connection with the establishment of Dunlop's general rubber goods factory in Christchurch, where he served for a number of years as Chief Chemist.

In 1949 he joined the Fletcher Group as a chemist and later held several management positions in Christchurch and Auckland. It was during this time that his interest in the scientific aspects of management was developed and led to a period in private practice as a consultant.

Mr Holmes was in charge of Work Study for Winstone Limited for a time before joining the University of Auckland five years ago.

Mr Holmes was Senior Lecturer in Mechanical Engineering at the University and leader of the group teaching Industrial Administration and Industrial Engineering in the B.E. programme. He was also Course Organiser for the inter-faculty Diploma of Business and Industrial Administration. He was an Associate Fellow of the N.Z. Institute of Management and President of the Auckland Work Study Society on two occasions.

Throughout his career George Holmes established a reputation as a thorough and dedicated employee. His quick wit, which enlivened many a discussion, tended to disguise his essentially human concern for his fellows. This often prompted him to make considerable sacrifices for worthy causes, colleagues or friends. No one ever turned in vain to him for help and many will miss his cheerful friendship and wise counsel.

Mr Holmes leaves a wife, son and two daughters.

LESLIE WILKINSON
M.Sc., F.N.Z.I.C.

Leslie Wilkinson, Government Analyst, Christchurch, died on 18 September after suffering ill-health for several years.

He was educated at Christchurch Boys High School, and in 1936 graduated M.Sc. with honours in chemistry at the University of Canterbury. After a year at the Christchurch Teachers Training College, and a short period teaching, he joined the staff of Chemistry Division, D.S.I.R. in Wellington. He transferred to the Auckland branch laboratory in 1946, and to the Christchurch branch laboratory in 1947. Following the retirement of Mr Alcorn in 1971 he was appointed Government Analyst, Christchurch.

Mr Wilkinson was elected as Associate of the Institute in 1939, and was awarded the Fellowship in 1962. While in Wellington he was a member of the Branch Committee, and was Assistant Secretary of the Institute. He was also the first Secretary of the Chemists Employment Committee. After transferring to Christchurch he became a member of the Canterbury Branch Committee, was Conference Secretary in 1950, and Branch Chairman in 1959.

Shortly after his appointment to Chemistry Division he went to Onekaka where he analysed several hundred iron ore samples as part of a study of a possible iron and steel industry. Mr Wilkinson also worked on corrosion problems associated with the Lower Hutt artesian water supply. An early publication, in 1941, describes a study of copper contamination of water from hot-water cylinders. Later, he was placed in charge of the paint research section of Chemistry Division. In Auckland he worked on timber preservation problems. In Christchurch his work covered food and drugs, forensic chemistry, and later, air and water pollution.

Mr Wilkinson represented D.S.I.R. on the Board of Health Committee whose report formed the basis of the Clean Air Bill introduced this year. He was also a member of the Water Pollution Advisory Council and National Research Advisory Council working parties on water use and pollution.

Mr Wilkinson was highly regarded by his colleagues, and was most generous and skilful in passing on his knowledge to younger associates. His faculty for clear and logical thinking, and ability to analyse a problem from basic principles was apparent in all his work.

He is survived by his wife and two sons.

G.C.

"A NATIONAL POLICY FOR TECHNOLOGY AND SCIENCE—?"

Conference held at Melbourne, 29th June, 1972; organised by the Royal Australian Chemical Institute.

Dr G. J. Wright, Senior Lecturer in Chemistry, University of Canterbury was visiting Lecturer in the Chemistry Department, Monash University at the time of the R.A.C.I. Conference "A National Policy for Technology and Science—?"

N.Z.I.C. Council asked Dr Wright to attend the conference and his report has been sent to the Minister of Science and N.R.A.C. In the following article he gives his impressions of the Conference.

As the only New Zealander amongst a couple of hundred Australians on their own ground, I was puzzled by this conference until I pieced together the events which led up to it. The Australian Academy of Science had been pressing for some years for a clearly defined government policy on developments in science and technology; the Academy actually sent the Minister (Mr Malcolm Fraser) detailed proposals for a national committee several years ago—proposals which apparently went unheeded. Many of the professional scientific bodies in Australia were also worried about the lack of national direction in science and technology, and this conference was the outcome of the R.A.C.I.'s concern. It was arranged for a day in May 1972, and then postponed till the end of June. Two days before the original date the Prime Minister announced that the government was setting up a National Advisory Committee on Science and Technology—rightly or wrongly the conference clearly believed that the Prime Minister was unaware of the change of date.

Once I had this background it became easier to understand the mood of the conference. What was to have been a crusade became a conducted tour—the Prime Minister's statement had taken the bite out of the day. There were criticisms over matters of detail, particularly the membership of the committee; for example, the conference obviously preferred the Academy's suggestion of "a majority of scientists" to the proposed "eleven distinguished persons with experience in manufacturing industry, primary industry, mining industry, commerce, finance

and science". But the government had done something, its action was generally acceptable, and the conference was without a cause to fight for.

