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VOLUME VI. MARCH, 1942 NO. 1

EDITORIAL

The formation of an Association of Scientific Workers, which was decided upon at a meeting held in Wellington last December, is an event of importance, and one in which members of this Institute must be keenly interested.

The main aims of the new organisation are such as to command the support of all whose work is scientific in nature; the ensuring of maximum co-operation between the sciences, and the application of science for the welfare of the community; the combating of the perversion and suppression of science; the promotion of scientific knowledge and method; and the guarding of the status of scientific workers. Some chemists may think that these objects are adequately pursued, at least as far as our particular branch of science is concerned, by the complementary activities of the Royal Society of New Zealand and our own organisation. We believe, however, that a broader view must be taken. It is clear that the Royal Society which embraces in its membership many who can not be described as scientific workers, cannot be expected to devote itself to guarding and raising the economic status of a portion of its membership. Moreover, it is not specifically concerned with the application of science.

As a result, some groups of scientists who are at present few in numbers—physicists and geologists may be taken as examples—may well suffer through the lack of an organisation to press their undoubted claims, especially when their obvious war-time value has ceased to be obvious with the coming of peace. Chemists, whose numbers have enabled them to build an active organisation, should not hesitate to join with their colleagues to build another whose basis is broader.

More important than these limited objectives however, are the problems of reconstruction which will face the country in the not too distant future. They are certain to be acute and an organisation through which workers in the physical, biological and social sciences can all contribute to their solution should be welcomed and supported by all citizens.

PRESIDENT'S MESSAGE TO MEMBERS OF THE INSTITUTE OF CHEMISTRY.

This is a critical hour in the history of the free peoples of the world. Europe is enslaved by the tyranny and oppression of Hitlerism, while Japan attempts to dominate the whole of the Western Pacific.

If either Germany or Japan are successful in their grandiose schemes of conquest, freedom of thought, of scientific creation and of spiritual values will be brought into subjection for many years to come.

The initial successes gained by Japan have brought to us more clearly the great dangers that lie ahead, for it can be said with equal truth that the success of Japan in dominating the Western Pacific would be just as disastrous to the freedom of Australia and New Zealand as the triumph of Hitler in Europe. Under these circumstances, conscious of the dark days which lie ahead, there comes an insistent call to every member of the Institute of Chemistry for devoted service and sacrifice, not only in our professional capacities, but in every direction that will assist the overthrow of tyranny and aggression throughout the world. Our work must not end with victory over aggression; there remains the vital work of reconstructing a new world order which will give to all peoples throughout the world the maximum security, liberty and happiness.

The foundations of this new world order must be laid by this generation of whom all members of the Institute are called to take their part. Probably in no previous era in the history of mankind are the dangers so immense, but equally there will come with victory, opportunities never yet given to understanding hearts to create a new world in which freedom, justice and security are enthroned.

To all members of the Institute comes the call for devoted service and sacrifice that the highest and noblest ideals may survive. In our professional capacity and in our duty as citizens of a free land, it is essential to give the maximum support to the armed forces, to civilian defence, to the vital industries of New Zealand, and to the co-operative effort of all free peoples to establish a new world based on freedom and justice.

THEODORE RIGG
President N.Z. Institute of Chemistry.

SIR THEODORE RIGG, K.B.E.

M.Sc. (N.Z.), M.A. (Cambridge), F.I.C. F.R.S. (N.Z.)

All members of the New Zealand Institute of Chemistry must have read with pleasure that Sir Theodore Rigg had been elected President for the present year. No previous appointment can have met with more general approval and I believe that the following summary of Sir Theodore's career will be appreciated.

Theodore Rigg was born in Yorkshire but came to New Zealand at an early age. After leaving Wellington College he joined Victoria University College in 1907, and later in the year was appointed junior cadet in the chemical laboratory of the Department of Agriculture, becoming an assistant chemist two years later. This combination of day and evening work was continued for a period of five years and though such a system has obvious disadvantages, these may receive compensation in the case of men with natural ability, enthusiasm, earnestness of purpose and great physical stamina. That the last named characteristic was not wanting is shown by the fact that for four years Rigg held the university three miles championship and was runner-up in the mile championship on three occasions.

The work of the chemical division of the Department of Agriculture was at that time undergoing rapid expansion under the leadership of Mr. B. C. Aston, F.I.C., but the laboratory was of a makeshift character, under-staffed, ill equipped, and overcrowded. The large variety of work in which the assistant chemists were called to take a hand certainly prevented over specialisation and offered a great insight into the nature of the agricultural problems which the chemist may be called upon to solve and the difficulties which may arise in their solution.

