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Registrar, N.Z. Institute of Chemistry (Inc.)

D. J. Hogan, P.O. Box 1926, Christchurch, N.Z.

Employment Officer

J. L. Mandeno, 1 Pine Tce., Wellington.

JOURNAL OF THE NEW ZEALAND
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THE PRESIDENT

The President for 1960-61 is Professor H. N. Parton, Professor of Chemistry, University of Otago. Details of Professor Parton's academic career were recorded in the *Journal* for August, 1954. Summarized baldly they include: M.Sc. (Canterbury University College) 1930; Ph.D. (King's College, London) 1934; Lecturer in Physical Chemistry at Canterbury and Associate Professor from 1947; Lecturers' representative on the Academic Board, University of New Zealand, for a number of years and later representative of the Professorial Board on the College Council. Dean of Faculty of Science, 1948-52. Appointed to Chair of Chemistry, Otago University, 1954. Refresher leave in Great Britain, 1948-9 and a representative for New Zealand at the Unesco Conference at Beirut during this time. Member of New Zealand delegation at the Geneva International Conference on Atomic Energy 1959. Author of many research papers concerned largely with the thermodyamics of electrolyte solution.

These notes indicate Professor Parton's achievements in his profession and particularly the service which he has given in University administration; but to members who wish to know more of the new President we recommend a perusal of his articles published in the June 1938, February 1953, and June 1959 issues of the *Journal*. These papers reveal not only his wide reading in the history and philosophy of science and his concern with

the social functions of science, but particularly a critical approach to accepted beliefs, which, coupled with a ready wit, has gained him the reputation of a stimulating lecturer.

Professor Parton has already given considerable service to the Institute during his periods as Chairman of the Canterbury and Otago Branches, in committee activities, and especially by his editorship of this journal over the difficult years 1940-47. Presumably his acceptance of the office of President indicates that he considers that the Institute has outgrown those deficiencies which prompted him to say, when it was seven years old, " . . . apart from providing opportunity for chemists to meet and hear each other's views on technical and general topics, admittedly a useful function, and admittedly one which the Institute performs excellently, I have been unable to persuade myself that the Institute is performing any function at all." (*Journal,* June 1953). If the President is still of this opinion, members may expect from his leadership salutary jolts to complacency which will direct the Institute to an enhanced social function.

Vice-President

The Vice-President for this year is Dr F. B. Shorland, Director of the Fats Research Laboratory, D.S.I.R., Wellington.

NEW ZEALAND SCIENCE MEDAL

Award to Dr W. A. McGillivray

It is with considerable pleasure that we record the award of the New Zealand Research Medal by the New Zealand Association of Scientists to Dr W. A. McGillivray. The award was made in recognition of his research work on fat-soluble vitamin A. Bill McGillivray is well known to members of the Institute for his participation in many activities, but especially for his work as Editor of this *Journal* from 1955 to 1960. A record of his earlier career was published in the *Journal* for February 1955, page 11, and his Chairman's Address to the Manawatu Branch in 1958 (this *Journal,* October 1958, page 159), on *Vitamin A—An Assessment of Present Knowledge* covers the field which has been his research interest over a number of years. Dr. McGillivray is now on the staff of the Dairy Research Institute at Palmerston North.

MOISTURE IN WOOL

H. P. ROTHBAUM

Dominion Laboratory, Lower Hutt

The work done at Dominion Laboratory on the commercial control of the water content of wool, and the effect of moisture on its heating during storage, is a good example of how the successful solution of one problem can lead to a practical application in a different field, and at the same time produce significant findings in a completely unrelated science. Work on the spontaneous combustion of wool aroused interest in the heating of wet wool and indirectly led to a useful practical method for solving the old problem of controlling the moisture content of exported wool. At the same time it was shown that common aerobic bacteria, if properly aerated, can have a much larger total metabolic activity than had previously been believed.

The Dominion Laboratory originally started work on spontaneous combustion of wool in 1949. This had been a serious problem in the New Zealand wool trade for at least 70 years, and I. K. Walker showed that fires could be caused in bales of wool by oxidation of body fats containing unsaturated compounds. Measures designed to segregate pie wool bales, and modifications to the original pie wool process, have since drastically reduced fires of unknown origin in wool stores and ships, and Walker received the first Morcom Green, Edwards Prize for this work in 1951.

Unfortunately, however, the scientific solution of a problem and the acceptance of its implications by the trade and the farming community are two entirely different matters. The Royal Commission of 1907 had suggested that fires originated principally in wool bales that were packed wet, and the shipping companies and farmers were still very concerned about the danger of damp bales. Their fears appear to be supported by the fact that every year a number of improperly dried bales show signs of heating during storage, reaching temperatures up to about 35°C. Walker had demonstrated that bales of slipe wool, purposely packed very wet, could reach temperatures up to 73°C., but showed no tendency at all to heat beyond this temperature. He therefore suggested that it would be useful to study the mechanism by which wet wool bales heat and to confirm that this temperature rise is unlikely to lead to fires.

Microbiological activity seemed the obvious cause of the heat produced in wet wool, but published data on the heat output of bacteria suggested that at 37°C. (the temperature at which all previous bacterial calorimetry had been performed) only 1% of the observed rate of heat production could possibly be due to micro-organisms. Furthermore, at 60°, wet heating straw had been shown to contain only about 10^6 bacteria per gram and if wet wool contained a similar low population, it seemed impossible that sufficient heat could be produced to cause the temperature to rise to 73°. However, the known maximum temperature of 76° at which thermophiles (high temperature bacteria) can exist, strongly supported the bacterial heating theory. It was therefore necessary to prove that wool can support far higher populations of thermophiles than had been previously thought, and that these could produce the required amount of heat. A trial-and-error investigation of culturing thermophiles was begun, and it was found that at optimum pH values up to 10^9 thermophiles per gram of slipe wool could be counted, provided the plates were incubated at 60° in an atmosphere of at least 90% humidity. Furthermore, heat output measurements performed on strongly aerated slipe wool at a range of temperatures gave values about a hundred times those reported in the literature, which had been obtained in poorly aerated media. Separate experiments proved that, at 60°, heat production is at least 99% bacterial in origin, and micro-organisms are, therefore, perfectly capable of heating wet wool bales. This work is described in a paper "Heat Output of Thermophiles occurring on Wool" by Rothbaum which will shortly appear in the *Journal of Bacteriology*.

As these results showed the enormous importance of aeration on bacterial growth, an investigation into the metabolic activity of the well known species *Escherichia coli* was planned. Using a technique of aerating very thin layers of broth at 37°, the heat outputs were found to be over a hundred times those previously reported and considerably higher values than those given in the literature were obtained for maximum cell counts, carbon dioxide production and oxygen consumption per millilitre of broth. However, the heat output, carbon dioxide production and oxygen consumption per cell correspond well with published data at very low bacterial populations. This suggests that the greatly improved aeration is responsible for the observed increase in total metabolic avtivity, and it was demonstrated that the commonly used Warburg technique would have seriously starved the broths for oxygen.

This work will shortly be published in the *Journal of Bacteriology* in a paper by Rothbaum and Stone entitled "Heat Output of *Escherichia coli*".

In practice it was found that wool bales could also heat in storage when the moisture content was below that at which bacteria would grow, and, by analogy with published work on stored grain, the heating of wool due to moulds is being studied. Moulds are active in humidities above 75%, and at temperatures below 45°C and, after the wool is conditioned in controlled temperature and humidity cabinets available at Dominion Physical Laboratory, the heat output is measured and the effect of degradation is studied. It was also found that the type of wool used greatly affects the results obtained, and it is hoped to complete this work on mould heating in the near future.

The most serious aspect of heating of improperly dried bales is the hold-up of shipping that occurs whenever even one warm bale is discovered in storage and precautions to avoid such an occurrence are important. The simplest way of doing this is to dry wool to a moisture content below that equivalent to a relative humidity of 75% (approximately 18% to 20% regain), when mould growth becomes impossible. If, on the other hand, wool is excessively dried, its water content will fall below the "standard of official regain", which is the commercially allowed water content used to calculate invoice weights from oven dry weights. This is 16% regain in Britain and 17% in most Continental countries. As all commercial transactions involve the weight of bales, the export trade naturally prefers wool to be near the maximum allowable moisture content, but a survey conducted in freezing works showed that slipe wool when baled has water contents ranging from 9.5% to 16% regain. A loss of up to 6% may therefore result to wool sellers, and the trade felt that it had been deprived of appreciable sums over the years.