The speakers were illustrious and informative—Sir Ian McLennan (Chairman of B.H.P.), Dr R. G. Ward (Planning and Research Manager for B.H.P.), Professor A. J. Birch (A.N.U. Research School of Chemistry) and Mr R. D. Hiscocks (a Vice President of Canada's National Research Council). The Australian speakers were scathing in their comments on previous lack of planning for developments in science and technology, making the point several times that developments in the past have been determined mainly by the Tariff Board and Arbitration Commission. The industrialists were certain that the resulting short-term changes in emphasis had seriously undermined industrial research and development. But much of their thunder had been stolen. The discussion groups in the afternoon had the same feel about them; people with lots of ideas were reduced to detailed criticism of a proposal with which, in the main, they agreed.

The key paragraph in this proposal is worth recording: "The primary function of the Committee (on Science and Technology), which will report to me through the Minister of Education and Science, will be to make recommendations to the Government on Australian efforts in civil science and technology. It will assess on a continuing basis Australian requirements, resources and potential in civil science and technology and will provide advice on these matters. The Government intends that the Committee should make wide-ranging and comprehensive assessments of the scientific and technological situation. It will advise on such facets as long-term planning, new areas which are of importance to Australia, the priorities that should be assigned to specific projects or areas of research, the means for improving efficiency in the use of resources and the effective development and utilisation of scientific and technological manpower. The Committee will be empowered to undertake studies on its own initiative, in addition to providing advice on specific matters that are referred to it by the Government."

The one strong conclusion which emerged from the conference was that the R.A.C.I. and similar bodies must make representation to the Advisory Committee without waiting to be asked—must bring to its attention areas involving chemistry deserving of special study and development—must become politically active on chemical matters, if you like. This New Zealander went away feeling that in terms of a defined policy for science and technology, New Zealand might be a bit ahead of Australia, but that the N.Z.I.C. could well take note of the conference's advice to the R.A.C.I.

MANAGEMENT COURSE FOR INDUSTRIAL CHEMISTS AND OTHERS EMPLOYED IN THE CHEMICAL, FOOD AND RELATED INDUSTRIES

The Auckland Branch together with the Auckland Technical Institute propose to hold a 12 week part-time Management Course for industrial chemists, recent chemistry graduates, salesmen and technical personnel employed in the chemical and food manufacturing or supply industries.

The course will be for four hours per week for 12 weeks during July-August, 1973 and it is envisaged that full time management tutors and guest lecturers will give a thorough introduction to management principles and techniques. As only there is room for twenty five students it is recommended that those interested make early contact with Mr J. G. Fletcher, Auckland Technical Institute, P.O. Box 5044, Auckland.

EDUCATION PRIORITIES CONFERENCE 15 & 16 AUGUST, 1972

Dr. P. K. Foster, Director of PACRA attended this Conference as N.Z.I.C. representative

In the company of approximately 280 others I attended this Conference representing the Institute of Chemistry. The registration list showed that of the registrants, half were in some way connected with the education business ranging from pre-school to tertiary, and about 20 came from the industrial and commercial world; and it appeared regrettable that there should be only one specifically affiliated to the Trade Union movement.

After the official opening by the Prime Minister and an address by the Minister of Education, two pre-circulated papers were presented. These were "Public Education in 1972", presented by the Director General of Education, and "In Search of a Statement of Aims for New Zealand Education" from the Advisory Council on Educational Planning and presented by Council's acting-Chairman, Mr Edgar. Responses at this first plenary session to these two papers were given by Professor Margaret Dalziel and Professor A. D. Brownlie.

The remainder of the Conference consisted chiefly of discussions in groups of about 30 or so. In the afternoon of the first day the discussion comprised awarding priorities. The hard-working secretariat correlated the findings of the nine groups. Nine topics appeared in the first priority list of five groups or more as follows:

Topic	*Number of groups*
Aims and objectives	9
Secondary school curriculum	8
Teacher education and training	7
Continuity of the curriculum	5
Pupil assessment	6
Pre-school education	5
Maori and Polynesians and other minority groups	6
Research and dissemination	8
Life-long education	6

These were discussed by the groups on the second morning, when there was also a Plenary Session at which the group chairmen reported on the general aspects of their individual discussions. The remainder of the day was spent in discussion, in groups, of the terms of reference of the Working Parties which were to comprise the next stage of the Conference.

Comment

The Conference created an uneasy feeling. This was because there were a number of matters which were not raised which were taken for granted, and/or were more fundamental than those discussed within the rigid schedule adopted. No time was opportune or available to raise them. For example:

1. With 280 people present for two working days, the cost of the Conference can be estimated to be of the order of $25,000, without considering the loss of productive work which would have resulted from the delegates' normal occupations. One must ask "Was it worth it?"

2. The key results of the Conference will comprise the number of working parties set up, the broad fields they are to cover, their detailed terms of reference, and the numbers in each party. All these items remained in the control of the Steering Committee, the Conference could do little or nothing to affect them, and they were all largely already decided in advance of the Conference.

3. The Departmental Paper covered a wide field but to quote its Introduction: "No attempt has been made to assign priority to any of the issues raised". The current level of expenditure $323 million for 1971-72) is surely too large to be expended (by implication) haphazardly

in the absence of priorities? That there are no accepted and operative aims either, is implicit in the title of A.C.E.P.'s conference paper: "In search of a statement of aims for New Zealand education". Why have aims and priorities not been recommended for Government decision by the Education Department, as the professional advisors to Government? Or as Professor Dalziel commented in her response to the Departmental Paper "This is a well considered and informative document, indispensable as a background to the proceedings of this Conference. But—where is the action?". One must ask these questions if one accepts the general principle that the prime responsibility of any management is to formulate for the approval of those to whom it is responsible, the aims and objectives of its own organisation.