In 1910, Rigg obtained the B.Sc. degree and in 1911 the M.Sc. with 1st class honours in Physical Chemistry. In connection with the latter degree, he presented two theses. The first, on Montan Wax, was published in Trans. N.Z. Inst., Vol. 44, 1911, pp. 270-287, and cleared up a problem which had been ineffectively attacked by several European chemists. The second thesis dealt with the changes in the chemical composition of mangel juice during storage and shewed that interest in the problems of bio-chemistry was already aroused. The reports of the Department of Agriculture shew that he was also helping in Mr. Aston's bush sickness investigations at that period. On obtaining the M.Sc. degree, Rigg was awarded the Jacob Joseph Research Scholarship and continued his work in Wellington until April, 1912. He then went to Ruakura Experi-

mental Farm to give lectures on agricultural chemistry and to gain practical experience in farm and orchard methods. Later in the year he was awarded the 1851 Exhibition Science Travelling Scholarship, joined the Cambridge University School of Agriculture and on the advice of Professor T. B. Wood, F.R.S., devoted his main attention to field work. In June, 1914, he was awarded a research degree on a thesis entitled "A soil survey of the market garden district of Bedfordshire." The travelling scholarship was renewed for a third year and some months were spent at the celebrated Rothamsted Experimental Station where Sir John Russell had recently been appointed director. After the retirement of the German troops from the Marne in September, 1914, Rigg worked on behalf of the Society of Friends in the restoration of agriculture in the devastated district. In 1915-16 he was in charge of evacuation relief in Montenegro and Albania (Serbian Relief Fund) and 1916-19 managing secretary for the Society of Friends' relief of refugees and starving children from Moscow at Samara (Kubushev). Returning in 1919 to England he again worked at Rothamsted and then in U.S.A., where further experience of soil survey and other agricultural research methods was obtained. In November, 1919, he married Miss White of Philadelphia and a few weeks later was appointed agricultural chemist at the Cawthron Institute. Later he became assistant director and on my retirement in 1933, was made director of the Institute. When the N.Z. Council of Scientific and Industrial Research was established in 1926, Rigg was elected a member and this position he has held ever since. He was knighted in 1938.

Of Sir Theodore's work at the Cawthron Institute I have only space for a very short account. It began with a careful soil survey of the Nelson district and this survey extended and modified, has formed a splendid foundation for the development of a long series of agricultural investigations from which the fruit industry, tobacco, and general farming have benefited. The results obtained in Nelson have had a wide application in other parts of New Zealand. Soil survey has obviously an important connection with soil deficiency and stock diseases and their treatment, and some results of startling importance have been reached. Sir Theodore Rigg's success is largely due to his intense thoroughness and power of concentration, but not less to his humanity. He never expects a member of his staff to work quite as hard as he works himself and he has always fostered the interests of those who are in his charge.

Thomas H. Easterfield.

COUNCIL.

President—Sir Theodore Rigg

Delegates—

J. K. Dixon (Wellington) L. W. Ruddle (Canterbury)
L. H. Briggs (Auckland) F. G. Soper (Otago)

Hon Secretary: J. A. D. Nash, P.O. Box 250, or Dominion Laboratory, Wellington.

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Hon. Sec'y.—B. E. Jackson, C/o. Shell Oil Coy, Freeman's Bay.
Committee—K. M. Griffin, R. Stansfield
W. Williams F. H. V. Fielder

Wellington:—

Chairman—J. K. Dixon
Hon Secretary—M. B. Rands, Dominion Laboratory.
Committee—Mrs. N. T. Clare G. S. Lambert
E. B. Davies J. L. Mandeno

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Secretary—F. H. Johnston, Dominion Compressed Yeast Coy., Moorhouse Avenue, Christchurch.
Committee—J. C. Forsyth H. C. Holland
L. W. Ruddle G. J. Warren
Editor of Journal—H. N. Parton, Canterbury College.

Otago:—

Chairman—M. V. B. King
Hon. Secretary—R. V. Peryman, Chemistry Dept, Otago Univ'y.
Committee—R. Gardner F. G. Soper
T. A. Thomson H. G. Woolman

COUNCIL MEETING (December 12th, 1941).

Sir Theodore Rigg presided, there being present Messrs Andrew and White, Professor Soper, Dr. Dixon and the Hon. Secretary. It was decided that any regulations made under the rules should be included with the rules when they are next printed. Dr. Dixon was appointed convener of the committee on misleading advertising, and was also asked to prepare a statement (printed below) giving details of the Wellington scheme for a laboratory assistants' certificate. A recommendation was made to the branches that in view of the particular need for encouraging industrial chemistry in New Zealand,

the Council approve the award of an essay prize and in the first instance the scheme be for five years, and the value of the prize £10.

