JOURNAL OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY

VOL. 22. No. 1

FEBRUARY - 1958.

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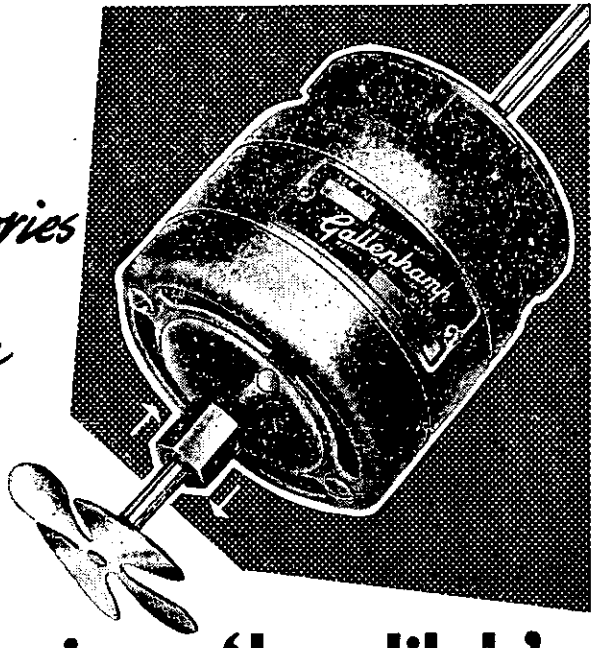

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PRESIDENT 1958: MR. C. R. BARNICOAT.

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PRESIDENT

President for 1958 is Dr. C. R. Barnicoat, Associate Professor and Head of the Biochemistry Department, Massey Agricultural College, Palmerston North. Dr. Barnicoat joined the staff of the Dominion Laboratory as a Professional Cadet in 1920. He graduated M.Sc. with first class honours in Organic Chemistry from Victoria University College in 1926, winning a Senior Scholarship in Chemistry and the Sir George Grey and the Jacob Josephs Scholarships. As a Commonwealth Fund Fellow, Dr. Barnicoat spent two years in the United States working in the Agricultural Biochemistry Department of the University of Minnesota, where he obtained his Ph.D. in 1938. The University of New Zealand conferred the degree of D.Sc. on him in 1952.

Dr. Barnicoat's research interests have covered a wide field but he has worked chiefly on problems of manufacture and preservation of New Zealand primary food products, especially problems of fat oxidation. In addition to his period in the United States, Dr. Barnicoat spent a year, 1930, at the Low Temperature Research Station, Cambridge, and has recently returned from a period of refresher leave spent mainly at the London Hospital Medical College.

Dr. Barnicoat established the Biochemistry Department at Massey Agricultural College in 1940. Since that time he has continued his research work on dairy products but has also been interested in a number of animal nutrition problems especially the wear of sheep's teeth. This latter investigation has led him into the field of histochemistry. During his last period of leave he concentrated particularly on acquiring specialised histochemical techniques and he regards this rapidly expanding field of research as a valuable connecting link between chemical and biological sciences.

Dr. Barnicoat was the first chairman of the Manawatu Branch of the Institute and for many years prior to the formation of that Branch had been responsible for organising regular meetings of chemists in private homes in Palmerston North. A Fellow of both the N.Z.I.C. and the R.I.C., he has taken an active part in our own Institute affairs and was Chairman of the N.Z. Section of the R.I.C. in 1950. We congratulate Dr. Barnicoat on his election and are assured of a pleasant and successful year under his leadership.

VICE-PRESIDENT

The Vice-President this year is Professor L. H. Briggs, Professor of Chemistry, University of Auckland. Professor Briggs is at present overseas on refresher leave but will be returning early this year.

SCIENCE IN INDUSTRY.

By W. A. JOINER,

Assistant Secretary and Deputy Secretary, Department of Scientific and Industrial Research, Wellington.

(Based on Presidential Address delivered to the Manawatu Branch, September, 1957.)

For my Presidential Address I have chosen to speak about science in industry. It is an old subject and one about which a great deal has been said, but, although it is unlikely that I can say anything new, it may be worthwhile for us to consider some aspects of applied science and its relation to industry in this country.

Before I go further I must make it clear that any opinions I may express are my own and I give them for what they are worth. They are not necessarily those of the Government or of my Department.

When I speak of industry it is to be understood that I refer only to manufacturing industry. I should hesitate to speak to this audience about science in our primary industries. The application of science in agriculture in New Zealand and its impressive contributions to increased and more economical production is something we can all be proud of, but I suspect there is much yet to be done and with every advance there will be new and more difficult problems to solve. In this respect I might mention our comparatively new primary industry of growing trees. Quite apart from their ultimate utilisation as timber or in other forms, I would be surprised if as time goes on the maintenance and improved productivity of our forests did not pose as many problems as the growing of those crops whose needs are more familiar to us.

Agriculture is generally thought of as the basic and most important activity of the New Zealander. This is a very natural point of view and one with which most of us would agree. After all, our primary industries provide us with all our essential foodstuffs, some of our clothing, and, if we include forestry, with most of our shelter—the three fundamental needs of man. In addition, the sale of the products of our soil provide the wherewithal to buy a multitude of other things—raw materials which we have not got and many kinds of goods which are necessary to maintain the standard of living which we have now attained.

Little wonder, therefore, that the climate of public opinion is more favourable to agricultural research than to applied science in other fields. With the very considerable research and extension services financed by the Government and the influence of the University Schools of Agriculture the farmer today can hardly be unaware of the benefits resulting from the application of the results of research.

There is, however, one thing which our primary industries cannot provide, and that is jobs for everyone. When all our service industries—transport, building, maintenance engineering, public administration and so on—have been provided for, work still needs to be found for many more people. This is true today and the need will be much greater in the future.

Dr. W. B. Sutch, in a paper presented at the A.N.Z.A.A.S. Conference in Dunedin this year, has drawn timely attention to the future problems which will result from our growing population brought about by natural increase and as a result of immigration which he estimates on a conservative basis. He estimates that by 1975 the population will have risen to over 3 million. By that time the total labour force will then have risen from something over 800,000 to 1,160,000. Allowing for an increase in the labour force for primary industry from 150,000 to 180,000 and for increased employment in service industries, etc., he concludes that 125,000 more people will have to find employment in manuufacturing industry. In other words, the number of those engaged in manufacturing industry will rise from 200,000 to 325,000—an increase of 62½ per cent. on the present labour force.

If we accept these figures, and the evidence for doing so looks sound, we can look forward to a very great development of our manufacturing industries over the next 20 years. A development of this kind is full of exciting possibilities. It poses urgent and challenging problems in economics, education, technology and in applied science. It is clear that to maintain or to improve our standard of living every encouragement must be given to manufacturing industries, especially to those which can by the nature of the markets for their products be operated economically and which can give the best return for the money spent on their raw materials. Those industries which can make use of indigenous raw materials should of course be developed by every possible means.

I think that we must expect the income derived from the sale of our primary products to be spent more and more on raw materials for manufacturing industry here to transform into consumer goods. It would be foolish to suppose that we should make everything we need here. As it is important to everyone that we should get the best possible return from the proceeds of our exports it would be useful if some way could be found of determining which industries should be encouraged. Here I find myself touching on the political and economic field in which I can claim no competence. The problem that we as chemists are concerned with is the efficiency and productivity of our manufacturing industries. Our ability to achieve good standards of quality and efficiency in industrial production bears a direct relationship to the extent to which we apply scientific methods and scientific knowledge. They

will not be achieved by astute business transactions or by appealing for protective tariffs and government subsidies. One might reasonably expect that in some fields of manufacturing our industries could earn by exports at least a proportion of the raw materials we are unable to supply from local sources. Even with the handicap of high living standards enjoyed here and with limited home markets some of our industries have been able to do just that.