It is accordingly difficult to see any answer to the chief question of which the above matters are parts i.e. why hold a Conference at all in the manner in which it was held? It should be noted that this is quite a separate matter from the importance which must be given to establishing aims and objectives, to adequate research to compile the necessary information, and to other matters agreed by the nine discussion groups to have high priority. As the Conference delegates included a large number (140) of educationists, with whom the Education Department would be in touch in the normal course of its duties, the Conference was hardly necessary to establish this list.

P. K. FOSTER

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

Aims, Structure and Mechanism

The International Union of Pure and Applied Chemistry (I.U.P.A.C.) is an organization free from political affiliations or obligations, created and operated voluntarily by chemists themselves on a non-profit basis. Its predecessor was the International Association of Chemical Societies, in the formation of which distinguished European chemists like Wilhelm Ostwald were prominent, and to which Ernest Solvay gave generous support. The proposal for a union of chemists was made informally in London in 1918 by Sir William Pope, President of the Society of Chemical Industry, and Paul Kestner, President of the Société de Chimie Industriele; it was formally constiuted at a meeting in Brussels in 1919.

Aims

The objects of the Union are both simple and important, namely to study matters in pure and applied chemistry which need international regulation, standardization or codification; to cooperate with other international organizations which deal with topics of a chemical nature; to promote cooperation between chemists of the member countries; and to contribute to the advancement of pure and applied chemistry in all its aspects. The adhering bodies, at present forty four in number, are national organizations such as academies of science or research councils which represent the interests of chemists in different countries. I.U.P.A.C., with similar Unions in other branches of science, is a Scientific Member of the International Council of Scientific Unions (I.C.S.U.).

Work of the Union

The ramifications of chemistry are now enormous. It is vital for health and medicine, for obtaining and maintaining satisfactory standards of living, for the production of

foodstuffs, for conservation of the environment, and in the conduct of international trade and commerce. It plays a significant part in current methods for obtaining nuclear energy, and in the prosecution of space research. Behind these obvious applications, less spectacular but essential work has to be done on such basic things as an agreed international nomenclature or terminology, on tables of symbols, atomic weights, standards of purity, and analytical methods.

Reports and recommendations on such matters, prepared by international groups of experts, have been of the greatest value; for many years they have been accepted universally as authoritative, although they are not mandatory upon any of the member countries nor the chemists belonging to them. This administrative aspect of I.U.P.A.C.'s affairs is handled at biennial conferences which, over the years, have been arranged in many countries. Work done between meetings by separate Commissions or by individuals, through correspondence or by informed discussions whenever opportunities offer, is brought to a focus at the Conferences, so that agreed conclusions can be reached. Normally a Congress is held in conjunction with the Conference. Congresses provide the opportunity for younger chemists to meet each other and to hear of progress in selected fields of current importance. The rapid growth of chemistry as a whole has now made it impracticable to deal with everything at any single Congress. In addition, I.U.P.A.C. sponsor a number of specialized symposia which are organized or recommended by its Divisions or Commissions. Between 1969 and 1971 thirty-six such symposia were sponsored in all parts of the world.

Mechanism

I.U.P.A.C. is at present divided into Six Divisions dealing with physical, inorganic, organic, macromolecular, and analytical chemistry, and some aspects of applied chemistry. Currently, emphasis is being placed in the Applied Chemistry Division on problems relating to human welfare, particularly food and the environment (food and fermentation industries, oils and fats, pesticides, air and water quality). In addition to the six Divisions there is an independent Section on Clinical Chemistry.

Each Division is headed by a Committee which coordinates the work of Commissions and Sub-Commissions belonging to it. Commissions cover a diversity of subjects, e.g. the Physical Chemistry Division has Commissions on physicochemical symbols, terminology and units, thermodynamics and thermochemistry, electrochemistry, physicochemical measurements and standards, molecular structure and spectroscopy, colloid and surface chemistry. The Inorganic Chemistry Division has Commissions on nomenclature, chemical taxonomy, organic photochemistry and medicinal chemistry. The Analytical Chemistry Division covers analytical reagents and reactions, microchemical techniques and trace analysis, nomenclature, spectrochemical and optical procedures for analysis, electroanalytical chemistry, and analytical radiochemistry and nuclear materials.

Between I.U.P.A.C. and I.U.B., the International Union of Biochemistry, there is a Liaison Committee and a joint Commission on Biochemical Nomenclature, a Committee on the Teaching of Chemistry, and various Interdivisional Committees. As Commissions complete the work for which they were appointed, they are dissolved. Others are formed as required. All Committees and Commissions are set up on an international basis and contain experts in the relevant field from academic and industrial establishments. A report on the work of I.U.P.A.C. over the period 1957-67 has recently been prepared by Prof. W. Klemm (President 1965-67).

Certain other organizations are officially associated with I.U.P.A.C., namely Comité International des Dérivés Tensio-Actifs, European Federation of Chemical Engineering, European Photochemistry Association, Federation of European Chemical Societies, International Congress on Catalysis, Interna-

tional Federation of Clinical Chemistry, International Magnetic Resonance Society, International Society of Electrochemistry (formerly C.I.T.C.E.).