Mr. J. A. D. Nash was re-elected Secretary-Treasurer and Council placed on record its appreciation of his excellent services during the year.

Explanatory Note to the Wellington Remit re Laboratory Assistants' Certificate. Prepared by Dr. J. K. Dixon.

The purpose of the remit is to provide for some sort of a career for laboratory assistants. At present they are usually taken on as handymen and used as such, with the result that after a few years they have often got too old to make a change and they are trapped in their position, having learnt no trade and being very dependent on the laboratory that employs them. Good laboratory assistants are of great use to a laboratory, and I feel that chemists owe them something to ensure that they can stand on their own feet if need be.

No man should be asked to do a job without some explanation of what is behind it, but with a busy chemist not much time is available for theoretical explanations, nor will the average laboratory assistant be in a position to appreciate readily that explanation without some background. My idea is, therefore, that in the early stages he should be encouraged to get some sort of theoretical basis for his work by taking chemistry and allied subjects at a night school. There are Technical Schools in most towns in New Zealand and the course suggested is one that could be taken at any such school.

It has been suggested to me that my laboratory assistants may rise to £265, and in exceptional cases, to £305. I would like to make the holding of the Laboratory Assistants' Certificate the prerequisite for passing to £305 or beyond. This would give some purpose to the technical studies. As it is now, assistants are encouraged to attend at the technical school but they have no goal to aim for and if they miss once or twice there is no incentive to pick up again. A young chap often does not worry about his future when he starts a job but this is the time to get him started on something.

The sub-sections in the remit are not necessarily in their final form; they have been set out to give an idea of what is aimed at. Elementary physics means properties of solids, etc. With laboratory arts the idea is to induce the assistant to do something well. It is quite possible that this section could be added to or that some combination of the three would be better.

COUNCIL MEETING (February 18th, 1942)

Sir Theodore Rigg presided, and Professor Soper, Messrs Andrew, Lambert, White and Nash were present. The question of a certificate for laboratory assistants was deferred to the next meeting. The rules published below for the Industrial Chemical Essay Prize were approved.

A deputation from the N.Z. Association of Scientific Workers waited upon the Council, and after the aims and objects of that body had been explained, the secretary was instructed to circulate information about the Association to branches, no further action to be taken in the meantime.

The Council expressed appreciation of the offer of the Australian Chemical Institute of further facilities to our members.

Appreciation was also expressed of the action of the Public Service Commissioner in agreeing to the Institute's suggestions on salaries, namely £255 for graduates with B.Sc., £280 for M.Sc. up to second-class Honours, and £305 for M.Sc. with first-class Honours.

Other decisions taken were to postpone the 1942 Conference, to forward agenda and minutes of Council meetings to the immediate past president, and to consider alterations to the rules at the May meeting, at which delegates will be asked to attend.

IMPORTANT ! !

Members are asked to take particular note of the following decisions of Council.

The 1942 Conference has been postponed.

The Rules of the Institute will be finalised in May, and comments on them should be sent to the Secretary by April 1st.

The Secretary would like all members going into camp to send him their military addresses.

INDUSTRIAL CHEMICAL ESSAY.

At the Council Meeting on February 18th, the establishment of an Industrial Chemical Essay Prize was approved, and the following regulations adopted:

1— The N.Z. Institute of Chemistry will offer annually a prize for an essay dealing with Industrial Chemistry in New Zealand.

2— The prize shall be open to all persons without restriction as to age and shall be offered for the first time in 1943.

3— No restriction will be placed on the length of the essay or its previous or subsequent publication, and the term "Industrial Chemistry" is to be understood in the widest sense. The essay may deal with a single industry or with a group of industries, or with any consideration affecting chemical industry as a whole in New Zealand.

4— The essays in completed form must be received by the General Secretary not later than 30th April in any year. The essays will be judged by a committee of examiners set up by Council for the purpose and one of whom shall be the President of the Institute. The award will be decided upon by Council after consideration of the report of the committee of examiners and the presentation of the prize will be made, whenever possible, at the Annual Conference of the Institute.

5— No award will be made in any year if, in the opinion of the Committee of examiners, there is no entry of a sufficiently high standard of merit in that year.

6— While the essays are to be judged primarily as contributions to the development of industrial chemistry in New Zealand, a reasonably high standard of literary work, and particularly of clarity of expression, will be required.

7— No paper will be published without the prior consent of the essayist.