These considerations lead me to say something about our indigenous resources. Plentiful supplies of fuel and power are essential for the development of manufacturing industries. A very interesting report has recently been published by the Government on the future development of sources of electric power. The cost is going to be great, but the need is essential and I hope that the expansion needed is not being estimated too conservatively and that parochial arguments about such things as the Cook Strait cable will not be allowed to interfere with the development of our power resources for the benefit of the country as a whole. Nevertheless, I think that special consideration should be given to the possibility of supplying power at specially low cost to encourage the establishment of electro-chemical industries or other large power consuming industries in the South Island. The attraction of more industry and population to the South Island would have a number of advantages and it is possible that profitable industries which this country could never otherwise look forward to, could be established. The recently discovered and very extensive deposits of aluminium ore in Northern Australia could well provide the basis of a large electrochemical industry in this country, if we are alert enough to seize the opportunity.

About 45 per cent. of the energy used in this country, apart from that derived from petroleum products used in motor transport, comes from coal. It should thus be a matter of some concern that coal has come to be regarded as an obsolescent kind of fuel. There is little hope for a long time of replacing it with electricity and if we are to continue to replace it with imported oil our hard won overseas funds will be so much the worse off. Apart from the fact that we must depend on coal for a significant part of our energy requirements, we cannot afford to allow the coal industry to decline so that we become largely dependent on imported fuels, the supply of which might be subject to conditions beyond our control. Moreover the coal industry gives work to between 4000 and 5000 men who are largely employed on a specialised job and it would be difficult to revive the industry if they were forced to disperse into other kinds of employment. If our coal mines were to be closed down or even if in some cases their output had to be seriously reduced, the result would be that much coal would be irretrievably lost.

Coal is a national asset which it would be folly to neglect, and we have considerable reserves of some kinds of good coal which, used intelligently, can provide a valuable source of energy for many years to come. I should like to emphasise the word " intelligently." Even in these enlightened days we still continue to waste a prodigious amount of coal. Something over 900,000 tons of coal are used annually in manufacturing industry with an efficiency of perhaps 50 per cent. Much of this coal is used for steam raising and in addition to better combustion efficiency, I think it can be assumed that considerable economies in the use of this steam would be possible, although I am unable to estimate what they would be. Nearly 800,000 tons of coal per year are consumed for domestic heating and for heating hotels and various public institutions and here the efficiency of use varies from as low as 10 per cent. for domestic fires up to perhaps 65 per cent. for the best large central heating installations. It has been estimated by Nicholson of the Dominion Laboratory in a recent report which will soon be published that 68 per cent. of the energy of the coal produced in this country is lost. It would of course be quite impossible to avoid a considerable part of this loss which in terms of quantity of coal amounts to over 1.7 million tons per year, but it is obvious that even a rather modest increase in efficiency of use would result in worthwhile savings.

In the United Kingdom the average saving in fuel used by industries which have used the National Industrial Fuel Efficiency Service is estimated at 15 per cent. An equivalent saving in industrial coal here would amount to nearly 140,000 tons per year. It should not be unreasonable to assume it possible to make a saving of this kind on coal used for all purposes as there is much scope for economies in domestic heating as well as in industrial use. If this were accomplished the annual saving would amount to something like 300,000 tons. It is not only coal that would be saved. The effort and cost of transporting such a quantity of material uselessly about the country is something we should not tolerate. Can anything be done about this? There is some evidence that the efficiency of use of coal has increased over the last 30 years, but the rate of progress has been very slow. As fuel costs are often small compared with other costs of production, there is perhaps not much incentive for industrial users to spend much effort in fuel economy. I would guess, however, that most of the 15 per cent. saving in the United Kingdom which I spoke of was brought about by following correct firing procedures and more effective use of boilers and that little capital expenditure was necessary.

In the domestic field the widespread use of better appliances would help and I believe a considerable advance in fuel economy would result from a much greater use of coal gas particularly in

closely populated areas. The devolpment in this country of the use of modern methods of total gasification as distinct from the traditional carbonisation holds possibilities for the future. Gas can be economically distributed over long distances and it is cheaper to pipe gas 100 miles than to transport an equivalent amount of useful heat as coal in railway wagons.

If someone should think that the achievement of all this fuel economy is going to affect adversely the mining and transport industries, let him remember our growing population and growing industrialisation. We shall need more coal anyway unless the coal industry gives up the battle against imported oil. More coal will soon be required to feed the new thermal electricity station near Mercer. When fully developed this station will consume nearly as much coal as is now needed to supply the whole domestic market, but it will not be a very economical way of using our coal resources. The establishment of an iron and steel industry based on the use of titaniferous iron-sands would call for considerable quantities of coal.

Toynbee at the Dominion Laboratory has been examining the possibilities of nitric acid production from coal and atmospheric nitrogen and Siemon and Hagyard at Canterbury College have been studying the requirements of a carbide industry. Both these need coal. If we should ever need large quantities of nitrogenous fertilisers we may be able to choose between Hagyard's Calcium Cyanamide and Toynbee's Ammonium Nitrate. Whether industries of this kind can ever be developed here it is yet too soon to say, but it is a healthy sign that our chemical engineers are thinking in this way. If one or two of the heavier basic chemical industries can be established the way is open for others, perhaps in the fine chemical or synthetic field. From the point of view of its value other than as a source of heat, coal is worth conserving by efficient use.

I have spoken at some length about the use of coal because there is some danger, in these times of rapid advances in the application of nuclear energy, of our losing sight of the important and basic part that coal must play in the development of industry.

What should be the role of the Governemnt in relation to research and development in the manufacturing industries? I have referred to the valuable results of agricultural research and extension services which are practically wholly financed by the Government. Because of the importance of our primary industries to the well-being of the whole community, I regard this kind of expenditure as fully justified, and I am sure that Government support of an expanding programme of agricultural research would be entirely justified by the results obtained.

When we turn to the manufacturing industries we find the position to be entirely different. We find that there is no comparable State contribution for research and development and where the State does contribute to the solution of problems in the manufacturing industry the manufacturer must pay at least half the cost involved. In 1956 Government expenditure on agricultural research and technical services amounted to about £1,322,000 whereas the corresponding figure for industrial research and aid to manufacturing industries was of the order of £79,000 (Government contributions to Dairy Research Institute and Meat Research Institute have been omitted from both figures).

From a national point of view this state of affairs needs to be closely examined as our prosperity is becoming more and more dependent on healthy manufacturing industries.

The organisation of scientific aid for the manufacturer is probably a more complicated problem than that of helping the farmer because of the diversity of manufacturing industry. Because there is continuing research going on into common problems of the farmer, because there is an active extension and demonstration service helping him to apply the results of the research laboratories, his difficulties are foreseen or at least he has somewhere to turn for assistance and advice. There is as yet no comparable organisation for the manufacturer. I doubt whether there could be anything exactly similar for the manufacturer, but even if it were possible, I am not at all sure that I would like to see the same kind of organisation for the manufacturer as exists for the farmer. I often think that those who directly benefit from research or applied science, whether they be farmers or manufacturers, appreciate its value more if they contribute directly to its cost.

The growing importance of manufacturing industry in the national economy demands that ways and means must be found for greater efforts to foster and encourage industrial research. I do not wish to give the impression that nothing has been done or to belittle the co-operative work of industry and the Government going on now, but I think there is need for more to be done. In establishing the D.S.I.R. the Government as long ago as 1926 recognised the importance of applied science in manufacturing industry. The broad policy of the D.S.I.R. is to encourage the use of scientific techniques in industry, to help raise the productivity of industry and the quality of its manufactures by the application of the results of scientific research. The D.S.I.R. has implemented this policy in a number of ways—by encouraging the establishment of research associations, whereby the cost of industrial research is shared jointly by a group of industrial firms and the Government, by undertaking industrial work in its laboratories, by giving technical advice and by disseminating technical information.

Within the first three years of the Department's existence, i.e., before 1930, three research associations were established—the Dairy Research Institute, the Leather Research Association and the Wheat Research Institute. There are now eight industrial research associations serving the dairy, meat, leather and shoe, laundry and drycleaning, pottery and ceramics, fertiliser, woollen manufacturing and wool scouring, flour milling and baking industries. All except the Wheat Research Institute are now independent incorporated organisations responsible for their research programmes and the management of their laboratories.