Administration

The governing body of I.U.P.A.C. is its Council, on which all adhering countries are represented. Between meetings of Council the business is conducted by a Bureau composed of the President, Vice-President, Past-President, Secretary General, Treasurer, ten or more elected members, and the Presidents of the six Divisions. More urgent decisions between meetings of the Bureau are delegated to a small Executive Committee.

Publications

The reports from Divisions and Commissions presented at the biennial Conferences are published in the *Comptes Rendus,* which also includes general information about I.U.P.A.C., its adhering members, associated bodies and membership of the many Commissions. In its early years detailed recommendations for nomenclature rules and standards were left for publication by national societies or other bodies, and the dissemination among working chemists was not always as complete as is required. The Union has now gone a long way to overcoming this difficulty.

Firstly, it publishes in *Pure and Applied Chemistry,* its official journal, the final (definitive) recommendations on nomenclature and standards, as well as main lectures given at many of its sponsored symposia. These articles are often issued as bound offprints from the journal so that those who do not wish to subscribe to the whole journal can obtain parts of it. Between 1960 and the end of 1972 thirty two volumes of *Pure and Applied Chemistry* will have been published, and more than 75 bound offprints have been issued. In addition, special supplementary volumes are produced to deal with reports which are too lengthy or specialized for the journal. Recent items of particular importance are revised editions of the Red Book (*Nomenclature of Inorganic Chemistry*), the Blue Book (*Nomenclature of Organic Chemistry*), and the Green Book (*Manual of Symbols and Terminology for Physicochemical Quantities and Units*). A fourth book, dealing with recommendations from the Analytical Chemistry Division, is under consideration. Arrangements have been made with the Union's publisher for reprinting and translation of some of these key recommendations, subject to minor conditions.

Secondly, the *Information Bulletin,* issued at regular intervals, contains information of general interest about the work of the Union. Tentative nomenclature recommendations are published as a supplement for scrutiny by all chemists before becoming final (definitive) recommendations. Other appendices now include technical reports of various kinds which are less appropriate to the journal.

Finance

The Officers and all who serve on the Committees and Commissions of I.U.P.A.C. work voluntarily. The Union has a small secretariat, but the administrative costs are kept to the minimum. The principal source of I.U.P.A.C.'s funds is the annual subscriptions of the member countries, together with a small subvention from U.N.E.S.C.O. and donations from national bodies, industry and individuals.

Recently, through a scheme of Company Associates, I.U.P.A.C. has been able to obtain more income and at the same time create a greater knowledge of its work among the chemical industrial firms in many countries. Company Associates obtain publications of the Union and information about congresses and symposia. The participation already of some 150 industrial firms in this scheme (most of the larger companies in the bigger countries as well as many smaller ones) indicates their appreciation of the value of the Union's work. It is hoped that others will join to support it. In recent years I.U.P.A.C. has received grants as a result of acting as consultant to important

agencies such as the European Economic Community. Increased income is still needed if the Union is to serve the international community as it should. The work of the Union now involves many practical problems relating to the environment and problems introduced by the rapid advance of chemical technology, as well as fundamental matters in the progress of chemical research.

Further information about the Union and its publications may be obtained from:

I.U.P.A.C. Secretariat,
2-3 Pound Way, Cowley Centre,
Bank Court Chambers,
Oxford OX4 3YF, U.K.

RECENT PUBLICATIONS

Titles of Appendices to be Published in November, 1972

(a) Tentative Nomenclature Appendices

No. 26: Nonmenclature, Symbols, Units and their Usage in Spectrochemical Analysis-II. Terms and Symbols Related to Analytical Functions and Their Figures of Merit (Commission on Spectrochemical and Other Optical Procedures for Analysis)

No. 27: Nomenclature, Symbols, Units and Their Usage in Spectrochemical Analysis-III. Analytical Flame Spectroscopy and Associated Procedures (Commission on Spectrochemical and Other Optical Procedures for Analysis)

No. 28: Electrochemical Definitions and Symbols (Commission on Electrochemistry)

No. 29: Nomenclature of Regular Single-Strand Organic Polymers (Commission on Macromolecular Nomenclature)

(b) Technical Report

No. 6: Collaborative Study of the Stability of Aflatoxin M_1 Standards (Food Section: Commission on Food Contaminants)

LETTER TO THE EDITOR

"Institute Membership"

In the October issue of the Journal the Auckland Branch Editor in a guest editorial refers to a change in the Rules of Membership as "the recent Council decision to make entry into the Institute more difficult for non-graduate applicants". I am writing on behalf of the Membership Committee to express our concern lest this view gains acceptance.

The change in Rules, and particularly the introduction of the professional interview which may be required particularly of non-graduate applicants, offers much greater flexibility, and in fact makes it far easier for applicants of adequate professional standard to make their case to the Institute for admission.

A commentary for attachment to the next re-printing of the Rules has been drafted by the Membership Committee, and is currently under Branch Committee consideration. It is important that all giving consideration to this matter should be aware of the greater ease with which valid applicants can be justified. It is certainly the wish of the present Membership Committee that this be so.

Yours faithfully,

P. K. FOSTER
(for Membership Committee)

PLEASE NOTE

During the absence overseas of the N.Z.I.C. Secretary, Dr W. E. Harvey for the next nine months, the Registrar. Mr D. J. Hogan will be Acting-Secretary. Please note—mail for the Secretary should be addressed to:

Mr D. J. Hogan,
P.O. Box 1926,
Christchurch.