In scouring works, the New Zealand Department of Agriculture has, for a number of years, provided an excellent service in core boring wool bales, analysing the water content and issuing regain certificates. This, however, does not help in actually controlling the moisture content of wool about to be baled, and the great variations in output occurred because no reliable method had been available for estimating the water content of a representative sample leaving the dryer (considered to be at least 3 lb) in a sufficiently short time to adjust the controls of the dryer. Electronic water measurement was found to be not accurate enough and con-

ventional oven-drying methods are too slow and use too small a sample.

A conference on the problem of moisture control in wool took place in June 1958, and shortly afterwards the writer suggested an approach that was so simple that it seemed incredible that it had not been used before. An apparatus was built, in which large quantities of hot air are forced through a container with 3 lb of wool, and the water content is directly shown on calibrated scales from the initial cold weight and final hot weight (corrected for buoyancy). The equipment is ruggedly designed for use by relatively unskilled operators, and gives a reliable analysis in about 7 minutes. The tester has been in continuous use in one scouring works for nearly two years. Many bales produced there have subsequently been tested by the Department of Agriculture, and the certificates issued were within 1% of the desired water content in 84% of all bales tested. The total average discrepancy was only 0.14%.

The New Zealand Wool Industries Research Institute is now arranging to have a number of testers made commercially for use in scouring works throughout New Zealand, and some freezing works are making their own. The equipment is described in detail in a paper by Rothbaum and Vere-Jones entitled "A Rapid Method of Determining the Regain of Scoured Wool after Machine Drying" which was published last year in the *Textile Journal of Australia*. Interest in the method has also been shown by the Australian Wool Testing Authority, as the moisture control of wool is as haphazard in Australia as it used to be in New Zealand.

This article describing work of the Dominion Laboratory on problems associated with wool storage was requested following the award of the 1960 Morcom Green, Edwards Prize to Dr Rothbaum for investigations in this field.

Dr Rothbaum was born in Vienna in 1926 and came to New Zealand in 1941. From Victoria University he obtained a chemistry honours degree in 1947 and a B.A. in music, philosophy and mathematics in 1951. In 1945 he was awarded the Sir George Grey Scholarship.

He has worked in the physical chemistry section of Dominion Laboratory, D.S.I.R., since 1947, first on spectroscopy and then on problems of wood preservation and salt manufacture. In 1954 he spent a year in the Division of Industrial Chemistry, C.S.I.R.O., Melbourne, and subsequently spent two years on a New Zealand National Research Fellowship in England, where he obtained a Ph.D. in electrochemistry at Liverpool University. Since returning to New Zealand in 1957 he has worked on problems connected with wool and fertilizers and in 1960 visited Australia in connection with these projects. He was treasurer of the Wellington Branch of the New Zealand Institute of Chemistry from 1957 to 1959.

SOME PROBLEMS IN PLANT ANALYSIS AS AN INDEX OF NUTRIENT STATUS

K. J. McNAUGHT
Rukuhia Soil Research Station, Hamilton.
(Based on the Chairman's Address to the Waikato Branch, November, 1960)

It can be claimed that plant nutrition investigations involving the interpretation of plant analyses are really the field of the plant physiologist. In practice, because of the large amount of analytical work required and the need to develop and improve analytical methods, the work at the Soil Research Station has been undertaken by the chemist. This paper is not concerned with analytical methods, however, but with some aspects of the application of plant analyses to studies of the mineral nutrition of plants.

Essentially the basis of the plant analysis technique is the concept that the best index of the nutrient status of a plant should be its own content of the particular nutrient. Immediately we are faced with the question: How should we express this status? Should we use concentrations of nutrients or should we use total uptake by the plant? It is generally accepted that concentration is physiologically more significant than total uptake. This is based on the concept that every living cell has a minimum requirement of each essential element for normal metabolism. However, there is evidence to suggest that some of the trace elements function in specialized tissues or at particular sites such as the growing tip and may not be needed to the same extent in all cells, but this would not fully justify switching to total uptake. (Incidentally, the soil chemist is usually more interested in uptake which he attempts to correlate against his values for "available" nutrients.)

FERTILIZER APPLICATION AND RESPONSE

First of all, let us examine the relationships we find from fertilizer or pot trials on a soil deficient in potassium, for example (Fig. 1).

Note the sharp increase in yield to a maximum at about 2 cwt in this case and no further yield increases at the highest rates.

This is what the field officer may find from a properly designed field trial.

FERTILIZER APPLICATION AND CONCENTRATION IN PLANT TISSUE

If now we analyse plant samples taken from such a trial and plot % K concentration in the plant against rates of fertilizer we find a somewhat similar curve (Fig. 2).

Note the large increase in K concentration up to the 4 cwt rate, but only very small further increases in spite of massive further additions of potash. Over the low potash range plant uptake is efficient, but in the high range it becomes very inefficient. The plant does not differentiate very clearly between the 4, 8 and 16 cwt rates. By contrast, if we analyse the soil, we find the converse trend. Over the low K range soil test changes are slight

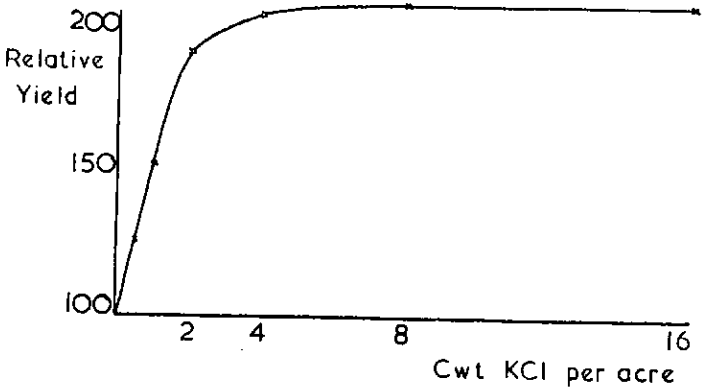

Fig. 1.

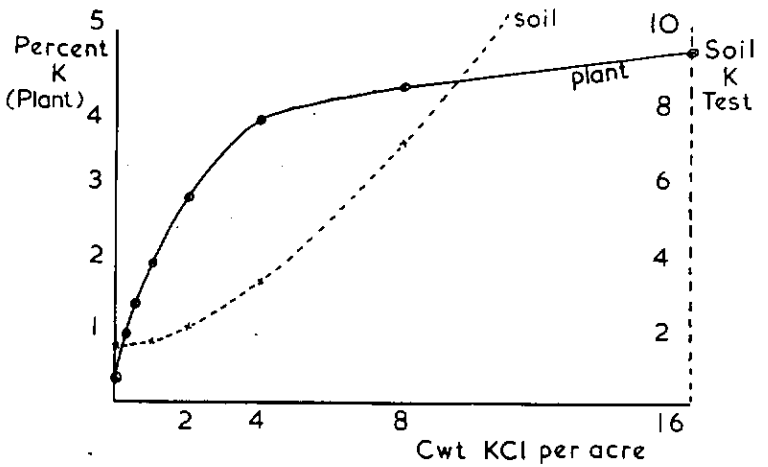

Fig. 2.

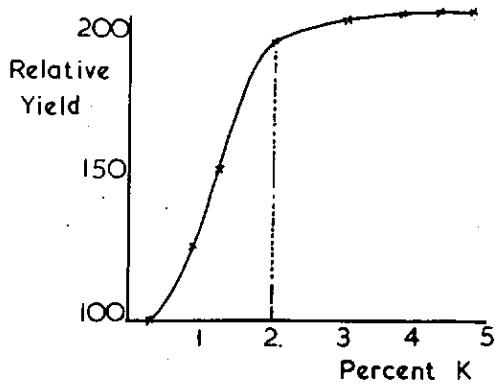

Fig. 3.

or not detectable, but increase enormously at the high rates. Plant levels reflect the fertilizer rates up to adequacy levels, but the soil tests reflect what the plant has *failed* to take up. On unfertilized soils plant and soil usually do point to the same deficiency, but a lot of confusion has resulted from people thinking that soil and plant analyses should always tell us the same thing. Some workers have quite unjustifiably condemned plant analyses because of poor correlations between plant and soil levels following fertilizer applications.