Some idea of the effort of the research associations may be gained from the figures, to the nearest £1000, for their total expenditure over the years since their establishment. Roughly half has been contributed by the Government through the D.S.I.R.

Leather and Shoe Research Assn.	1928	—	£83,000
Woollen Mills Research Assn.	1937	—	£86,000
Pottery and Ceramics Research Assn.	1945	—	£65,000
Fertiliser Manufacturers' Research Assn.	1947	—	£60,000
Laundry and Drycleaning Institute	1947	—	£33,000
Dairy Research Institute	1926	—	£716,000

Until a few years ago the research associations were financed on the basis of £1 of Government Grant for each £1 contributed by industry. The arrangement now is that the Government contributes £1 for £1 up to an agreed maximum sum for each research association and that thereafter the Government contributes £1 for every additional £2 contributed by industry.

The research associations with the largest incomes are those connected with primary industry, viz., the Dairy Research Institute and the new Meat Industry Research Institute with annual incomes of £65,000 and £40,000 respectively. The incomes for the others vary from £9000 to £14,000. The industrial contributions for the Dairy Research Institute and the Meat Industry Research Institute are provided by the Dairy Board and the Meat Producers' Board and the Freezing Companies respectively. Those for the other associations are subscribed by member firms on a basis appropriate to the industry and to the size of the industrial units and vary from several hundred pounds per year to a few pounds for individual firms.

Some of the associations have their laboratories alongside D.S.I.R. establishments and as a result have access to libraries and facilities which they could not afford themselves. The D.S.I.R. is always pleased to help in this way and the close personal rela-

tions with workers in other fields are of value in overcoming the feeling of isolation which might be experienced by the staff of the smaller research associations.

Experience has demonstrated the value of the research associations as an effective means of assisting industries to solve their technical problems and keep abreast of new process developments, but, what is also important, they have helped those engaged in industry to appreciate the value of applied science and to realise that its greatest benefits can come only when it is accepted as a permanent aid to better and increased production.

The kind of work done by the research associations varies with the technological state of their industries. Where industrial units have no technical or scientific staff it is necessary for a time to encourage members to institute some measure of technical control, for until that is done they are unable to take advantage of new developments or the results of applied research. Where firms have technical staff the research associations are able to deal with more fundamental problems and I think in some respects that firms in the latter category attain greater benefits from their research associations than do those less technically developed. Nevertheless, the immediate results obtained by the introduction of even simple forms of technical process control are well worth while and should encourage members to do more for themselves leaving the more difficult tasks of research and development to their research associations. It is heartening to see the enthusiasm of many of the members for the work of their research associations when their laboratories have been established and their work is under way.

I think that some of our research associations were established with inadequate financial provision and although their incomes have risen, largely because of changes in the value of money, I believe that, in some instances, more generous support from industry, carrying with it greater Government contribution, would be fully justified. Even a modest increase in income would enable some of the smaller associations to do still more effective work for their industries and thus yield a more than proprtionate increase in useful results.

Although the number of research associations which can be formed is limited at the present stage of our industrial development, I believe that even now there are a number of industries which would benefit from having them. I have in mind such industries as those dealing with concrete and cement products, forest products, and the metal working industries including foundries and metal fabricating works. A great deal of our manufacturing industry is concerned with the transformation of metal raw materials into a wide variety of finished products. The size and importance of

this industry should enable it to support, at reasonable cost to its members, a really good research association which could deal with all aspects of ferrous and non-ferrous processing including casting, pressing, fastening and welding, machining and electroplating.

The support of research associations is only one of the ways in which the D.S.I.R. is assisting the manufacturer. The Auckland Industrial Development Laboratories (A.I.D.L.) were set up after the last war on the nucleus provided by the Auckland Technical Development Board which was formed during the war for defence development projects. The A.I.D.L. was given the specific task of assisting industry in the Auckland area. A similar war-time organisation in Christchurch became the Canterbury College Industrial Development Department (C.C.I.D.D.) which is the responsibility of Canterbury University College, but which receives financial support from the D.S.I.R. In its early years of existence the A.I.D.L. undertook for industry a wide variety of testing and service jobs in the fields of physics and engineering, but as firms have become better able to deal with this kind of work the A.I.D.L. have concentrated their efforts on the more difficult and longer term research and development work. The Laboratories have encouraged the formation of associations of manufacturers to sponsor technical advisory services and investigations and have been successful in forming foundry, fuel user, and instrumentation groups, with encouraging results.

During the War a rapid expansion of the Dominion Physical Laboratory (D.P.L.) took place and the Laboratory established wide contacts with industry. In subsequent years D.P.L. continued to do a good deal of industrial work, but the amount of this kind of work is now considerably less than formerly.

The Dominion Laboratory also undertakes work for industry, but as there are several private consultants in the field of industrial chemistry, this Laboratory has in general followed a policy of not doing work which these consultants are able to do. A little over five years ago the Dominion Laboratory, in conjunction with the Bacon Curers' Association, undertook a research project for the industry. The Association agreed to pay approximately half the cost of providing a research officer for a period of three years. At the end of this time the arrangement was renewed for a further period and it is pleasing to know that the work being done is appreciated by the industry.

During the War and immediately after it, some industries had need of the services of the D.S.I.R. laboratories and were encouraged to make use of the facilities available. The result was that a good many service jobs were done for industry on a basis of full or part payment for the work. Work of this

kind has greatly diminished as industry, in some cases with the encouragement of the D.S.I.R., has provided its own facilities for special jobs and for testing work.

It is sometimes thought that one way to stimulate an industry to make use of scientific methods is to do ad hoc jobs for it and in this way gain the confidence of those who are not convinced of the need for scientific aids as a permanent part of their production methods. There is something to be said for this opinion and for the D.S.I.R. to undertake work with this object in view, but it needs to be done judiciously. The practice is fraught with some danger and there is a good deal of evidence that some firms are inclined to look to the D.S.I.R. for the solution of difficulties which would not have arisen if even simple technical control methods had been in use. Common examples of this kind of thing are the use of unsuitable metals or alloys for castings, faulty design leading to corrosion, failure to control electro-plating baths. Some manufacturers tend to try all kinds of expedients before asking assistance with the result that they expect an immediate answer to avoid further hold-up in production and preferably an answer that will allow them to get by for the time being. Jobs of this kind are not encouraging to the staffs of our laboratories, but on the other hand there is genuine satisfaction to be had in helping in the solution of industrial problems when there is a real desire on the part of the manufacturer to improve production or quality.

The D.S.I.R. assists industry in yet another way by providing a service of technical information. It has at Head Office a Technical Information Officer whose task it is to attempt to answer some of the numerous enquiries made to the Department. He deals with between 500 and 600 enquiries a year about half of which are from manufacturers. When he is unable to answer technical questions from the literature and data immediately available to him he refers the enquiries to an apropriate Branch of the Department or seeks its advice to enable him to give a satisfactory answer. Many enquiries from industry go directly to D.S.I.R. Branches and the A.I.D.L. have an information officer who deals with enquiries in the Auckland area.

The D.S.I.R. colaborates with the Department of Industries and Commerce in the production of the Industrial Bulletin which is issued every two months. The Bulletin contains technical abstracts, selected articles on technical subjects and the D.S.I.R. section often contains brief notices of work in its laboratories which is likely to be of interest to manufacturers.

The pattern of Government particpation in industrial research in this country is broadly similar to that in the United Kingdom, other Commonwealth countries, and in some European countries.

Of course there are very great differences in scale and scope. In most countries one notable difference from the kind of organisation here and in the U.K. is that the main Government agency for scientific research is not a Government Department. It is usually a State supported organisation responsible to a Minister, but controlled by a Research Council. This is the kind of organisation in Australia, South Africa, Canada and India and in some European countries. I recently had the opportunity of having a brief look at the organisations for industrial research in the United Kingdom, Canada, Norway, Holland and Germany. In all these countries the problems are similar to our own. The research association scheme which has become so important in British industry and which we have adopted in this country has not been so actively pursued in the other countries I have mentioned although there are variations of it in Norway and Holland. In these countries there are central Research Councils which allocate funds provided by their Governments to research institutes for different industries. Some of these institutes may be wholly supported in this way whilst others may be almost wholly supported by their own industries. In Canada, much of the industrial research work is done by the provincial Research Councils which receive grants from the National Research Council, their own provincial governments and contributions from industry for special research projects.