NEWS FROM BRANCHES

Auckland

This Branch and the chemists on the Auckland Technical Institute staff organised a very successful Symposium on Heavy Metals in the Environment. The Symposium gave chemists from Otago to Whangarei, geologists, environmentalists and others interested in the environment an opportunity to discuss the effects of heavy metals on the environment.

The "Christmas Luncheon", the first for this branch for a very long time, attracted 72 members and guests, who enjoyed the usual lavish Danish House luncheon. Dr Colin Maiden, Vice Chancellor, University of Auckland addressed the meeting on "Emission from Automobiles", an address which was lively and controversial.

The Annual General Meeting was given a novel twist this year when a special invitation was sent to each member inviting him (and his wife) to attend the meeting after enjoying refreshments (at no charge) of wines, lagers, cheeses and savouries. At the suggestion of Mr Raymond Hopgood name tags have been purchased and will be printed for members to wear at future functions.

Dr G. A. Wright is completing a report from his Branch on "Blueprint for Survival" for the Auckland City Council to consider.

An Auckland Branch delegation consisting of Dr G. A. Wright, Dr I. Devereaux and Dr A. Odell waited on the Waitemata Harbour Study, a joint planning study by the Auckland Harbour Board and the Auckland Regional Authority. They explained how members of the Institute should be involved in matters concering the chemical quality of the harbour waters and related matters.

On 26 October Mr A. C. Kennett and the Branch Committee arranged a Symposium on "Laboratory Supplies". Although no violent arguments ensued the Laboratory Supply Houses and their customers had a thoroughly enjoyable discussion on all aspects of laboratory supplies.

Personal:

Mr K. J. Osborne has joined Metal Protection Ltd as Managing Director.

Mr J. D. Salinger moved to Wiri as Quality Control Chemist with Merck, Sharpe and Dohme (N.Z.) Ltd. when their modern new factory complex opened recently.

Mr A. C. Kennett presented a paper on Hazardous Materials to a Materials Handling Seminar on 18 November arranged by the Centre for Continuing Education and the School of Engineering, University of Auckland.

The following members took part in a Seminar on Pollution Control on 4-7 December at the School of Engineering University of Auckland:

Water Quality Assessment—Dr M. E. U. Taylor.

Industrial Waste Water Control—Mr R. Hicks.

Management in the Control of Air Pollution —Mr N. G. Thom.

Air Pollution Monitoring—
Dr D. J. Spedding.

Manawatu

The Branch is to nominate an official representative from the New Zealand Institute of Chemistry to the Sub-Committee of the Palmerston North City Council's Economic Development Committee. The Sub-Committee is convened by Professor R. L. Earle (Massey) and is to investigate the promotion of science-based industries in the

Manawatu region. Dr R. W. Bailey (D.S.I.R.) is also a member.

Over fifty members attended the end of year function of the Branch at Monties Restaurant. The meeting was addressed by Mr H. Barr (Unilever N.Z. Ltd.) on "Productivity—The Chemist and Others."

Massey University

During the third term, senior students from Rangitikei College, Marton, came in with their teacher, to use the full facilities of the First Year Chemical Laboratory. This visit, which has been aptly described as a "field trip" for chemistry students, is the first of what is hoped to be a number of similar visits, from school pupils in the Manawatu and surrounding districts.

Dr Nario Masaki visited the Department of Chemistry, Biochemistry and Biophysics. He is from Kyoto University, Japan and his interests include the structure and function, of biologically important organic molecules and proteins.

New Zealand Dairy Research Institute

Dr K. J. Kirkpatrick has been seconded to the N.Z. Milk Products Inc. in Chicago, U.S.A., for two years. He will act as technical advisor for the marketing of New Zealand dairy products in the U.S.A.

Dr G. F. Serviallach has recently joined the staff as a chemical engineer in the Casein and related products Section. He obtained his education at the University of Barcelona and the Swiss Technical Institute, Zurich.

Mr A. A. Evans has been awarded a Ph.D. in chemical engineering from the University of Canterbury.

A pilot plant designed to extract bile acids from animal gall is being commissioned in the Biotechnology Department. The process is the result of two and a half years investigation by Tasman Vaccine Laboratory Ltd. in collaboration with Dr R. Chong of the Biotechnology Department. The plant was built by N.Z. Pharmaceuticals Ltd. (a joint venture between all meat export freezing companies and Tasman Vaccine Laboratory Ltd.) who intend to establish a factory capable of processing all the gall available in New Zealand.

Wellington

V.U.W.—Chemistry Department

Associate Professor W. E. Harvey, left on 25 November for nine months sabbatical leave. The first two months will be spent visiting organic chemists in Fiji, Canada and U.S.A. and the remaining months at Bristol University, England in Professor M. C. Whiting's department.

Mrs Helen Harvey will spend seven months in Bristol.

Dr B. C. Weatherburn arrived on 17 November to take up the position of Lecturer in Inorganic Chemistry.

Dr H. Keyzer is to visit the U.S.A. in December-January to attend the Southern California A.C.S. Branch Conference in Polymer and Analytical Chemistry.

A Laser Raman Workshop is being held in the Chemistry Department, Victoria University of Wellington from the 6 to 8 December, 1972. This meeting is being convened by Dr M. J. Taylor of the Auckland University.