RELATIONSHIP BETWEEN YIELD AND CONCENTRATION IN PLANT TISSUE

To enable us to decide whether a plant is adequately supplied with a particular nutrient or not, we need reference values. Critical levels in relation to appearance of deficiency symptoms are valuable, but obviously the most useful level will be the minimum concentration for maximum yield, that is the *critical level in relation to yield.* To establish such values we have to relate plant levels to yield or yield responses to fertilizers (Fig. 3).

Both yields and % K increase over the deficiency range till the critical level is reached, beyond which there is no further increase in yield. The critical level for cocksfoot is about 2% K, but plants continue to take up potassium in "luxury" amounts in excess of their needs. As the levels increase within this luxury range, however, the plants resist further uptake (see Fig. 2) so that the K level is nearly as high at the 4 cwt rate as at the 16 cwt rate.

Over the deficiency range the concentration of K is not very sensitive; that is, it changes less with large increases in yield than

over the transition zone where there is a fairly good correlation. Over the luxury range there is no correlation between K levels and yield. With P and N the changes in concentration in the deficiency range tend to be quite small.

A difficulty in plant diagnostic work is that the critical level is not clearly defined. It appears to be higher or lower in some cuts than in others. The diagnostic implications of all these effects are not usually realized. It means that if we analyse samples from poor and good patches of growth, we may find an appreciably higher level in the good plants only if their better nutrient status brings them into the transition or adequacy range. If the better plants are still slightly deficient they may show similar levels to those in the poorer plants. If a response is obtained to an application of a mixed fertilizer, the most likely factor giving the response will be the nutrient present in relatively low concentration.

(Because the relationship between yield and concentration of nutrients in plant tissues is curvilinear, and plant levels reach a maximum, correlations with soil tests tend to be poor especially at high levels of supply.)

In soil analysis, using a particular procedure, there is only one value for a particular soil, irrespective of the crops to be grown: but in plant analysis different plants growing in that soil may show very different nutrient levels. Soil analysis gives a generalized picture of nutrient supplies, plant analysis is more specific. Thus the soil chemist's description of a soil as potassium deficient may be correct when applied to the white clover component of a pasture growing on that soil, but plant analysis will often show that the grass component is not deficient in potassium but is deficient in nitrogen. The soil chemist's approach tends to oversimplify the problems. In Australia there are extensive areas where lucerne survives when copper is added but subterranean clover fails because of zinc deficiency, but the picture is reversed when zinc is applied in the absence of copper.

NUTRIENT INTERRELATIONSHIPS

Passive Effects

When a deficiency is corrected yields increase and the general trend is towards reduced levels of other nutrients present in moderate supply. This is just a simple dilution effect associated with increased growth. It has been described as a "depression" of levels or as evidence of nutrient "antagonisms", but I do not think it should be referred to in these terms.

Antagonistic Effects

With some treatments there are marked antagonistic or competitive effects. For example, in plants such as brassicas and most grasses, potassium applications to potassium-deficient soils result in marked depression of sodium levels to as low as only one-tenth the concentration in some cases. This inverse K-Na relationship is dominant in some plants (Table 1).

TABLE 1

	K deficient		*K adequate*		*K excess*	
	% K	*% Na*	*% K*	*% Na*	*% K*	*% Na*
Ryegrass	0.4	1.0	2.0	0.3	4.5	0.1
Potatoes	0.4	0.1	2.0	0.1	5.0	0.1

Plants such as potatoes and paspalum do not possess the property of taking up sodium in appreciable amounts. In these plants potassium shortage is offset by higher uptake of Mg and Ca. (Table 2). (In the case of sodium absorbing plants, levels of these nutrients are also affected by potassium deficiency but to a smaller extent).

TABLE 2

	K deficient		*K. adequate*		*K excess*	
	% Mg	*% Ca*	*% Mg*	*%Ca*	*% Mg*	*% Ca*
Ryegrass	0.30	0.9	0.25	0.8	0.20	0.7
Potatoes	1.00	2.5	0.60	2.0	0.40	1.5

Potassium-induced magnesium deficiency in potatoes and tomatoes can easily be produced on some soils by overdoing potassium applications.

(In potato tubers the reverse trend is found—potassium actually increases Mg levels in the tubers.

	%Mg in dry matter	
	Leaves 22.1.57	*Tubers 15.5.57*
No K	1.20	0.086
1 cwt KCl	0.99	0.094
2 cwt KCl	0.95	0.103

Potassium apparently interferes with translocation of magnesium from the roots and stems to the leaves.)

The reason for these differences in behaviour of different plants is not established, but modern theory is that movement of nutrients from the cytoplasm into the vacuole or cell sap through the tonoplast membrane depends on the action of "carrier molecules" or "ion carriers". In some plants the tonoplast presents an insuperable barrier to sodium entry, irrespective of potassium supply. In other plants, if potassium is in short supply, sodium is able to attach to the carrier molecules and gain entry through

the differentially permeable membrane, but if potassium concentrations are high in the "free space" the absorption sites will be occupied by potassium ions and sodium will be prevented from entering. Other sites and carrier molecules appear to be involved in calcium and magnesium absorption.

Positive or Beneficial Effects

In some cases fertilizers or liming materials appreciably increase the uptake of elements not present in the applied fertilizer. For example, sulphur increases nitrogen fixation by clovers on a sulphur-deficient soil—that is, nitrogen concentrations increase as well as yields of the clover plants.

Lime tends to increase molybdenum concentrations, whether the soil is molybdenum deficient or not. Sodium chloride increases potassium uptake on some soils.

In our rates of potash trials potassium chloride has sometimes increased Mn levels significently. This has not been associated with any detectable fall in soil pH levels, and the reason for the effect is not clear.

MULTIPLE DEFICIENCIES

These passive, antagonistic, or beneficial effects may occur in various combinations when two or more factors are limiting growth. Such effects may be confirmed or indicated by plant analyses.

When there are two factors limiting growth, it is usual to find that the correction of one will accentuate the deficiency of the other through simple dilution effects associated with increased growth. Sometimes a marginal or sub-clinical deficiency may be converted to a clinical deficiency with typical symptoms in this way. For example, nitrogen applications to grasses on a soil low in potassium can produce potassium deficiency symptoms through increasing the demand for potassium.

Sometimes we find plant levels are unaffected by the presence or absence of a second nutrient in short supply. For example, in a rates of P x rates of S trial at Winchmore we found that although double superphosphate and gypsum each gave quite large responses and together gave enhanced responses (that is, there was a positive interaction on yield), the concentrations of sulphur in phosphorus-deficient clovers and grasses were the *same* as in plants adequately supplied with phosphorus. The explanation may be that the plant growth responses to phosphorus were accompanied by a proportionately greater root extension and utilization of the sulphur present in the soil. Another possibility is that the phosphorus fertilizer promoted greater break-down of organically-bound sulphur compounds in the soil.

Interactions

Plant analyses have proved most useful in the study of interaction effects on yields.

Usually, if two elements are in short supply, for example P and K, there will be a positive interaction of the two nutrients on yield, that is each enhances the response effects of the other treatment. If two treatments are both functioning in the same way—*e.g.*, lime and molybdenum on a molybdenum-deficient soil—we can expect a negative interaction, that is, the effect of the two treatments together will be significantly less than the sum of the separate effects.

Sometimes a treatment will give a depression of yield in the absence of a second treatment, but a yield increase in its presence. In one trial, on a soil deficient in S and Mo, for example, elemental sulphur depressed growth in the absence of molybdenum, through an unfavourable effect on availability of soil Mo, but gave a significant response in the presence of molybdenum.

Occasionally we find two treatments each giving excellent responses, but no interaction effects on yield. For example, in a pot trial on a magnesium-deficient soil, we obtained independent responses of white clover to lime and to magnesium sulphate. Analytical evidence and symptoms indicated that the magnesium sulphate responses were due to the correction of magnesium deficiency, the lime response to the correction of manganese toxicity.

	Yield (g)	*% Mg*	*ppm Mn*
Control	3.0	0.04	260
4 cwt $MgSO_4.7H_2O$	5.3	0.22	290
8 cwt „	5.4	0.34	290
1 ton lime	5.7	0.04	110
1 ton L + 8 cwt Mg	8.1	0.28	110

Tissue Analysed

Large differences in nutrient levels may be found when we compare leaf blade with petiole or stem with leaves. For example, N is about twice as high in the blade as in the petiole.

Leaf Maturity

Older leaves tend to be lower in N, P and K, especially when these are in limited supply, and higher in Na, Mg, Ca and Mn especially when present in adequate supply. A deficient element will usually be translocated to younger tissues during growth but some elements such as Ca and B are rendered immobile in tissues and cannot be re-used if supplies of these nutrients run short.