In many of the scientific institutions which I visited I sensed a very keen enthusiasm for the application of science in industry. This enthusiasm was shared by administrators, by those engaged on fundamental research and by technologists. It was not merely the interest of the scientist in his own work, which is common enough among scientists anywhere. It seemed to be engendered by a zeal for the progress of industry and a recognition of the responsibility of the scientist to see that the results of his work were understood and applied. This is the kind of enthusiasm which we in New Zealand need too if our industries are to progress as they should.

Science to many of us is a way of life—something worthy in itself of our best efforts and devotion—but let us not ignore or belittle its practical and social values. Many of the world's greatest scientists and the men who have been leaders in our own science of chemistry have been concerned with its practical use and have received inspiration from working on practical problems. Sir William Hardy once wrote to Sir Henry Tizard—"You know this applied science is just as interesting as pure science and what's more it's a damned sight more difficult."

The application of science can only result from the joint action of scientists and those responsible for the control and management of industry. The latter are more often than not unaware of the value to them of applied science. It is a common-place to say that

today our whole lives are influenced by scientific progress, but I fear that science is still looked upon too much as something apart from everyday life, some kind of esoteric study which cannot be comprehended except by the specialist. How often are we amazed at the ignorance of those who stoutly proclaim that science is a waste of time if you want to get practical results? How often have we been embarrassed by the faith of those who think that scientists can solve all their problems? The spreading of an appreciation of science, what it is and what it can do for our material welfare is something that fundamentally concerns our educationists, but we also have a responsibility and it is something in which our own Institute might well take an increasing interest.

In what I have said I have drawn attention to the inevitable expansion of manufacturing industries in this country as a result of increasing population. If we are to maintain even our present good standard of living it is essential that such industry be built up on sound technology founded on applied science. To-day there can be no other way to success.

If it is essential to ensure that our industries are operated as efficiently as possible it is equally essential that we must avoid economic waste. Perhaps efficiency and avoidance of waste are really the same thing, but I think we need to be sure that we look at them together.

I have spoken of the need to provide industry's basic requirement—fuel and power—and of the need to conserve, by intelligent and efficient use, our resources of coal. Coal is now and must remain for some time to come one of our most important energy sources. It may well form the basis of some important industries of the future which in time may open the way for the growth and expansion of chemical industry in this country. Perhaps we can look forward to the time when raw coal as a source of heat for industry and for the domestic consumer will be regarded as an anachronism. Today we see the gas industry at the cross-roads. Now, and I hope not too late, it is realised that we cannot do without it. If the industry is to be regarded as something we must put up with until we have greatly extended our hydro-electric works or applied the latest developments in nuclear reactors, it will not play its full part in our national economy and it will be less and less able to pay its own way. Such a valuable industry is worthy of a better future than that. It will need courage and enterprise in those responsible for its destiny, a new look at gas production techniques, and the reshaping of public opinion which has too long been allowed to regard gas as old-fashioned.

A healthy manufacturing industry is the concern of everyone and therefore of the Government. I have the impression that here more than in many other countries, industry, both primary and manufacturing, looks to the Government for a lead. I believe that

a clear and settled policy about the development of industry provides a stimulus for sound healthy growth. Governments elsewhere are realising that the prosperity of their countries depends on the application of science in industry. In this country the Government has realised this in the relation of science to agriculture by providing most of the scientific research, aids and service, which have undoubtedly contributed greatly to the increase in production of our primary industries. Here, too, the Government has done worthwhile work in encouraging co-operative research for some of our manufacturing industries, but much more needs to be done if the future is to be safeguarded. More manufacturers must be made aware that applied science is not just something that can be called in to help when there is trouble, but that its very great benefits can only be reaped when it is treated as an integral part of production technique. Many of us have regarded our country's economy as almost entirely agricultural without fully appreciating the need for thriving manufacturing industries. We must be willing to revise our views. The time is short and the need is pressing.

WOMEN IN CHEMISTRY IN NEW ZEALAND.

By ELSA B. KIDSON,

Senior Chemist, Soil Bureau, D.S.I.R.;
(Seconded Cawthron Institute, Nelson).

(Based on Chairman's Address, New Zealand Section, Royal Institute of Chemistry, delivered at Joint Institutes of Chemistry Conference, Christchurch, August, 1957.)

I wish to express my appreciation of the honour of being the first woman chairman of the New Zealand Section of the Royal Institute of Chemistry, realising that my election was a gesture of courtesy to the women members of the Section. I have chosen my title with this in view, feeling that the time has come to put on record the achievements of women chemists in New Zealand and to assess their possible role in the scientific development of this country.

New Zealand has been in some directions a progressive and enlightened country where women's status is concerned. In 1893 she gave women full and equal franchise, and was the first country in the world to do so. It was not till after the First World War that the battle for the vote on equal footing with men was won in Britain and most European countries, and even in the U.S.A.

There appears to be nothing in the original charter of the University of New Zealand excluding women from qualifying for degrees; so it is to be presumed that the University of New Zealand at least in principle opened its doors to them from the beginning. It is certain that Canterbury College, founded in 1873, produced in 1877 the first woman to qualify for the degree of B.A. in the British Empire. This was Kate M. Edger, afterwards Mrs. Evans, the first headmistress of Nelson Girls' College. Perhaps Miss Edger may also rank as the first woman chemist, as she took first year Chemistry, though it is extremely unlikely that she used it in her teaching career. That she had a scientific bent is borne out by the fact that she took Mathematics to her final year, and in 1876 was a Senior Scholar in both Mathematics and Latin. Hers was one of the first two Senior Scholarships awarded. She took the degree of M.A. some years later. It is interesting to find that this first blue-stocking, addressing a prize-giving of the Christchurch Girls' High School some 40 years later, chose as her subject, feminine charm, its desirability and uses. In 1881 Helen Connon whose memorial is to be seen in the Hall of this University had the distinction of being the first woman in the British Empire to receive the degree of M.A. with Honours.

While N.Z. women in the years to follow graduated in increasing numbers, those in many other countries were not so privileged. In 1911, when the Home Science School was founded at Otago University, two highly qualified women staff members, one from Girton and the other from Newnham were listed without degrees. The Lecturer in Chemistry was Miss G. H. Rawson afterwards wife of Professor Benson of Otago University. Her academic qualifications read "Natural Science Tripos, Newnham. Post Graduate Course in Home Science and Economics, King's College for Women."

In the early days of the University of New Zealand there was no science faculty, though science subjects could be taken for an Arts degree. It was not until 1883 that a special amendment to the Charter enabled the degrees of B.Sc. and D.Sc. to be conferred. The M.Sc. to correspond with the M.A. was not instituted until 1905. Early Bachelors of Science could qualify for B.Sc. with Honours in the year after graduation.

The following brief history of New Zealand women in chemistry has been based mostly on the Honours lists of the University.

The first men to take Honours in Chemistry were two Canterbury students under Professor Bickerton in 1880. Their subject was Chemistry and Experimental Physics (Electricity and Magnetism). Considering that university education for women was in

its infancy, and science was not supposed to be a feminine subject, it is interesting to find two women with Honours in Chemistry as early as 1889. These two pioneers both belonged to Otago. They were Isabella Cecilia Jane Ker Duncan, and Isabella McLandress. Two years later, in 1891, another woman took Honours in Chemistry at Otago. This was Catherine Ferguson. All three had 3rd Class Honours which was more of an achievement than might appear on the surface, as it is almost certain that there was no school preparation for such a subject. Isabella Duncan had been Dux of Otago Girls' High School in 1882 and Isabella McLandress had been Dux of the same school in 1884. Isabella Duncan became Mrs. Cochran and I have been unsuccessful in obtaining further details of her life. Isabella McLandress became a teacher and is known to have taught at Napier Girls' High School and other North Island Schools in the early years of the century. Catherine Ferguson was appointed Principal of Waitaki Girls' High School in 1893 at the age of 27 and held this position till she retired 26 years later. She did not teach Chemistry, as nothing of the sort was taught till 1915, and then only Home Science. She did apply to have science taught in 1909 and Botany became a subject for Matriculation. It was as a brilliant and inspiring teacher of English, particularly English Literature that Miss Ferguson is remembered, her chemistry qualifications unknown or forgotten.