Professor H. F. Shurvell, Queens University, Ontario, arrived in mid-November for a five weeks visit. He is an authority on Raman's Spectroscopy.

A one-day course was held for 6th and 7th Form teachers of chemistry and Biology in Chemical Energetics at Victoria University on Friday 24th November, 1972.

D.S.I.R.—Chemistry Division

Dr R. B. Glover has returned to Wairakei after a year with the United Nations geothermal project in Kenya.

Mr R. S. Jordan has left for Imperial College, London, to take a Ph.D. in Chemical Engineering.

Mr R. J. Armstrong recently visited a number of toxicological and environmental research units during a visit to Melbourne.

Mr J. T. Hughes spent three weeks in Australia in September visiting pesticide and food research laboratories.

Mr L. M. Smith visited Australian concrete and building research establishments in September.

Mr P. T. Wilson has returned to Chemistry Division after studying for a Ph.D. in electrochemistry under the supervision of Dr G. J. Wright at Auckland University.

Dr W. F. Giggenbach will be a member of the summer party to Antarctica where he will study volcanic activity in that region.

Mrs C. Johnson recently joined the toxicology section.

In September a very stimulating lecture was delivered by Dr P. Wiggins, entitled "Water Structure and Ion Distribution in Living Tissue".

Institute of Nuclear Science and Soil Bureau 8th International Radiocarbon Dating Conference

At the instigation of Dr T. A. Rafter and Mr T. Grant-Taylor, this conference was organised by the Royal Society of New Zealand and held at the Civic Centre, Lower Hutt City, from 18th to 25th October, 1972. Fiftyfour delegates attended from overseas, including Professor W. F. Libby (Nobel prize winner) and 37 from New Zealand. These included several members of the Institute of Nuclear Sciences, Soil Bureau and N.Z. Geological Survey.

Specialised papers on topics of current interest in the field such as secular variations of carbon-14, carbon-14 studies in the ocean, fresh-water and in soils, occupied 5 days. Public lectures were given by Professor W. F. Libby on "Radiocarbon Dating, Memories and Hopes", and by Professor N. W. G. Macintosh of Sydney University on "Radiocarbon Dating, a Pointer in Time to the Evolution of Man in Australia and Islands to the North West".

Wellington Hospital

Miss J. Mattingley has recently returned from five months overseas. After giving a paper on aminoacid excretion at the 8th International Congress of Clinical Biochemistry in Copenhagen she visited laboratories in Switzerland, the U.K. and Hawaii.

Part of this time (four weeks) was Long Service Leave; this year is the first time that Long Service Leave has been available to hospital scientists who have given at least twenty years service.

Canterbury

University of Canterbury

Dr. G. J. Wright has been promoted to Reader and Drs. J. W. Blunt and M. H. G. Munro to Senior Lecturer.

Dr. M. J. McEwan is to spend the next year at the Laboratory for Atmospheric Space Physics in Boulder, University of Colarado, engaged on some of the work arising from the Mariner 9 probe.

A refresher course for Teachers was given recently by the Chemistry Department in conjunction with the N.Z. Education Department. It was attended by about 30 teachers from 17 schools, and by lecturers from the Teachers Training College. The course, designed to present recent developments in chemistry and the teaching of the subject at stage II-III level, was given as a 24 lecture series on Wednesday mornings at 8 a.m. In this way the teachers' normal duties were minimally interrupted.

Industry

Dr. B. R. Wilkinson is now manager of the Tasman Vaccine Laboratory Ltd.'s new biochemical laboratory at Prebbleton. The laboratory was recently established to develop the production of fine biochemicals from N.Z. raw materials.

Otago

Chemistry Department, O.U.

Congratulations are extended to Drs D. Fenby and J. Simpson whose promotion to Senior Lectureships in chemistry have been recently announced. Dr Fenby left last month on a private visit to France, where he will be spending about four months.

Professor and Mrs H. N. Parton have returned to Dunedin after their trip to the U.K. and Europe.

Dr B. M. Peake has received a U.G.C. grant for the purchase of a small E.S.R. spectrometer. It is planned to use this for the study of paramagnetic species of interest to the Chemistry Department and other departments in the University of Otago.

The Chemistry Department's new seven storied staff and research building is now scheduled for completion on 25th January. The contractor has been granted an additional 30 days because of the loss of time caused by inclement weather and the accident involving the crane. However, stores have already started moving into the new building, and all staff and research students begin to move in on December 11th. The Chemistry Department will thus be right out of its old premises well before the end of this year.

Medical Research Council—Biochemistry Group

Dr M. R. Grigor has returned to the Biochemistry Group after a two year period at Oak Ridge and associated Universities, Tennesee, U.S.A. Dr Grigor, who worked with Dr F. Synder on problems concerned with lipid chromatography and lipid metabolism was granted study leave from the Medical Research Council of N.Z. for one year and held a Damon Runyon Fellowship for the second year.

Biochemistry Department

Dr M. G. Shepherd has been awarded a Seato Fellowship for 3 months study in Australia. He leaves Dunedin in November to work with Professor B. J. Ralph in the School of Biological Technology, University of N.S.W.

Dr L. D. Kennedy, a Ph.D. graduate from the Biochemistry Department has just returned from 2 years post-doctoral study under Professor J. Preiss of the Department of Biochemistry and Biophysics, University of California, Davis. He will take up an appointment with the Applied Biochemistry Division, D.S.I.R., in the New Year.