8— The value of the prize will, for the present, be £10, to be spent on books or instruments to the satisfaction of Council.

BRANCH NOTES

AUCKLAND.

Dr. L. H. Briggs, the chairman for 1942, is a graduate of Auckland University College. After graduating M.Sc., he spent some years in research work, one at A.U.C. on post graduate work in essential oils, two at Massey College on

butter-fat deterioration problems, and two at Oxford under Sir Robert Robinson on alkaloids, leading to the Doctorate of Philosophy. In 1933 he took up his present post as lecturer in organic chemistry at A.U.C. and in 1941 graduated D.Sc. in the University of New Zealand, in recognition of his work on plant products. In the course of his career he has been awarded eight scholarships, including University Entrance, and an Oxford Exhibition by the British Association. His contributions to chemistry in New Zealand, both in university teaching and research, are of a very high calibre, and make up a record of great merit. Dr. Briggs has been a member of the Auckland branch committee since 1933 and became a Fellow of the Institute in 1936. His interests are not limited by the science of chemistry, as he is a Rugby referee of representative standing, both in England and Auckland, and he has tramped in many parts of the country.

R. T. Danvers, who has been branch secretary for several years, has become manager of J. Wattie's canneries at Hastings.

GAS DETECTION.

Auckland members of the Institute have been active in the formation of a gas detection group. At the annual meeting in November it was announced that the E.P.S. authorities wished to have 20 gas identification officers available, and 12 were enrolled by the 19th December, membership later being increased to 21. Most of the gas officers are chemists, but one of the most enthusiastic is a dentist, and the most useful member to date is an engineer who has spent his week-ends making the gas detection pumps for all members from brass pipe and castings. This pump is made to the description of the British gas officers' pump and the glass funnel for holding the contaminated earth is a four ounce bottle with a narrow mouth screw top which screws into a brass socket.

The training of the gas officers is being carried out by Mr. G. Chamberlain of the Dominion Laboratory staff who has made a study of English A.R.P. methods. Meetings are held twice weekly at the Dominion Laboratory and a full study of the war gases is being made, based on notes from Prentiss, Sartori and Home Office publications.

Although the full protective clothing is not yet available, the detection of mustard gas in sand by the pump, while wearing a service respirator and rubber gloves in a concentration of chloropicrin and B.B.C., has proved quite difficult enough for a start.

WELLINGTON.

The Chairman for 1942, Dr. J. K. Dixon, is a graduate of Canterbury College, where he took an Honours degree, and did post graduate research on wheat problems. Further research followed at Otago University on a Lubecki Scholarship, and two years' work at Imperial College, London, lead to a Ph.D. in Agricultural Chemistry. On returning to New Zealand Dr. Dixon began work on lamb ailments at Morton Mains, eventually cured by cobalt, and during the illness of Professor Inglis in 1934, he lectured at Otago University. In 1935 he became soil chemist at Cawthron Institute, and worked there for five years on problems connected with the soil survey. On the amalgamation of soil chemical work, he came to Wellington in 1940 as chief soil chemist.

A. J. Metson, Associate Member, is on service overseas with an artillery unit. After graduating at Canterbury College he became assistant soil chemist at Cawthron Institute. Two years later, when the soil survey interests were combined in a central laboratory, he transferred to Wellington.

CANTERBURY.

At the annual meeting in November, Dr. M. M. Burns was elected chairman for 1942. Dr. Burns is now in camp with the Canterbury Yeomanry Cavalry, and his duties as Quartermaster Sergeant will prevent him attending meetings. At a committee meeting held on February 16th, Mr. C. G. W. Mason was elected to replace Dr. Burns as chairman. Mr. L. W. Ruddle took over Dr. Burns' duties as delegate and Mr. G. J. Warren was invited to join the committee.

Mr. W. L. M. Dearsley of the Dominion Compressed Yeast Company addressed the annual meeting of the Branch on "Alcohol Production." He said that synthesis from the elements is uneconomic, and fermentation processes are used. Fermentation of cellulose would be the cheapest method, and work has been done leading so far to no economic use. Sugars, either as starting materials themselves, or from starch containing materials, constitute the present source. In factory practice one part of anhydrous starch gives 0.40 parts of alcohol by fermentation, and 0.48 parts by acid hydrolysis. Possible starting materials grown in New Zealand at present are potatoes and grain. One ton of potatoes containing 18 per cent of starch will yield 24 gallons of 95 per cent alcohol. With potatoes at £1 per ton, Mr. Dearsley estimated the cost of alcohol at 2/3d per gallon, the cost increasing to 4/9 per gallon with potatoes at £4 per ton. In some continental countries subsidies, taxes and special farming conditions have

been arranged or imposed so that the price of alcohol corresponds to that with potatoes not much over £1 per ton. Wheat at £10 per ton, yielding 77 gallons of alcohol was estimated to produce the spirit at 4/6 per gallon.