In the year that Catherine Ferguson took Honours in Chemistry (1891) there entered the University, Emily Hancock Siedeberg, the first woman to graduate from the Medical School in Otago, qualifying for the degrees of M.B., Ch.B. in 1896 and B.Sc. in 1901. She is still living in Dunedin where she is known by her married name of McKinnon and she has been able to comply with a request for some details of her career on which I have based the following brief account. I make no apologies for digressing here. I feel that some tribute is due from the professional women of today to those who forced down the barriers of prejudice against women in the professions.

Emily Siedeberg grew up in a period when most women were utterly dependent on their fathers or husbands or brothers for their daily bread, their shelter and their clothing. The burden of female dependents could be a heavy one for the men, and for the single women the status of poor relation must have often been humiliating and degrading. The late 19th century saw the beginning of the struggle for the right of women to lead independent and useful lives. Miss Siedeberg's father was responsible for her career. When she was 10 years old he made up his mind that she should be a doctor, and she grew up with the idea and became inspired by it. In 1891 she applied for admission to the

Medical School and to the Hospital, thereby provoking much discussion and controversy. "Can a woman who pries into the intricacies of the human frame with all the ghastly proceedings attendant on the acquisition of such knowledge remain the delicate and refined creature which we compare to an angel?" asks a writer in the University Review of June 1891.

Having sufficient singleness of purpose to cope with difficulties and prejudice, and behaving with prudence and decorum she passed successfully through the Medical School without serious untoward incidents, life being made more pleasant by a second woman medical student, Margaret Cruickshank, who enrolled in 1892. After graduation she had some further training in Ireland and Germany and returned to a private practice and a very difficult but finally successful struggle against prejudice. She later held a number of important appointments, including that of Medical Superintendent of St. Helen's Maternity Hospital, Dunedin, from 1905 to 1938. She has to her credit a long period of active life of service to the community, and has held executive office in many organisations concerned with social welfare and also with cultural activities. Her services to the community have been recognised by a number of honours including a C.B.E.

After Catherine Ferguson in 1891 no more women appeared in the Chemistry Honours Lists until Marion K. Wilson in 1902. A student of Professor Easterfield at Victoria College, she made history in that she was not only the first woman to win a Senior Scholarship in Chemistry, but the first Senior Scholar at Victoria College, the last of the Colleges to be established (1897). She is known to have taught at a number of schools in the Wellington district. Four years after Miss Wilson, in 1906, Victoria College produced two more woman graduates in Chemistry, Anastasia I. Slowey, and Clara M. Taylor. Miss Slowey tells me she abandoned chemistry after leaving Victoria College, though she was awarded a scholarship for further research work. She taught secondary classes at a district high school for two years and then entered the Sisters of Mercy, South Dunedin. She obtained diplomas in Pianoforte (L.R.A.M.) and Speech (F.T.C.L.). She is now Sister M. Philip at the Convent of Mercy, Winton, where she teaches music.

Clara Taylor of whose ability Professor Easterfield had a high opinion belonged to a gifted family which also produced a woman doctor and a woman lawyer. She received her secondary education at a small country school, Stratford District High School, having won an Education Board Scholarship and a Queen's Scholarship. The latter provided not only 2 years at a secondary school, but 3 years at Victoria College. At secondary school she learnt only a little very elementary chemistry and it was doubtless the

excellent teaching and enthusiasm of Professor Easterfield which were responsible for her decision to specialise in Chemistry. She later won a Sir George Grey Scholarship, and, after graduation was given a government grant for research in organic chemistry with Easterfield. In 1910, having been awarded a free P. and O. passage to England, she went to study with Pope at Cambridge. During the period 1903-1913 there appeared in print 8 papers of which she was sole or part author. A shortage of openings for women in chemical research and a growing demand for science teachers probably shaped her subsequent career. The fact that in 1912 she was appointed chief science mistress at St. Paul's Girls' School in London speaks for itself. This school has almost as high a standing as the famous boys' school of St. Paul's, though it is some centuries younger. It has the best of everything and at present has laboratory assistants to wait hand and foot on its science teachers. In 1921 she was appointed head mistress of the Northampton School for Girls and from 1926 till 1940 was head mistress of the Redland High School in Bristol. She published two books, the first in 1923 on "The Discovery of the Nature of the Air and of its Changes during Breathing," and the second in 1930 in collaboration with her sister, Dr. P. K. Thomas on "Elementary Chemistry for Students of Hygiene and Housecraft." She died in 1940 at the early age of 55. She was New Zealand's first woman research chemist, and for many years afterwards no others followed in her footsteps.

In 1909 Mary R. Barkas, also a student of Professor Easterfield took Honours in Chemistry, the first woman to do so for the degree of Master of Science instead of Master of Arts. She had been awarded a Senior Scholarship in German in 1908. Later she qualified in Medicine and became a doctor. After Mary Barkas there was a gap of 13 years until Vera B. Reader of Victoria College in 1923. Her New Zealand M.Sc. was followed by a D.Phil. at Oxford and several years work as a biochemist. She married another biochemist, Dr. Ernest Walker ,and when her children were very young she led an entirely domestic life. Seeking an outlet for her abundant energy, she then studied medicine, qualifying and working as a general practitioner during the years of the last war. The death of her husband in 1943 left her with the sole responsibility for the education of her children and she continued in the profession of medicine, specialising in the treatment of allergies which, she claims, requires a knowledge of Biochemistry and Psychology as well as Medicine. She is now of some reputation in this sphere of work and recently read a paper on allergies of the eye to a conference of allergists in St. Louis. Though she works under the name of Dr. Vera Walker, she is now the wife of a research chemist, Dr. John C. Smith, formerly of Wellington.

In 1924 Victoria College produced the first woman to gain First Class Honours in Chemistry. This was Miriam M. Herrick, M.A., who became Senior Science Mistress at Wellington East Girls' College and on retirement joined the Head Office Staff of the Department of Scientific and Industrial Research.

In 1926 two women qualified, one from Canterbury College and one from Victoria College. The latter, Alice M. Copping was for a number of years on the staff of the Lister Institute in London, associated with Dr. Harriette Chick who is famous for work on vitamins. Miss Copping's chief interest was the B group of vitamins. During the war she was concerned with work on wartime diets. For many years one of her duties was the abstracting of papers on Nutrition. She recently accepted an appointment as lecturer in a women's Home Science college attached to London University and is at present the holder of a Fulbright award for travel in the U.S.A. and study in the Department of Home Economics in the University of Connecticut.

A graduate of 1929, Ivy E. Arthur of Victoria College was later awarded a Sarah Ann Rhodes Scholarship at Otago, and taught Home Science at the Correspondence School before her marriage. In 1929, Moira M. Dennehy also of Victoria College qualified with First-Class Honours. A brilliant student, she had been the second woman to win a Senior Scholarship in Chemistry. After her Honours year she went abroad and was there awarded a Sarah Ann Rhodes Scholarship to continue her studies. She worked at the Rowett Research Institute and became a D.Sc. of the University of Aberdeen. It was war work in the Ministry of Economic Warfare and probably her ability as a linguist which shaped Dr. Dennehy's subsequent career, an unusual and distinguished one in no way connected with her former profession of Chemistry. She is now an Assistant Secretary in the Board of Trade of the United Kingdom and is at present in the Commercial Relations and Export Department of the Ministry. She is concerned with the economic and commercial relations of the U.K. with Western European countries particularly Germany and France and with exports to those areas. She is in charge of two branches, one of which deals with Western Germany, France and French Overseas Territories and the other with matters relating to the European Customs Union and Free Trade Area and most work connected with the Organisation for European Economic Co-operation. She is a C.B.E.