ANOMALOUS CORRELATIONS BETWEEN FERTILIZER TREATMENTS AND YIELD RESPONSES

Poor Correlations

Critical levels are usually not very precisely defined. Temperature appears to be an important factor, especially with elements such as phosphorus, and more information is needed on this subject. Various workers have suggested that balance of nutrients is more important than absolute levels. For example, Lundegardh has advocated use of K/Ca ratios in potassium deficiency investigations. Personally I remain unconvinced. Certainly fibrous tissues with lower levels of nitrogen have lower needs of other nutrients. Again there is no question that balance of nutrients *in the soil* is important but the problem is whether balance *within the plant* is so important. We are trying to get evidence on this point by running rates of potash pot trials with three rates of phosphorus.

Consider two sets of plant analysis figures (white clover).

A.	0.5%	Phosphorus	1.5%	Potassium
B.	0.25%	„	1.5%	„

According to the balance concept, A should be K deficient, B not. According to the normal concept, both A and B are K deficient as the critical level is about 1.8%. B is also phosphorus deficient, and of course no large response to potash can be expected in this case till phosphorus also is applied.

Correlation Failures

Some of the apparent failures of plant analysis to predict treatment responses have been satisfactorily explained. Early workers sometimes found no relationship between lime responses and calcium levels in plant tissues. We now know that they were using the wrong correlations as most lime responses are due to correction of manganese or aluminium toxicity or molybdenum deficiency rather than calcium deficiency.

In our experience, major element levels correlate reasonably well with responses to fertilizers containing the deficient element. In the case of trace elements we have much less evidence and are not really in a position to pass judgment. We have found no obvious anomalies in our work with molybdenum, copper and boron, but manganese and especially iron have given some disappointing results.

Piper (Cu and Mn), Steenbjerg (Cu, P, etc.) and Stout (Zn), however, have found quite anomalous relationships between trace element concentrations and responses to the nutrients, in many cases. Steenbjerg in particular has demonstrated that, under conditions of acute deficiency of copper, the concentration of copper in plant tissues is much higher than in moderately deficient plants

and even higher than in quite healthy plants. A completely convincing explanation is not forthcoming. Dr Hewitt of Long Ashton (*Colloquium on Plant Analysis*, Paris, 1956) has suggested a "trigger mechanism": a higher nutrient status may be required for the initial process of cell division than for subsequent cell expansion. Another possibility which has not been discussed is that there may be some abnormal metabolite in plants extremely deficient in copper which precipitates or combines with the copper present, rendering it non-functional. Certainly this sort of effect appears to be important in some forms of iron deficiency where from radio-phosphorus studies it has been shown that iron is precipitated in the veins as iron phosphate. The determination of total iron (or other trace element) may be of little value as a measure of the nutrient available for activation of the particular enzyme systems.

De Kock of Macaulay Institute has advocated the use of P/Fe ratios which he has found to correlate satisfactorily with the incidence of iron deficiency chlorosis (60 to 70 in chlorotic mustard leaves, 40 to 50 in healthy—*Soil Science*, 1955, *79*, 167-75).

There appears to be merit in the use of ratios in cases such as this where there is good supporting physiological evidence.

Mn-Mo ratios in the plant may prove useful in molybdenum deficiency investigations.

If the trace element is required particularly at the growing point it may be better to use meristematic tissues—*e.g.*, for zinc and boron. It is claimed that zinc is concentrated in the nodes in maize and that boron is best determined in the top 6 in. growth of lucerne.

If only part of the trace element present in plant tissues is in an available or active form, it may prove more satisfactory to measure the activity of enzyme systems activated by a specific trace element, instead of measuring the concentration of the trace element itself. There is likely to be more emphasis on this approach in the future, but such work has not been attempted at Rukuhia. Complications are likely to arise with trace elements which are involved in several enzyme systems, and with elements which can replace one another in some systems.

The writer is firmly of the opinion that plant analysis is a fundamentally sound technique, but its application is somewhat restricted as yet through inadequate knowledge of the relationships between plant nutrient levels and yield responses for many plants and many of the essential elements.

THE REGISTRY

Fellow

(Elected December 1, 1960)

LAMBERT, George Stanley, M.Sc., F.I.M., Hayes Metal Refineries Ltd., Auckland.

Associates

(Elected December 1, 1960)

BAYLISS, Stuart Patrick, B.Sc., Ocean Beach Freezing Co. Ltd. (Invercargill, Chemist).

BRIDGMAN, Michael John, B.Sc., N.Z. Wallboards Ltd., Christchurch (Manager).

BUTKUS, Antanas, D.Agr.Sc.(Bonn), Southland Frozen Meat Co. Ltd., Invercargill (Chief Chemist).

CROWLEY, Bernard John, B.Sc., Glaxo Laboratories Ltd., Palmerston North (Asst. Factory Manager).

DENNISON, John Scott, M.A., B.Sc., Dip.Ed., Otago Boys' High School, Dunedin.

HAWTHORN, John Crawford, M.Sc., Formica (N.Z.) Ltd., Papakura, Auckland (Works Chemist).

MALCOLM, Geoffrey Norman, M.Sc., Ph.D.(Manc.), Chemistry Dept., University of Otago (Lecturer).

SIRETT, Nancy Elliot, B.Sc., Endocrinology Research Unit, Medical School, Dunedin (Research Officer).

WATERS, Joyce Mary, (Mrs.), M.Sc., Ph.D., University of Auckland (Assistant Lecturer).

Honorary Life Member

(Elected December 1, 1960)

OCCLESHAW, Frederick Ernest, British Phosphate Commission, Nauru.

Leave of Absence

COLEBROOK, L. D. For three years with remission of subscription.

THE SOCIETY FOR VISITING SCIENTISTS

The attention of members visiting Great Britain is drawn to the Society for Visiting Scientists which has its headquarters at 5 Old Burlington Street, London, W.1. This Society provides overnight accommodation for visiting scientists at a nominal charge, maintains a library with current scientific journals, and holds discussion evenings at which scientists of different disciplines and different countries can meet together. It also keeps an index giving details of the activities, scientific interests and whereabouts of about 70,000 scientists, and in this way can supply useful information service to visitors.

Some members of the Institute have found that these facilities and the helpful staff make the Society's House a congenial and convenient centre while they are in London. Further information can be obtained by enquiry to the Assistant Secretary of the Society at the address given above.

BRANCH NEWS AND NOTES

OTAGO BRANCH

Congratulations are offered to Dr E. Gregory, O.B.E., F.N.Z.I.C., Dean of the Faculty of Home Science, who was included in the New Year Honours List.

Dr J. Murray has recently returned from study leave at Imperial College, London.

Dr A. D. Campbell has been awarded a Nuffield Fellowship, and has left to spend a year of study leave in broadening his microchemical experience at Birmingham.

Dr Muriel Bell has returned from the 5th International Nutrition Conference.

Dr A. M. Kennedy has recently come from the Dominion Laboratory to take up the appointment of Senior Lecturer in Applied Chemistry at the University of Otago.

Mr M. R. Grimmett is relinquishing his research post in the Medical School to take up the appointment of Assistant Lecturer in Chemistry at Massey Agricultural College.

CANTERBURY BRANCH

Professor S. R. Siemon, Professor of Chemical Engineering, University of Canterbury, has been appointed a member of the Council of Scientific and Industrial Research for a period of four years from January 1, 1961. Dr F. J. Llewellyn, Vice-Chancellor and Rector, University of Canterbury, has retired from the Council on completion of a term of office.

MANAWATU BRANCH

The Branch extends congratulations to Dr W. A. McGillivray on the award of the New Zealand Association of Scientists' Research Medal for his work on fat-soluble Vitamin A.

Mr G. M. Wallace has been elected President of the New Zealand Dairy Science Association.

Dr R. Brooks, formerly of the University of Capetown, has taken up an appointment in the Biochemistry Department at Massey College.

Dr E. Moustafa is now working at the Plant Chemistry Division, D.S.I.R. He has worked previously at Cambridge, Cairo and Khartoum.

WELLINGTON BRANCH

Mr E. W. Wright of Wallaceville Animal Research Station has gone to the National Institute of Research on Dairying, Reading, England for a period of two years.