Industry News

The New Zealand Lactose Company at Edendale, Southland, reports that their new reverse osmosis plant has continued to assist whey evaporation through the peak of the dairy season. By the end of this year reverse osmosis will have removed a total of two million gallons of water from whey. The ultrafiltration of whey is also proceeding on a semi-commercial scale to produce a soluble protein from cheddar whey.

Montan wax is in the news again following the estimate by an Australian market research company that deposits in the Otago-Southland area could support an industry worth between $10 million and $15 million a year. Montan wax is a valuable industrial wax used in the manufacture of cosmetics and various chemicals, and occurs in the low grade shale and lignite deposits of Otago and Southland, as well as on the Chatham Islands. Investigations have been made on wax yield and quality of Otago montan waxes, and a gas chromatographic analysis of various wax samples has been started in the Chemistry Department of of the University of Otago.

The stock of maturing whiskey is being added to daily at the Wilson Malt Extract Co. Ltd in Dunedin. Both malt and grain

whiskies are being produced from barley grown in South Canterbury, Otago and Southland.

Malted barley is extracted, fermented and distilled in pot stills to produce the malt whisky which usually accounts for about 30% of the normal blended whisky. The more neutral grain spirit is produced from a mixture of barley and malted barley using a continuous column for distillation.

All the process equipment was designed and made locally; the Chemical Engineering Department staff of Canterbury University being involved in the design of the continuous column. The Department of Biochemistry at Otago University are at present investigating extraction and fermentation techniques.

Salmac Insulation of Dunedin report the application of some interesting chemical engineering methods in their use of cellular plastics. Their rigid urethane foams, made by the reaction of a polyester resin and a diphenyl-methane—diisocyanate in the presence of water, have excellent insulation characteristics when the cells are filled with a high molecular gas such as Freon 11 or Freon 12.

Pharmacy News

Mr W. Thomas of the Department of Pharmacy has just returned from Nepal where he worked as short term consultant for W.H.O. on pharmacy education and the setting up of hopsital pharmaceutical departments.

Visitors

A visitor to the Departments of Chemistry and Pharmacy was Dr G. S. Hartly, recently retired Research Director of Fisons Pest Control Ltd. (Cambridge, U.K.), who has now settled in New Zealand.

BOOK REVIEW

Intermediate Inorganic Chemistry R. G. Cunninghame, B. H. Robinson and J. Simpsen. Whitcombe and Tombs Ltd., Christchurch, 1972. 159 pages, soft cover, $6.60.

It is probably an unfortunate byproduct of the information explosion that, even at the seventh form level of education nowadays, a student must possess not one general chemistry book, but one for physical, one for inorganic and one for organic chemistry. This practice has been found by the reviewer to be educationally detrimental to students, since it tends to make a subject too specialised. too early in their careers. It can also do untold damage to the subject which tends to get bogged down in a mass of chemical verbiage. Consequently, this reviewer believes that at seventh form level a good general text book (of which there are many available) is more satisfactory than three or more specialist texts.

"Intermediate Inorganic Chemistry" has been written with the aim of introducing students to atomic and nuclear structure and inorganic chemistry. The authors are all lecturers at the University of Otago. They state that their book should be suitable as an introductory course for seventh form students preparing for university or a technical institute, and consequently have covered the U.B. and U.S. prescriptions.

All data in the text are expressed in S.I. units, but no units are given for equilibrium constants, and melting and boiling points are quoted in Kelvin. The book in nine chapters covers atomic and molecular structure (60 pages), the solid state (14 pages), coordination compounds (12 pages) and systematic inorganic chemistry (55 pages). The text is quite well illustrated (not in colour) but the style is very terse.Little emphasis has been placed on readability; and one strongly suspects that in some sections, particularly the systematic inorganic section, the authors have merely reproduced their lecture notes. In fact, the contrast between the complex and detailed explanation of wave mechanics in chapter one (34 pages) and the skimpy, disjointed descriptive chemistry of chromium, manganese and iron (2 pages), would surely leave a pupil wondering whether chemists are just quasi-mathematicians who no longer go near a laboratory bench. This point is further emphasised by the inclusion of the twelve pages chapter on coordination chemistry which describes nomenclature, stereochemistry and thermodynamic stability of the complexes but does not mention one method of preparing a coordination compound, nor give any information as to what chemists use these complexes for.

Also included is an appendix entitled the "Spontaneity of Chemical Reactions". This is a brief but reasonably successful attempt to introduce simple thermodynamics and cell theory, but "gives the false impression that the sign of ΔG is a guide to whether or not a reaction occurs "spontaneously". No mention is made of kinetic considerations nor of reaction rates. Finally, each chapter is accompanied by a set of problems, but heaven help the poor chemistry teacher, because no answers are given in the book!

The overall impression one receives on reading this text is that it is very modern, and both factually and chemically correct. But, if this is the forerunner of what is to come, one feels very sorry for the pupils. The modern educational trend is not to specialise at too young an age. Yet here we have a text which would have high school pupils discussing wave functions and molecular orbital energy level diagrams, subjects which only a few years ago were dealt with in the stage two syllabus at university. The book is even less suited to those pupils contemplating a technical institute course. These people would have difficulty comprehending the first few pages, let alone the first two chapters. This leads the reviewer to the unfortunate conclusion that books such as this one are either ahead of their time, or are best suited to a university stage one student, or as a reference book for a pupil reading for University Scholarships.