In 1930 there appear the names of Dorothy J. Ellison and Annie E. Lorimer. Miss Ellison was a Senior Scholar in Chemistry. She became a science teacher and is listed in the N.Z.I.C. records as holding the position of Senior Science Mistress in a school in New South Wales. Miss Lorimer has had an interesting

and varied career, some of it chemical. She has evolved from chemist to the Wellington City Council, via war experience with the Y.W.C.A., to Officer in Charge of the Arohata Girls' Borstal in Wellington. She has been awarded the M.B.E.

To summarise to 1930, there have been 15 women with Honours in Chemistry. There were 120 men in the same period. Ten of the fifteen women were graduates of Victoria College, three of Otago University and two of Canterbury College. Three were Senior Scholars in Chemistry, and two gained First-Class Honours. Three qualified for local or overseas doctorates. At least seven were absorbed into the teaching profession and two became doctors. Some have had distinguished careers. Since 1930 there have been 43 women compared with 366 men. Of the 43, 10 gained First-Class Honours and a number were scholarship winners. Monica Lindsay of Otago in 1944 won a Post Graduate Scholarship in Science and Philippa Glasgow, of Canterbury was awarded a Royal Institution Science Research Scholarship in 1948. Auckland has produced a brilliant woman chemist in Dorothy J. Suter, with honours in 1951 and a Ph.D. two years later. She won a Senior Scholarship in Chemistry, the Sir George Grey Scholarship, the Student Memorial Scholarship and the Grace Phillips Memorial Bursary. At the post-graduate stage she was awarded a University Research Scholarship, a University Research Fellowship, and was offered an I.C.I. Post-Doctoral Fellowship. She is now at Girton, where she is a Tucker-Price Fellow of the College. Isobel M. Morice, now of the Fats Research Laboratory of the D.S.I.R. was awarded a Ph.D. of London University in 1945.

Three women with recent First-Class Honours are now taking a Ph.D. course; one, Joan Mary Anderson of Otago, the holder of an English Speaking Union Scholarship, is studying with Calvin in California.

In the brief account of the 1931-56 period I have not done justice to many who though not qualifying for First-Class Honours or Scholarships have proved themselves able chemists. I have had to omit any assessment of the numbers taking Chemistry to a lower stage than Honours, and I have not mentioned a group who took Chemistry to Stage III and afterwards qualified for a doctorate, either Ph.D. or D.Sc. overseas. To this group belong three women who worked in the laboratory of the Department of Agriculture with Miss B. W. Simpson of Rowett Research Institute, who was in New Zealand during the years 1929-30. Mainly owing to her influence they went overseas for further study and experience. They were Winsome W. Young, Ph.D., Ethelwyn M. Mason D.Sc., and Ruth Strand Ph.D. All three married and Dr. Ruth Strand, now Dr. Ruth Allcroft, is the only one to have continued in her profession. Always full of energy and keenly

interested in animal nutrition, she is now a Senior Research Officer of the staff of the Veterinary Laboratory of the United Kingdom Ministry of Agriculture at Weybridge. She visited New Zealand as a delegate to the International Grasslands Congress in 1956 and gave a paper on mineral deficiences and excesses in livestock to the New Zealand Grasslands Conference which followed.

Certain Home Science graduates may be classified as chemists. These are the women who have taken Nutrition for the degree of Master of Home Science which requires Chemistry to Stage III and is itself largely chemical. Otago University has produced a number of these in recent years, with a high proportion of First-Class Honours. Special mention should be made of Elizabeth G. Wilson, now Mrs. C. McLaughlan, a very able research worker engaged in vitamin work and dietary surveys at the Medical School in the nineteen thirties, and of Marion F. Harrison, the winner of a Post-Graduate Scholarship in Science in 1948, who carried out important research on fluorine in New Zealand teeth under the direction of Dr. Muriel Bell. She qualified for a Doctorate at Cambridge and married in England but is returning shortly to New Zealand with her husband. She is at present bringing up a young family, but the opinion has been expressed that she may return to Chemistry.

On the staff of the Home Science School as Lecturer in Chemistry is Dr. Helen M. S. Thomson, a Master of Home Science of the University of New Zealand and a Ph.D. in Textile Chemistry of Leeds University.

Two outstanding women scientists, both Fellows of the New Zealand Institute of Chemistry are nutritionists. Dr. Elizabeth Gregory is Professor of Home Science at Otago University and Dean of the Faculty of Home Science. She worked for a Ph.D. degree in the Biochemistry Department of University College, London, under Professor, later Sir Jack, Drummond. She is a foundation member of the Nutritional Research Committee of the New Zealand Medical Research Council and a member of the Dietitians Board of the New Zealand Department of Health. In 1940 she was given a visitor's grant of the Carnegie Corporation of New York.

The second is Dr. Muriel Bell, M.B., Ch.B. in 1922 and afterwards lecturer in Physiology at the Otago Medical School. In 1926 she was awarded the degree of M.D. for a thesis on the basic metabolic rate. At that time the William Gibson Scholarship was awarded every third year to one medical woman in the British Empire. In 1929 Dr. Bell received this honour. She held the scholarship for the maximum period of three years, working on nutritional research in London with Professor Drummond. After seven years' overseas experience she returned to

New Zealand and has become the foremost authority on nutrition in this country. She is at present Nutritionist to the New Zealand Department of Health and in addition Chairman of the Nutrition Research Committee of the Medical Research Council of New Zealand. In the latter capacity she directs research work done in the Nutrition Research Department of the Medical School in Dunedin. As Nutritionist to the Department of Health her duties are many and varied, including responsibility for the spread of propaganda on protective foods, testing of local sources of vitamins, advising the Government on rationing in wartime, and so on. She has initiated and supervised such work as surveys of vitamin content of New Zealand fruits, vegetables, cereals and fish products, of the fluorine content of New Zealand teeth, of Maori and pakeha diets and of the incidence of rickets. She was gazetted as a Public Analyst in 1950. She was the first woman Fellow of the Royal Society of New Zealand. In 1952 she was awarded a Research Fellowship of Harvard University and worked at the Harvard School of Public Health on radioactive isotope studies, thus gaining experience in the most important of modern techniques.

A little-known episode of her career is connected with the fact that she was called in to report on "bush sickness" of sheep at Mairoa in 1929. In an improvised laboratory she showed that the disease was not due to calcium defiiciency, a possibility she had been asked to investigate. She also showed that the accompanying aenemia was not due to iron defiiciency as had been believed: Later in 1935 she suggested to Dr. J. K. Dixon as he acknowledges in a paper that cobalt might be concern in bush-sickness in Morton Mains. Almost immediately the classical work of Filmer and Underwood appeared in print, showing that a similar disease in Western Australia could be cured by cobalt and leading to the control of the disease in this country by the use of cobalt salts.

Like many of the other professions in New Zealand, Chemistry has benefited in recent years by a leavening of overseas scientists with a background of deeper knowledge and experience and a wider culture than this young country has yet been able to develop. To this group belongs Dr. Rosa Stern, a Ph.D. of Vienna, for many years a valued member of the staff of the Wheat Research Institute and now in private practice. She is a past chairman of the Canterbury branch of the New Zealand Institute of Chemistry.

I hope this short account of the women chemists of New Zealand has spoken for itself. The numbers have been perhaps surprisingly small. For instance whereas 486 men appear in the Chemistry Honours lists up to 1956 there are only 59 women, some 11 per cent. of the total. There is no doubt that in the early days Arts were considered a more suitable sphere for women and

in Arts subjects, though the men were still very much in the majority, the proportion of women was much higher. But in recent years rather surprisingly the situation has not altered very much. There are comparatively few women training for chemistry.