Mr N. H. Law, Director, together with Dr R. H. Locker and Dr B. B. Marsh of the Meat Industry Research Institute of N.Z. (Inc.) have now transferred from Lower Hutt to Hamilton. The new laboratory building for the Institute, situated close to the Ruakura Animal Research Station Laboratory, will be opened by the Governor-General, Lord Cobham, in March.

Mr E. S. Borthwick, Assistant Technical Adviser to Shell Oil (N.Z.) Ltd., has returned from a two-year period of transfer to the Shell International Petroleum Co. in London during which time he was able to study many phases of the Shell Group's activities, including research, technical development, refining and manufacture, marketing, and sales technical assistance.

Although based on London the opportunity was taken to travel widely within the United Kingdom visiting numerous industries to gain further field experience in the use of petroleum products and in the way in which research and development facilities can be applied to the solution of industrial problems.

Dr Miles Kennedy has resigned from the Chemical Engineering Division of the Dominion Laboratory, Lower Hutt, to start the year as Senior Lecturer with the Chemistry Department of the University of Otago.

Dr Raymond Carman has resigned from the Dominion Laboratory, Wellington, to take up a position as Lecturer in Organic Chemistry as from the beginning of 1961 at the University of Queensland, Brisbane.

Miss Alison Camden-Cooke, of Dominion Laboratory, Wellington, is at present on leave of absence visiting Europe and the United Kingdom.

Mr Alastair Scrymgeour, of Tasman Vaccine Laboratory, Upper Hutt, is now with Irvine and Stevenson, St. George Co., Dunedin.

EASTERFIELD MEDAL

The biennial award of the Easterfield Medal, donated by the Royal Institute of Chemistry to commemorate the first Chairman of the N.Z. Section, the late Sir Thomas Easterfield, will again be made this year. The award is open to all chemists within New Zealand who are under the age of 35 years at April 30, but the major part of the work on which the award is based must have been carried out in New Zealand. The successful candidate is required to deliver an address on the subject of his research. Authority to make the award is vested in the Committee of the New Zealand Section of the R.I.C., on the recommendation of a selection committee prescribed by regulations governing the award. These regulations were published in this *Journal*, April 1954, page 65, together with a description of the Medal. It should be noted, however, that the closing date for entries or recommendations, which must be fully supported by all relevant papers, is now *April 15*, not April 30 as stated in the 1954 *Journal*.

In addition to the high honour associated with this Medal, the award for 1961 will carry with it a cash grant of £25.

LIST OF OFFICERS

For the Year November 1, 1960—October 31, 1961

President: Prof H. N. Parton, University of Otago, P.O. Box 56, Dunedin.
Vice-President: Dr F. B. Shorland, Fats Research Laboratory, P.O. Box 8021, Wellington.
Acting Hon. Gen. Secretary: Mr A. P. Oliver, N.Z. Breweries Ltd., P.O. Box 211, Wellington (till February, 1961).
Hon. Gen. Secretary: Dr W. E. Harvey, Victoria University, P.O. Box 196, Wellington.
Auckland Delegate: Prof D. R. Llewellyn, 62 Portland Street, Remuera, Auckland.
Waikato Delegate: Dr E. P. White, Ruakura A.R.S., P.B., Hamilton.
Manawatu Delegate: Mr G. M. Wallace, Massey College, Palmerston North.
Wellington Delegate: Mr W. E. Dasent, Victoria University, P.O. Box 196, Wellington.
Canterbury Delegate: Mr D. J. Hogan, Dominion Laboratory, P.O. Box 2112, Christchurch.
Otago Delegate: Dr W. G. Hanger, Medical School, P.O. Box 913, Dunedin.
Editor: Mr N. T. Clare, 109 Cambridge Road, Hamilton.
Past President: Mr E. W. Hullett, Wheat Research Institute, Box 1489, Christchurch.
Registrar: Mr D. J. Hogan, P.O. Box 1926, Christchurch.

AUCKLAND BRANCH

Chairman: Prof D. R. Llewellyn, 62 Portland Road, Remuera, Auckland.
Secretary: Mr R. S. Jebson, P.O. Box 22, Otahuhu, Auckland.
Treasurer: Mr R. W. Olliff, Auckland University, Box 2175, Auckland.
Committee: Mr C. W. Harland, 110 May Road, Onehunga, Auckland, S.E.5.
Mr. D. G. Howard, P.O. Box 1084, Auckland, C.1.
Mr L. W. Jagger, 23 Princes Street, Auckland, C.1.
Mr D. A. Morrison, Dominion Laboratory, Durham Street West, Auckland, C.1.

WAIKATO BRANCH

Chairman: Mr J. E. Allan, Rukuhia S.R.S., P.O. Box 490, Hamilton.
Secretary/Treasurer: Mr F. D. Dorofaeff, Rukuhia S.R.S., P.O. Box 490, Hamilton.
Committee: Mr K. J. McNaught, Rukuhia S.R.S., P.O. Box 490, Hamilton.
Mr R. J. Lancaster, Ruakura A.R.S., P.B., Hamilton.
Dr E. P. White, Ruakura A.R.S., P.B., Hamilton.
Mr F. R. Leighton, N.Z. Co-op Dairy Co. Ltd., P.O. Box 459, Hamilton.

MANAWATU BRANCH

Chairman: Mr G. M. Wallace, Biochemistry Dept., Massey College, Palmerston North.
Secretary/Treasurer: Mr R. C. Lawrence, Dairy Research Institute, Massey College, Palmerston North.
Committee: Dr R. W. Bailey, Plant Chemistry Division, P.B., Palmerston North.

Dr G. W. Butler, Plant Chemistry Division, P.B., Palmerston North.

Mr E. Jessop, Glaxo (N.Z.) Ltd., P.O. Box 624, Palmerston North.

Dr E. Richards, Biochemistry Dept., Massey College, Palmerston North.

WELLINGTON BRANCH

Chairman: Mr W. E. Dasent, Victoria University, P.O. Box 196,Wellington.
Secretary: Mr H. R. Penhale, Soil Bureau, P.O. Box 8001, Wellington.
Treasurer: Dr D. J. Brasch, Dominion Laboratory, P.O. Box 8023, Wellington.
Committee: Dr A. J. Ellis, Dominion Laboratory, P.O. Box 8023, Wellington.

Dr G. S. Cox, N.Z. School of Pharmacy, P.O. Box 177, Petone.

Mr J. K. Johannesson, W.C.C. Laboratory, P.O. Box 2199, Wellington.

Miss J. M. Mattingley, 59 Bombay Street, Ngaio, Wellington, N.4.

CANTERBURY BRANCH

Chairman: Mr E. R. Hounsell, University of Canterbury, P.O. Box 1471, Christchurch.
Secretary: Mr D. J. Hogan, Dominion Laboratory, P.O. Box 2112, Christchurch.
Treasurer: Mr T. A. Mitchell, Wheat Research Institute, Box 1489, Christchurch.
Committee: Mr R. W. Cawley, Wheat Research Institute, Box 1489, Christchurch.

Mr P. W. Craighead, Fletcher Industries Ltd., P.O. Box 1168, Christchurch.

Mr A. H. Horn, Lincoln College P.O., Christchurch.

Dr R. D. Topson, University of Canterbury, P.O. Box 1471, Christchurch.

OTAGO BRANCH

Chairman: Dr R. E. Corbett, University of Otago, P.O. Box 56, Dunedin.
Secretary/Treasurer: Dr W. G. Hanger, Medical School, P.O. Box 913, Dunedin.
Committee: Prof R. D. Batt, Medical School, P.O. Box 913, Dunedin.
Dr J. C. Dacre, Medical School, P.O. Box 913, Dunedin.
Mr R. M. Carr, University of Otago, P.O. Box 56, Dunedin.
Mr A. H. Lewin, 12 Derwent Street, Dunedin.
Mr J. Robb, Glendermid Tanneries, Sawyers Bay, Dunedin.

COUNCIL SUBCOMMITTEES

Conference Committee: Prof D. R. Llewellyn (*Chairman*).
Employment Officer: Mr J. L. Mandeno, 1 Pine Terrace, Wellington, W.3.
Examinations Committee: Mr C. R. Edmond, 41 Dowling Street, Dunedin (*Chairman*); Mr T. H. Kennedy, Medical School, Box 913, Dunedin (*Secretary*).
Membership Committee: Mr S. G. Brooker, P.O. Box 9012, Newmarket, Auckland; Dr W. A. McGillivray, Dairy Research Institute, Massey College P.O., Palmerston North; Prof S. R. Siemon, University of Canterbury, P.O. Box 1471, Christchurch.