L. H. BOULTON.

JOBLING AWARD

James A. Jobling Pty. Ltd., international manufacturers of Pyrex, Quickfit and E-mil Laboratory Glassware have announced that an Award will be made to the Student, attending a New Zealand Technical Institute, who achieves the best results in Chemistry III, with a pass in Laboratory Technology and one other subject in the same year.

The award will consist of $20 cash, a $20 book voucher and a Pyrex "Yard Glass".

For further information, please contact:

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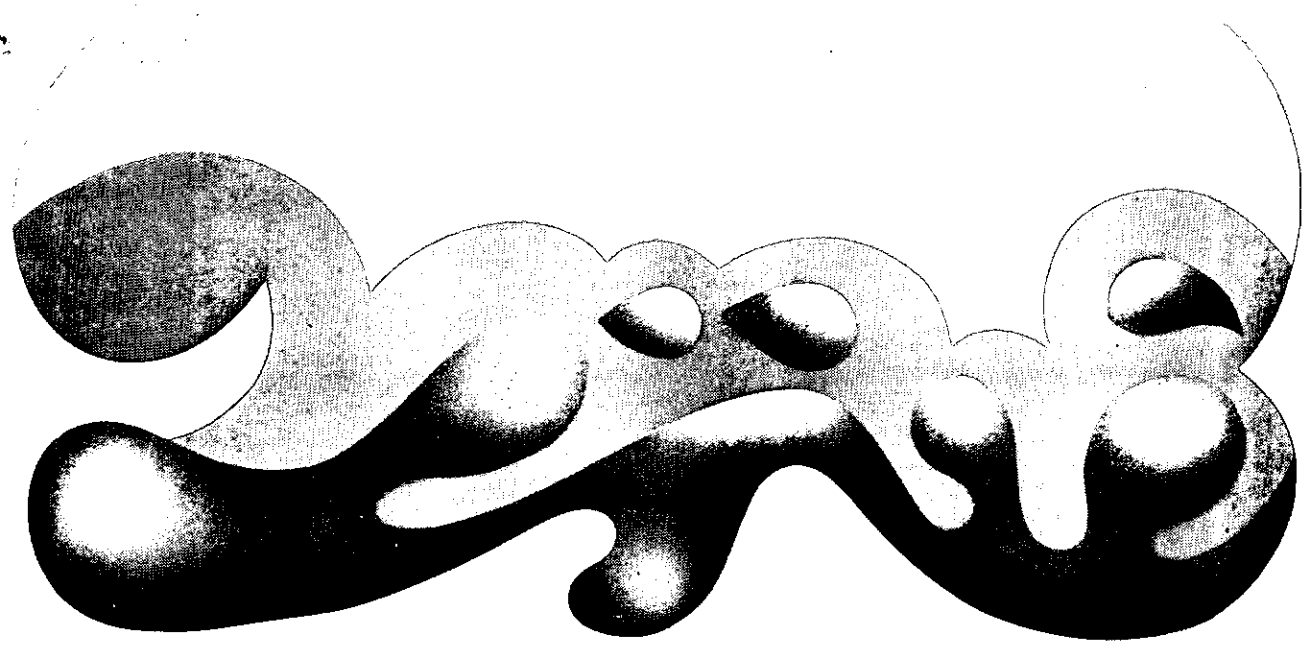

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The new Mettler Electronic Balances record weighing results automatically.
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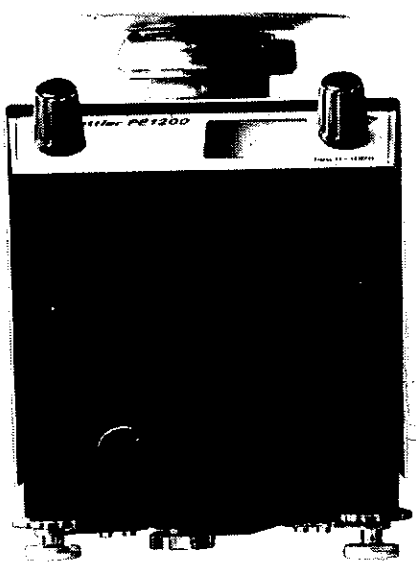

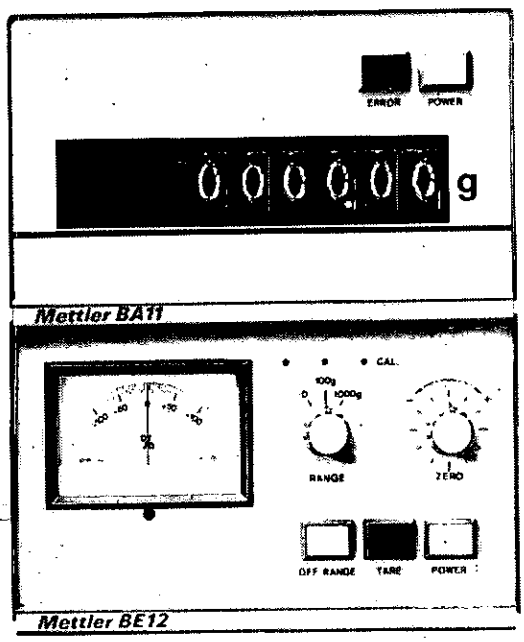

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