Before about 1926 opportunities for women in chemistry were to all intents and purposes non-existent except very limited ones in the teaching of Home Science. Since that time the expansion of activities in both routine work and research in the Department of Agriculture, the establishment of the Department of Scientific and Industrial Research, rapid industrial expansion combined with a growing appreciation of the value of the chemist in industry, have combined to create a much increased demand for chemists including women chemists. There are at present good opportunities for interesting work and good salaries. That women are at present making only a very small contribution to the profession in this country is strikingly shown by the membership list of the New Zealand Institute of Chemistry and the New Zealand Section of the Royal Institute of Chemistry. In the 1954 list of fellows and associates, there are only 35 women out of a total of 495; some 7 per cent. Of these, 7 were apparently not working as chemists, leaving 28 of whom 10 were in Government laboratories, 7 in the universities, 5 in the teaching profession, 3 in industry, 2 in research associations or institutes, and 1 in private practice. Since then the situation has not altered much, and the total of women associates and fellows is still very low (34). There have been slight changes in type of employment, e.g., a few more women in industry.

It seems possible that the small number of women choosing to specialise in Chemistry may be partly due to the level of chemistry instruction in girls 'schools. The old subject, Home Science, in which the chemistry was negligible, has been abolished. Though Chemistry may be taught as a separate subject for School Certificates and is often so taught in boys' schools, instruction at this stage in girls' schools is usually supplied by the core subject General Science which includes elementary Chemistry, meant more to encourage an intelligent layman's interest in the science than to provide a preparation for a future chemist. It is, in fact, a general knowledge subject for the average pupil and inadequate for the scientifically gifted. The separate sciences are taught mainly in the 6th forms. Only big schools can provide teaching in more than one, and the choice usually depends on the staff available. Probably the most popular subject is Biology, a mixture of Botany and Zoology which is often well and enthusiastically taught. There are, however, some 1050 girls at present listed as being taught Chemistry, mostly at this post-School Certificate stage.

What the future will bring forth remains to be seen, but the key to the position is in the phrase " well and enthusiastically taught." The enthusiasm of a teacher for his subject is as important as his teaching of facts. Indifferent teaching not only produces a student ill-equipped for the university course, but fails to " sell " the subject to the pupil. Just what the level of instruction is in girls' schools I am not in a position to know. There are, and have been, I understand, some very good women teachers of Chemistry. Judging by the records of the University of New Zealand, women highly qualified to teach Chemistry must be very scarce indeed. Apparently the position even in boys' schools leaves much to be desired. For example, in one of the main centres only two teachers of Chemistry in boys' schools have Honours in Chemistry, one in a State school and one in a private school.

A Student Liaison Officer attributes the shortage of women chemists to lack of mathematics, lack of Chemistry teachers in girls' schools, reluctance of women scientists to become teachers, and to emphasis on the humanities rather than science in girls' schools. He is not alone in deploring the lack of preparation of science students in mathematics, even the men. This is a more common deficiency in women students as many women teachers are themselves the victims of poor mathematics teaching, lacking a basic understanding and enthusiasm for their subject and the power to impart both. Yet some women make first-class mathematicians, contrary to popular belief. In collecting information on women chemists from the pages of the University Calendar I have been impressed by the number of women with First-Class Honours and scholarships in both Mathematics and Physics. Some of these have returned to the schools but at present the Department of Scientific and Industrial Research and other organisations compete very successfully for mathematicians as well as physicists and chemists.

The need for the availability of sound preliminary training in Mathematics and Chemistry is stressed by an appreciation of the fact that these (and also Physics) are basic sciences for such careers as Medicine, Botany, Zoology, Entomology, Home Science. For instance some Chemistry is essential for Botany, and without Chemistry to a high standard one's choice of botanical study is seriously limited. The same applies to Entomology where Insect Physiology is an important science. Medicine involves Chemistry to about the standard of Stage I in the first year, as does Home Science.

The same problems exist in England and have been discussed by Mamie Oliver in the issue of the Journal of the Royal Institute of Chemistry for August 1955. She mentions that it is by no

means unusual for girls to go to boys' schools for their chemistry instruction, where more-qualified teachers and better facilities are usually available, and in many cases the boys make return visits for Biology.

An interesting recent development in New Zealand is the employment of male teachers for science instruction in some girls' schools formerly staffed only by women. Some of these men are retired teachers with considerable experience in chemistry teaching.

An opinion has been expressed by a former teacher that young graduates could profit by more instruction in how to teach both theoretical and practical chemistry and that the level of present chemistry teaching could be raised by more refresher courses, particularly in laboratory work which is often weak. Teachers with overseas experience have deplored the absence of laboratory assistants in New Zealand schools, believing that better use could be made of the science teachers available if such duties as the care and maintenance of apparatus and the setting up of experiments could be taken off their hands, and some help given in the supervision of large practical classes. Technical assistance of this type, common in European schools, might also help to make science teaching a more attractive career.

I feel myself unqualified to speak with any authority on the educational aspect of the subject, but it is obvious that if there are to be more women chemists something must be done to increase the number of well qualified teachers of chemistry and to arouse interest in the subject in girls' schools.

The choice of a career must in many cases be influenced by vocational guidance in the schools. A criticism has been made of vocational guidance in England that it has tended to direct girls into what have previously been regarded as peculiarly women's occupations, e.g., nursing, and has been inclined to work on a demand and supply basis so that the suitability of girls for more unusual occupations has been often disregarded. I have it on the best authority that this has not been so in New Zealand. Any girl anxious to enter an unusual profession has been assisted in every possible way, though, she may be warned if openings are very rare or non-existent in this country, e.g., in the Diplomatic Service. It may be pointed out, however, that the present information sheets on science careers (dated December, 1956) give a frightening if true picture of the qualities necessary for a scientist, and contain for example, the following:—" They do not receive very large monetary rewards for their labour, they have to work hard, often for long hours under difficult conditions, frustrations and disappointments may be many

and successes few in number, and their curiosity and love of science must carry them through." In discussing the prospects for scientists they state, " There is at present no shortage of scientists in New Zealand except in science teaching. It is probable, moreover, that this shortage will lessen within the next ten years, in which case competition for scientific posts will become keener." As a comment upon this assessment of the position in the teaching profession I quote a recent statement in the press. " Mr. R. A. Dickie, Principal of the Auckland Teacher's College placed before the Auckland Education Board figures which showed that out of 239 post-primary teachers now in training at the college, only 9 were in the mathematics group and 11 in science." We have reached the stage where the increasing demand for scientists in research and industry is being met at the expense of the teaching profession. What of the future?

It seems that for the enlistment of women into chemistry, more might be made of the openings for women graduates in skilled analytical work as members of teams or to assist some more qualified person in the conduct of research. It is in this training period, which nearly all research chemists must undergo, that the qualities of iniative, imagination, etc., of the potential research leader will become apparent. There is still interesting work for those who lack these somewhat rare qualities.

Apart from information supplied by the Vocational Guidance Officers, some more active propaganda in the schools is indicated. There is no doubt that less is known of the chemistry profession in girls' schools than of many other professions and occupations.

I have assumed, firstly that girls' schools could produce a higher proportion of Chemistry students, and secondly, that it is worth some effort to bring this state of affairs about. The questions must inevitably be asked—are there enough potentially able women scientists to warrant this effort; is science foreign to women and are women scientists merely freaks? It is my opinion that more women have a scientific bent than is realised. I put to you the opinion of Dame Caroline Haslett, a highly successful electrical engineer, that many so-called masculine or feminine mental attributes are not fundamentally masculine or feminine but are cultural rather than biological. Her argument is supported by quotations from a well-known anthropologist and from one of Britain's leading psychiatrists. To say that women do not have the physical strength of men is to state an undeniable biological truth. To lump them all together in any human activity beyond plain biological function is like the old classification of all women as bad drivers, a myth exploded by two world wars. Women vary greatly in intellectual capacity, initiative, originality and every other mental quality as do men. It is a widely held mistaken belief that women as a class are particularly fitted for monotonous

routine work requiring dexterity but no exercise of reasoning. Some women (and men also) may be of this type, with the attitude of the dumb blonde quoted by John R. Allen in a recent number of "Scottish Agriculture." "A girl's gotta go somewhere daytimes, and I've always got my private life to go home to." But few are likely to be prepared to make a life's work out of such routine even though they may carry it out with patience if occasion arises.