Professional Status Committee: Miss J. M. Mattingley, 59 Bombay Street, Ngaio, Wellington, N.4.; Dr R. B. Miller, Soil Bureau, P.O. Box 8001, Wellington; Mr J. K. Johannesson, W.C.C. Lab., P.O. Box 2199, Wellington.

List of Members Committee: Mr J. S. Pollard (*Chairman*).

Unesco Representative: Mr J. A. D. Nash.

Standards Institute of New Zealand: Representative of N.Z. Standards Institute Council, Mr G. A. Lawrence; Chief Representative for all Standards Institute Affairs, Mr C. L. H. Stonyer.

Chemical, Insecticides, Refrigeration etc, Mr C. L. H. Stonyer; Electroplating and Electrometal Finishes, Dr R. Gardner; Metal containers, Paints etc., Mr J. M. Tingey; Textiles, Dr L. F. Storey.

Honorary Librarian: Mr S. G. Brooker.

Standing Committee of Council: Prof H. N. Parton, Dr W. E. Harvey, Mr W. E. Dasent.

PAPERS READ BEFORE BRANCHES, 1960

AUCKLAND

Symposium on Atmospheric Pollution (*Messrs. R. Hicks; W. E. Russell; C. F. Denmead*).

Some Aspects of Corrosion with Special Reference to Marine Structures (*Dr Titchener; Dr Sprott*).

The Biochemistry of Mental Disorders (*Dr R. O. Farrelly*).

A Visit to the Dominion Breweries (*Mr J. Rickets*).

Antibiotics (*Prof A. W. Johnson*).

Applications of Rotatory Dispersion Studies to Organic Chemical Problems (*Prof Carl Djerassi*).

An address by Mr J. T. O'Leary, Executive Secretary of the New Zealand Atomic Energy Committee.

Molten Salts (*Prof H. Bloom*).

Nucleic Acids, Genes and Viruses (*Sir Alexander Todd, F.R.S.*).

Some Recent Trends in Physical Chemistry (*Dr H. W. Thompson, F.R.S.*).

WAIKATO

Experiences Overseas (*Mr R. J. Lancaster*).

Preliminary Experiments on some Abnormal Constituents of the Serum of Sheep suffering from Facial Eczema (*Dr A. Taylor*).

Analytical Chemistry of Selenium (*Mr J. H. Watkinson*).

General Aspects of Industrial Fermentation (*Mr H. F. Oakley*).

Antibiotics, especially Actinomycins (*Prof A. W. Johnson*).

Recent Studies in Biosynthesis (*Prof. A. J. Birch, F.R.S.*).

Application of Rotatory Dispersion Studies to Organic Chemical Problems (*Prof C. Djerassi*).

Application of Spectroscopy to Chemical Problems (*Dr H. W. Thompson*).

MANAWATU

Trends in Protein Synthesis (*Dr D. G. Russell*).

D.S.I.R. Research in Britain (*Sir Harry Jephcott*).

Weedkillers—A Chemical Review (*Dr J. C. Andrews*).

Electrochemical Methods of Analysis (*Dr P. Rothbaum*).

Variation in Composition of Milk Fat (*Dr J. C. Hawke*).
The Separation of forms of Inorganic Soil Phosphates (*Mr C. V. Fife*).
Vitamin B12 (*Prof A. W. Johnson*).
Chemical Structure and Biological Activity of Myco-bacterial Lipids (*Prof E. Lederer*).
Mitochondria—the Power Plants of the Cell (*Dr G. W. Butler*).
The Enzymic Synthesis of Polysaccharides (*Dr R. W. Bailey*).

WELLINGTON
Modern Paint Coatings (*Mr W. E. Childs*).
Experiments on the Spontaneous Combustion of Textiles (*Mr E. F. Hubbard*).
Industrial and Business Management as it Applies to the Scientist (*Mr K. Schwarz*).
Applications of Infra-Red Spectra to Inorganic Chemistry (*Mr W. E. Dasent*).
Mellor Lecture: Some Comparisons of Oxygen and Sulphur Compounds (*Dr C. J. Wilkins*).
Vitamin B12 (*Prof A. W. Johnson*).
Recent Studies in Biosynthesis (*Prof. A. J. Birch*).
Chemical Structure and Biological Activity of Myco-bacterial Lipids (*Prof E. Lederer*).
Advances in the Chemistry of Fabric Finishes (*Mr N. S. Whittall*).
Some Recent Trends in Physical Chemistry (*Dr H. W. Thompson*).

CANTERBURY
Mission to Malaya (*Dr M. M. Burns*).
Strong Electrolyte Solutions (*Dr J. M. Austin*).
Keeping Warm (*Mr J. S. Pollard*).
Structure and Sorption in Porous Crystals (*Prof R. M. Barrer*).
Some Observations on Chemistry in Overseas Universities (*Prof J. Packer*).
Antarctic Exploration—East of the Beardmore (*Mr R. W. Cawley*).
Recent Advances in High Temperature Chemistry (*Dr H. Bloom*).
Some Current Research in the Chemistry Department (*Dr Wilkins; Dr Metcalfe; Mr Vaughan*).
Chemical Engineering Research in C.S.I.R.O. (*Dr H. R. W. Pratt*).
Aromatic Character (*Prof A. W. Johnson*).
Optical Rotatory Dispersion Studies (*Prof C. Djerassi*).
The Chemist in Biology and Medicine (*Prof A. J. Birch*).
Infra-red Radiation and Chemical Problems (*Dr H. W. Thompson*).

OTAGO
Reflections on Study Leave (*Dr F. N. Fastier*).
Porosity and Structure in Molecular Sieve Crystals (*Prof. R. M. Barrer*).
Some Canadian Experiences in Mineral Chemistry (*Dr J. Rogers*).
Recent Advances in High Temperature Chemistry (*Dr H. Bloom*).
Some Applications of Rotatory Dispersion Studies to Organic Chemical Problems (*Prof C. Djerassi*).
Vitamin B12 (*Prof A. W. Johnson*).
Recent Studies in Biosynthesis (*Prof A. J. Birch*).
Chemical Structure and Biological Activity of Myco-bacterial Lipids (*Prof E. Lederer*).
Physico-chemical Methods of Studying Natural Products (*Dr H. W. Thompson*).

COUNCIL MINUTES

ABRIDGED MINUTES OF A MEETING OF THE COUNCIL OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY (INC.) HELD IN THE LABORATORY OF N.Z. BREWERIES LTD., WELLINGTON, ON THURSDAY, DECEMBER 1.

PRESENT

Prof H. N. Parton (President, in the Chair), Prof D. R. Llewellyn (Auckland), Dr E. P. White (Waikato), Mr G. M. Wallace (Manawatu), Mr W. E. Dasent (Wellington), Mr D. J. Hogan (Canterbury, Registrar), Dr W. G. Hanger (Otago). Mr A. P. Oliver (Acting Hon. Gen. Sec.).

APPOINTMENTS

Officers and subcommittees as listed on page 19 were appointed.

Resolved: That Mr D. J. Hogan be appointed Registrar for a period of three years.

Resolved: That Mr J. Shanahan be appointed Auditor for a period of three years.

Resolved: That the Trustees be authorized to operate the Trust Fund P.O.S.B. Account, namely Prof H. N. Parton, Sir Theodore Rigg and Dr J. C. Andrews.

Resolved: That the President and Registrar investigate the position of the Trust Fund and Trustees. (*Note*: This will include such matters as the purpose of the Fund, mode of election of Trustees, etc.).

Resolved: That Messrs J. R. Beck and A. P. Oliver continue to operate the Bank Account.

P.O.S.B. ACCOUNT

This is very seldom used. The Bank gives interest to societies such as ours, therefore there is no further point in running two accounts.

Resolved: That the Auditor's recommendation be given effect to, and that the P.O.S.B. fund be transferred to the Bank Account.

Resolved: That the Registrar and Mr T. A. Mitchell be authorized to operate the P.O.S.B. Account.

EMPLOYMENT SUBCOMMITTEE (Auckland)

Resolved (Manawatu/Canterbury): That the Committee's report of May, 1960, be referred back for minor corrections before circulation. University Staff and the Post Primary Teachers' Association are to be consulted to provide more recent salary figures. Prof D. Llewellyn agreed to approach the Committee.

HONORARIA

Resolved: That the honorarium for the Acting Hon. Gen. Secretary be £50.