The cheapest source of alcohol today is molasses, and the industrial spirit used in New Zealand today, made in Australia from cane sugar molasses, costs 1/7 in the producing country and about 2/- per gallon in New Zealand. By importing cane molasses at £8 per ton, we could produce alcohol at 3/1. Tapioca meal, imported at £9/10/- per ton, would give alcohol at 3/4. The establishment of a beet sugar industry here would mean cheap alcohol, since with beet molasses at £2 per ton, alcohol could be made at 1/8 per gallon. An output of 25,000 tons of sugar would give 400,000 gallons of alcohol, which would suffice for industrial purposes but not go as far as power alcohol.

OTAGO.

At the annual meeting a programme of "Odds and Ends" was presented, in addition to the transaction of routine business. This year we had a good selection as the following list will show, and it is fairly certain that all tastes were catered for. The subjects covered were: Conductimetric analysis and the 'Magic Eye' as a null indicator (T. A. Thomson); The 'Magic Eye' in potentiometric analysis (R. V. Peryman); A method of isotope separation (Prof. Soper); The estimation of fluorine (Dr. Gardner); A new gas generator (W. Metcalf); Standard ground glass joints (L. H. James); A new still head (H. McLean); An efficient inexpensive polarising apparatus (T. A. Thomson); A simple micro projection apparatus (R. V. Peryman); An efficient vacuum regulator (H. McLean).

Our new chairman, Mr. M. V. B. King, has been connected with the N.Z.I.C. in many capacities. He has served the Otago Branch as member of committee, secretary-treasurer, branch editor, and now as chairman. Members at the 1941 Dunedin conference will remember Mr. King's efficient work in this direction. Mr. King was educated at Otago Boys' High School and Otago University. He shewed interest in science at an early age at school and as was natural, graduated B.Sc. and later M.Sc. Mr. King then joined the staff of the Chemistry Department, Otago University where, in addition to his work of lecturing, he carried out research op tutin. Mr. King was later appointed lecturer in biochemistry at the Medical School, which position he now holds. Our chairman's interest in chemistry is as wide as his appreciation of the work of others. The Branch looks forward to a successful year under Mr. King's leadership.

CORRESPONDENCE.

The Editor, 9/12/41
Journal of the New Zealand Institute of Chemistry.

Sir:

I have several times noticed that chemists who have never had occasion to make up standard solutions in quantities greater than a litre become a little bothered when they have to prepare larger quantities. There is not usually available any vessel holding the required volume with an accuracy comparable to that of a measuring flask. The difficulty is easily got over by a method of successive approximation which can perhaps best be made clear by an example.

In my own laboratory we frequently make five litres of standard solution in a bottle on which the only graduation is a file-scratch on the straight side of the bottle; the measurement is subject to an error of the order of 20ml. We always aim at making the solution in the first instance 2 or 3 per cent too strong. (Even with smaller volumes it is often advisable to use this method where the substance to be weighed is deliquescent or its exact strength or purity unknown). A measured volume is then withdrawn and its exact normality determined —usually by two independent methods. The quantity of water required to be added to dilute the solution to standard strength is then readily calculated. Thus if 5000 ml. is made up and 250 ml. withdrawn for standardisation, and the solution is found to be 1.025 N, then the volume of water required to dilute to normal is 4750 x 0.025 = 118.75 ml.

Now suppose the original volume to have been 20ml. in error. Clearly the error in the quantity of water to be added would be 20 x 0.025 = 0·5 ml. and the proportionate error in the final solution is of the order of 1 in 10,000 which is well inside the error of an ordinary burette measurement. The calculation is of course readily generalised and it can easily be shown that if the original volume V is subject to error v, and the factor of the solution 1 + a (v being small in comparison with V and a being a small fraction) the final proportionate error is of the order av/V and as a v is a second-order quantity this will usually be negligible.

If av/V is of the order of a burette error—say 1 in 1,000—then less than the calculated quantity of water can be added, another measured quantity withdrawn for standardisation and the final dilution then calculated. It is of course advisable to test the final solution as a check.

As far as I know the above method is used in most laboratories where quantities of standard solution are made up, but I do not remember having seen the calculation of error as above.

I am, etc.,

41 Dowling Street, Dunedin. R. GARDNER.