Resolved: That the honorarium for the Editor be £35.

Resolved: That the honorarium for the Secretary of the Examinations Committee be £15 per year for 1959-60 and 1960-61, total £30.

LIST OF MEMBERS

Resolved: That Mr J. Pollard be appointed Chairman of the standing committee for membership list revision.

OVERSEAS VISITORS

Resolved: That Dr R. Cornforth and his wife be invited from Australia to undertake a lecture tour.

Note: Dr Cornforth is an authority on organic chemistry, in particular the steroids. Expenses in connection with his tour will be met by the

Institute, as the sum contributed by the D.S.I.R., the Universities and the Chemical Society was fully expended on the five 1960 visitors. This course of action will result in the N.Z.I.C. paying its fair share of the total cost of the six visitors.

PROFESSIONAL STATUS COMMITTEE

On the advice of the Committee, the Salary Survey is to be further delayed as it appears that Government scientific salaries may be increased early in 1961.

ROYAL CHARTER

The Internal Affairs Department states that Incorporation by Royal Charter is granted very rarely. The only N.Z. organizations so incorporated are the R.S.A. and the University of N.Z. Neither body has the right to use the word "Royal" in its title. Only about four Charters per year are granted throughout the Commonwealth. The Department considers it most unlikely that an application by the Institute could succeed. The Department considers that, on the other hand, the Institute would stand a good chance of being granted permission to use the word "Royal" in the title. The requirements are that the applicant organization should be of good standing financially and professionally, should fully represent the chemists of New Zealand and be active in the advancement of the profession.

Branches are asked to decide whether the title "Royal" is to be sought, in order that application can be made.

TRUST FUND

Resolved: That on the advice of the Trustees the sum of £500 be invested in Lyttelton Harbour Board 10-year stock or an equivalent approved trustee security.

RULES

A list of amended Rules and Regulations was received.

Resolved: That Rule 5 be amended by replacing the third sentence with the following:

"Every application shall be signed by the applicant who shall provide the names and addresses of two referees, preferably Fellows or Associates of the Institute, to whom the applicant is known personally and who can, if necessary, provide information regarding the applicant's experience in the practice of chemistry and general fitness to be admitted to the Institute". and that Rules 8.2.3 and 9.3.1 be amended by deleting the words "or of the Chemical Institute of Canada" and replacing them with such equivalent qualification of that Institute as will have been determined by the Hon. Gen. Secretary's enquiries.

PHARMACEUTICAL CHEMISTS

A letter was received from Mr K. W. Staples enclosing a letter he had sent to the Editor of the *Directory of N.Z. Science*. This letter objected to the use in the 1954 edition of the abbreviation Ph.C. in the list of degrees and professional qualifications. It was pointed out that the letters are an abbreviation for an occupation, and not of a Degree or Diploma. This term is also in use in the 1960 *List of Members* of the N.Z.I.C.

Resolved: That Mr Staples be thanked for his letter, and that the use of the term Ph.C. be discontinued in the N.Z.I.C. *List of Members*.

BRANCH GRANTS

Resolved: That the sum of £20 be granted to Branches for the year 1960-61.

CHEMISTRY IN ACTION

Resolved: That the sum of £10 be granted to the Canterbury Branch to defray the cost of organizing *Chemistry in Action—1960*.

CONFERENCE 1961

Resolved: That the sum of £20 be advanced to the Auckland Branch for Conference 1961.

LOCAL MEMBERS

It appears that some Local Members are in arrears with their subscriptions, which means they are receiving *Journals* for which the Institute pays the publishers. As there is no central record of the financial status of Local Members, Branch secretaries are asked to take the matter up urgently with those concerned. Local membership is a cheap privilege which should be rapidly withdrawn for non-payment.

EXAMINATIONS

Resolved: That Council approves the principle of paying examiners and supervisors for Associateship examinations, and examiners for the L.A.C., and that the Examinations Committee be asked to report on a suitable scale of fees.

Resolved: That the Associateship examination shall be held in a laboratory approved by the Examinations Committee.

Resolved: That the Examinations Committee be requested to obtain permission from the University Registrar when the use of a University laboratory for an N.Z.I.C. examination is desired, and that accounts for this submitted by the University shall be sent to the N.Z.I.C. Registrar for payment.

A. P. Oliver,
Acting Hon. Gen. Secretary.

SCIENCE CONGRESS COMMITTEE REPORT

The Committee from the Wellington Branch which organized the programme for Section B (Chemistry) at the Ninth N.Z. Science Congress in May presented its report at the August Council Meeting. The convener of the Committee was Mr J. R. Beck and the secretary Mr H. R. Penhale. Their report is of especial importance because it considers problems arising from the Institute's participation with other bodies in the Congress, and because the Committee's "precirculated lecture" system is an unusual, although not entirely new, procedure at Institute conferences. Reference to these matters is included in the following excerpts from the Report.

Circulation of papers: All speakers except the guest lecturer, Professor R. M. Barrer, were requested to supply some 200 to 300 copies of the completed lecture prior to the congress, or if this was not possible, on the grounds of personal expense or for other reasons, to supply the lecture on a stencil. In practically all cases the printed lectures were received from authors and only one lecture was required to be duplicated by the programme committee.

Complete sets of symposia papers were posted to all persons who had registered for the congress and who had indicated an interest in chemistry, engineering, architecture, medicine or forestry at the beginning of May. In addition, all members of N.Z.I.C. who registered for the congress were sent copies of the papers to be presented in the chemistry sessions. Copies of papers were also available at the various sessions.

The time available for the presentation of each paper was 25 to 30 minutes. Speakers were asked not to read their papers already distributed to congress delegates, but to confine their remarks to highlights of their papers, further details or comments, and illustrations, taking in all about 10 to 15 minutes. The remaining 10 to 15 minutes were devoted to discussions and questions.

It was quite obvious that this system of printing and distributing complete papers before the congress, and leaving plenty of time for discussion with the speaker at the time of presenting the paper, was most successful. In practically all cases fruitful discussions took place with the papers.

The cost of printing the papers was borne in nearly all instances by the employers of the speakers. The cost to the organizing committee was slight. Some 25 papers were distributed.

Press: Members of the Press attended the congress. Copies of all Section B papers were given to the Press who much appreciated this action. A number of Press articles appeared containing material from these papers.

Attendance: Of the total of approximately 1,500 registered for the congress, 135 were members of the N.Z.I.C. On the registration forms members were requested to indicate the sections of main interest and of secondary interest.

In addition to the 135 N.Z.I.C. members indicating chemistry as primary choice, 35 non-members indicated chemistry as primary choice, and 73 non-members indicated chemistry as second choice.

Details of N.Z.I.C. members who registered for the congress are as follows:

	Govt.	*Industry*	*Teaching*	*Univ.*	*Total*
Wellington members:	55	20	6	2	83
Outside Wellington:	24	20	0	8	52
Totals:	79	40	6	10	135

The attendances at the symposia ranged from 50 to 80. There were about 40 at the chemistry sessions. The guest's lecture was well attended, with over 100 persons present.

General: The relative value of Science Congresses and N.Z.I.C. conferences has been variously commented on by members. This committee feels that the aims of the conferences are widely different and that Council should decide on future participation. In this connection it has been suggested that if Section B (Chemistry) were deleted from the congress programme then very few Government chemists would be able to attend.

INSTITUTE PRIZES

The attention of members wishing to make entries or recommendations for Institute Prizes for 1961 is directed to the Regulations published in the *Journal*, April 1959, page 47. The closing date for all Prizes is April 30.

OBITUARY

FREDERICK PALLISER WORLEY

The death in December of Professor F. P. Worley, M.A., M.Sc., D.Sc. (Lond.), D.I.C., Emeritus Professor of Chemistry, University of Auckland, and an Honorary Fellow of the N.Z. Institute of Chemistry, severs another link with the pioneering days of chemistry in New Zealand. Born in Nelson in 1880, Professor Worley received his early education at Nelson College but graduated M.A. and M.Sc. from Auckland where his interest in chemistry was stimulated by Professor F. D. Brown. After teaching at King's College and Auckland Grammar School between 1900 and 1906 he was appointed Acting Professor of Chemistry and Physics at Auckland University College during 1907. On obtaining a research fellowship he spent the next six years in London and was awarded a Doctorate of Science of London University. He returned to Auckland as Professor of Chemistry in 1914 and held this post until his retirement in 1947.

Professor Worley's early publications were mainly contributions to the theory of solution chemistry, much of this work being done in association with H. E. Armstrong in London during Armstrong's classical criticism of the ionic hypothesis. He retained his interest in this field after appointment to the chair at Auckland but over the years published papers on a wide range of topics. He was frequently consulted on the application of science in forensic problems and in the development of industrial chemistry in the Auckland district.

Professor Worley was largely responsible for the formation of the Auckland Chemical Society in 1925 and of its successor, the Auckland Branch of the Institute. He was an early President of the Institute (1936-1937) and was elected an Honorary Fellow of the Institute in 1949.

BOOK REVIEWS

CHEMICAL PROCESS PRINCIPLES. PART II—THERMODYNAMICS, by O. A. Hougen, K. M. Watson, R. A. Ragatz. Published by John Wiley & Sons, Inc., New York, 1959. 567 pages. Price 9.75 dollars.

This, the second edition of Part II of *Chemical Process Principles*, has been extensively revised and considerably enlarged by the original authors and Professor Ragatz, as was Part I in 1954. The main additions have been chapters on fluid flow and two on heat engines, the latter including modern engines of free piston, jet and rocket types. Among other additions are sections on electrochemical reactions, distillation and gas absorption, and the sections on prediction of thermodynamic data by generalized methods have been expanded. The chief omission is of some of the first edition material on prediction of thermodynamic properties from molecular structure. Although the method of presentation—discussion illustrated by worked examples—remains unchanged, much of the new material deals with applications of thermodynamics, and to this extent the second edition has a rather more practical flavour than the first.

As a source of information on methods of predicting thermodynamic data, this book must remain one of the standard texts for chemists and chemical engineers. The new material may make it even more useful to the latter group.

LEHRBUCH DER PHYSIOLOGISCHEN CHEMIE (14th Edition), by Franz Leuthardt, Zurich, 920 pages. Water de Gruyter and Co., Berlin, 1952. DM. 42 (about £3 17s. 0d.).

This is a well-produced textbook of physiological chemistry based on the original text of S. Edlbacher who died in 1946. There is no doubt that a great deal of information has been packed into it, so that it becomes a work of reference as well as a textbook. The most striking feature to the reviewer is an excellent 34-page literature review including references to books and reviews on all branches of the subject. This is supplemented by a number of leading references in the text.

—S.G.B.

The latest part of the 4th Edition of *Houben-Weyl*: *Methoden der Organischen Chemie* (Vol. 5, part 4) covers the preparation of bromine and iodine compounds and concludes with chapters on reactivity and reactions of organic compounds containing chlorine, bromine and iodine. Although the field covered by this part might be considered a relatively small division of the subject, it is treated in such detail that it requires 892 pages. The great value of *Houben-Weyl* lies in the numerous detailed examples of actual preparations taken from the literature. The present edition is under the general editorship of Eugen Muller and the contributors to the part under review are N. Kreutzkamp, H. Meerwein, A. Roedig and R. Stroh. The book is produced to the usual high standards of Georg Thieme Verlag of Stuttgart and sells at 180 Deutschmarks.

—S.G.B.

THE SURFACE CHEMISTRY OF METALS AND SEMICONDUCTORS, edited by Harry C. Gatos. Published by John Wiley & Sons, Inc., New York. 526 pages. Price 12.50 dollars.

This volume contains twenty-two papers presented at a Joint Symposium of the Corrosion & Electronics Division of the Electrochemical Society held in Columbus, Ohio, in 1959.

The surface properties of metals have been extensively studied over a very long period in such fields as metallurgy, electrochemistry, catalysis and corrosion. Interest in semiconductors has been much more recent and can only be described as intense since the discovery of the transistor in 1948. While approaches to the study of these two types of surfaces have been quite different, it has become evident that metal and semiconductor surfaces have many common characteristics and this symposium was arranged to give an effective interchange of theory and technology between these two fields of study. The papers presented cover a wide range of topics which are grouped into five parts:

(1) Chemistry and Physics of Surfaces; (2) Imperfections and Surface Behaviour; (3) Electrode Behaviour of Metals and Semiconductors; (4) Surface Reactions in Liquid Media; (5) Surface Reactions in Gaseous Media.

Many of the papers are excellently illustrated with diagrams and photomicrographs. All include extensive lists of references and the symposium discussions are recorded.

The authors are all active workers in the field of surface chemistry and have provided in this book an authoritative summary of current knowledge of many surface properties of metals and semiconductors.

—G.S.L.

ANALYTICAL APPLICATIONS OF DIAMINO-ETHANE-TETRA-ACETIC ACID, by T. S. West and A. S. Sykes (Chemistry Department, University of Birmingham). The British Drug Houses Ltd., Poole, England. 127 pp.

Recent investigations on the properties of EDTA and other chelating compounds have revealed many interesting and useful applications of these materials. This booklet provides an excellent review of the voluminous literature, much of which is in foreign languages. This is the second edition and is a reprint of the first supplemented with an additional 18 pages of new material. This appendix deals primarily with problems of endpoint determination in complexometric titrations. The complete review lists 523 original papers. The work is a concise presentation of both theoretical and practical aspects of the subject and should be highly successful in its function as a sales promotion instrument. At the same time it is an excellent scientific contribution.

—R.J.L.

PHOTOCONDUCTIVITY OF SOLIDS, by Richard H. Bube. Published by John Wiley & Sons, Inc., 1960. Price 14.75 dollars.

This is a competent and well-produced treatment of an important topic in chemical physics, but probably only of interest to a very small group of chemists. It is a book which will undoubtedly find a place in all libraries devoted to chemical research, but probably not in the private libraries of most chemists. The subjects covered in the volume are the theory and practice of photoconductivity with special attention to the way that current theory affects the selection of photoconductive material for various uses. The author is not a theoretical physicist, but a practical physicist in the Radio Corporation of America Laboratories, Princetown, so a practical outlook on this very interesting subject is to be expected. Origins and mechanisms of photoconductivity are discussed in the early part of the book, the problems of making electrical contact with the crystals and the ways in which the behaviour of crystals can be stimulated and a reasonably vigorous treatment of the various possible theoretical concepts of photoconductivity are included. There is a very complete and up-to-date set of references to the original literature covering over a thousand journal references.

—S.R.S.

THERMOELECTRICITY, by Paul H. Egli. Published by John Wiley & Sons, Inc., 1960. Price 10.00 dollars.

This volume is marginal for private libraries of those in the practice of chemistry, but one which will find a place in all research laboratories. It is a symposium of papers by a large number of authors and suffers from this in its unevenness of treatment and presentation. The Editor, however, has done a very good job in minimizing this overlap and in ordering the material so as to produce as nearly as possible a series of chapters of connected topics. The volume is in four sections covering fundamental concepts, basic properties concerned with thermoelectricity, the chemical and physical properties of thermoelectricity materials, and methods of measurement of these properties. The four sections are rounded off by a very useful discussion by the Editor of the way in which research should develop to make future maximum use of thermoelectric materials covering both classical materials and semiconductors. This is altogether a very interesting and useful symposium for those whose business is with

thermoelectric devices, whether as users of them for measurement or as workers in physics and chemistry who are interested in how this sort of behaviour is developed.

—S.R.S.

OPTICS AND SPECTROSCOPY. The Optical Society of America, American Institute of Physics, 335 East 45 Street, New York 17. Subscription rate: 28 dollars per annum.

This journal is a full English translation of the Russian *Optika i Spektroscopiya* and appears monthly in two volumes a year, commencing with Volume 6, No. 1 (January, 1959) of the Russian journal. The translation and publication is being undertaken on the initiative of the Optical Society of America with a grant-in-aid from the National Science Foundation, and the above subscription includes also the *Journal of the Optical Society of America*.

The field covered is wide and most branches of atomic and molecular spectroscopy are included. Practical experimental details are often scanty and most papers are devoted to theoretical discussions of results. There is a surprising absence of papers on the instrumental aspects of spectroscopy and optics.

—J.E.A.

BIOCHEMICAL PREPARATIONS (*Vol. 7*), Henry A. Lardy, Editor in Chief. John Wiley & Sons Inc., New York, 1960. 102 pages. 5.25 dollars.

Volume 7 continues this excellent series with the description of 20 more vouched-for methods for preparation of organic chemicals of importance in biochemistry. These include methods for the synthesis both chemical and enzymic, of P^{32} labelled A.D.P. and A.T.P., *d*-fructose 1-phosphate, cerebrosides, etc.

—G.M.W.

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