The effects of ingrained prejudice die hard even where women scientists have proved their worth. One common belief is that women make bad administrators, and some of them do, but so do some men. There have been some very good women administrators, e.g., some strikingly successful business executives in the U.S.A., and the fact that there are not more is partly due, I believe, to over-anxiousness, which is itself a relic of their former subservience. In the past men have often objected to working in subordinate positions to even the most able of women. If this is a genuine male characteristic nothing can be done about it except to provide female assistants for women scientists wherever possible. Thinking of the matriarchal systems of some Eastern countries one is led to suspect that this is merely a prejudice belonging to our Western tradition.

As a result of this attitude to women in administrative positions, and often, be it said, the understandable reluctance of the women themselves to take the responsibility, middle-aged women scientists are often seriously limited by inadequate help, and the need to carry out the routine work for their projects, routine just as tedious to them as to men of similar age and attainments. I have seen this happen overseas. It has hardly had time to happen here.

Without a doubt the most serious consideration in the training and employment of women chemists is not their ability but their probable loss to the profession on marriage. In a recent overseas journal the opinion was expressed that to train women chemists is wasteful and useless. This opinion is held in some circles in this country. It is a curious fact that it is held more in relation to the sciences than to the arts. Yet if it is wasteful to train women in science, it is wasteful to train them in anything but housework for the same reasons. A broader concept of education than this is needed, a concept where a quality of mind is as important as the ability to assist in the material progress of the country. Women (and men) of the past have fought for the right of women to develop their talents in whatever direction they may lie. A scientific training should help to develop a balanced judgment and the ability to weigh evidence, valuable qualities in man or woman. From the more practical point of view there are many applications of science

in the home. But more important is the influence of an educated woman on her children. It is no accident that children of former women teachers have done so well in the past. Home influence plays a considerable part in the development of the inherent abilities of the child. There is usually a tendency for a family tradition; for example, a scientific family background tends to produce scientists, a fact well-illustrated by the family histories of some of my audience.

Moreover, not all women marry. Some remain single from choice, perhaps unwilling to give up a career; others may be victims of war, of environment, of family circumstances or of some psychological trouble; some find themselves with the responsibility of aging parents or other dependents. From the point of view of both the individual and the community, these single women should be given the opportunity to lead a full and useful life in the type of work best suited to them.

It is a fact that most women expect to marry, but our economic structure is such that until they do, nearly all must earn a living, perhaps for some 5 or 6 years. Their reputation as contented routine workers has almost certainly resulted from the reactions of many to the apparently temporary nature of their employment. It is easy to put up with monotony if it is not going to last long. This feeling of impermanence may retard the development of inherent qualities of initiative and originality. But for some women this atittude is not possible. They are driven by a restless curiosity and a desire to see further and know more, an instinctive reaction to the job on hand, be it temporary or permanent.

Whatever their status, graduate or technician, women can give useful service during these pre-marriage years. Whether they need to be lost to the profession on marriage is another question.

As in other countries science must inevitably play an increasing part in the development of this country and much will depend on the quality and adequacy of its scientific personnel. Just what part women can play remains to be seen. That women scientists of ability will appear is certain. These are of value to the community and that they should be given every chance seems common sense. Whether they may return to the profession if they marry depends a great deal on how much their services are valued and to what extent ancillary services can be provided for them. Some will almost inevitably take up their work again. They are, however, handicapped in this country by lack of domestic labour and unless some way is found of supplying this want, married women in the professions cannot give their best service to the community. In countries like the U.S.A. and Britain, where shortage of scientists and technologists is already acute, married women are recognised as a potential source of much needed scientific personnel. In this year's May issue of a sober American journal,

"Engineering News Record," there is a report of a conference at the School of Engineering, Columbia University, to consider the education of girls for careers in science and engineering, one of a series to discuss remedies for the manpower shortages in these fields. Those taking part included psychologists, anthropologists, teachers, guidance counsellors, and representatives of industries which employ scientists and engineers. The main themes of the discussion were the untapped reserve especially among mothers of grown families, and the need to identify talented girls early and to awaken scientific curiosity.

The social pattern of life for an educated girl was defined as about 5 years of work before marriage, 10 years to set up a family and then a potential 25 to 30 years' career. At the time the last child is launched, according to a distinguished woman anthropologist, women develop a great burst of energy and ability, both mental and physical, and it drives husbands and families distracted unless an an outlet is found for working it off. Another speaker rated home influence high and an educated mother even higher in the influences behind successful scientists and engineers. The conference agreed that teachers and guidance counsellors should stop their wide current practice of discouraging girls from studying science and mathematics.

If married women are to be drawn again into the profession and given positions of responsibility, they must be prepared to so arrange matters, that they are not at the mercy of divided loyalties, ready to down tools at the first moment of domestic crisis. Nor is it advisable in a position of responsibility to overwork to the extent of trying to cope with the running of a house as well, particularly in this country where young children are not usually sent to boarding-school. Adequate provision must be made for the family, and domestic help appears to be almost a necessity. Where the job is easier, domestic labour-saving devices and family co-operation may be sufficient.

Whatever the position in research, there is no doubt that there is scope for married women in the schools where the shortage of science and mathematics teachers is now a matter of grave concern. Already many married women teachers have returned to their former employment. If ever the provision of laboratory assistants in schools should become Government policy, and one hopes it will, married women chemists desiring part-time less-exacting work should be able to give useful service here.

To those in administrative positions I make the plea that women scientists be treated in their spheres of work without prejudice as individuals, as diverse in character and ability as the other half of the human race. May I add the reminder that prejudice can usually be sensed, will usually be resented, and may lead to loss of efficiency and even to an aggressive attitude of self-defence.

In closing I wish to pay tribute to the late Sir Thomas Easterfield and Sir Theodore Rigg, both past Directors of the Cawthron Institute, under whose jurisdiction women scientists could work in an atmosphere of freedom and encouragement.

I acknowledge with gratitude my debt to the many who have assisted by supplying material for this address: To Professors of Chemistry and Mathematics, administrative staffs, and Liaison Officers of the University of New Zealand; teachers, librarians, vocational guidance officers, psychologists, botanists, members of the Federation of University Women, relatives of early women chemists, Dr. Emily Siedeberg McKinnon, the Trade Commissioner for the United Kingdom, and executive officers of both Royal and New Zealand Institutes of Chemistry.

ABOUT THE AUTHOR

Dr. E. B. KIDSON

Dr E. B. Kidson was born in Christchurch and educated at Nelson Girls' College where she won a Junior University Scholarship. She took a science course at Canterbury University College, qualifying for the degree of M.Sc. with honours in organic chemistry in 1926. In the previous year she had been awarded the Sir George Grey Scholarship and the Haydon Prize in Chemistry. After graduation she spent two years as demonstrator in chemistry at Canterbury College and later held appointments with the Department of Agriculture and the New Zealand Refrigerating Co. In 1931 she joined the chemical staff of the newly-formed New Zealand Soil Survey (later to become the Soil Bureau) which was at that time stationed at the Cawthron Institute. She has remained at the Cawthron Institute as a seconded officer of the Soil Bureau and during the past 26 years has worked mostly on cobalt in relation to bush-sickness, magnesium defiiciency of apples, vitamin C content of fruits, molybdenum in soils, and nutritional diseases of the tomato. In 1952 she was awarded a D.Sc. of the University of New Zealand on published papers, of which she is the sole or part author of some 30. She was overseas in 1937 and again in 1954, mostly at Rothamsted Experimental Station. At present she is engaged in a study of "Cloud" or "blotchy-ripening" of tomatoes using a water-culture technique. She was elected a Fellow of the New Zealand Institute of Chemistry in 1943 and of the Royal Institute of Chemistry in 1944.

BRANCH CHAIRMEN.

AUCKLAND BRANCH.

A. L. ODELL

Chairman of the Auckland Branch this year is Dr. Allan L. Odell, Senior Lecturer in Chemistry, University of Auckland. A graduate of Auckland University College, Dr. Odell completed his M.Sc. in 1942 carrying out alkaloid work with Dr. L. H. Briggs. He joined the staff of the Chemistry Department the following year and has been mainly associated with the teaching of advanced Inorganic Chemistry. He was responsible for the establishment of Magneto-Chemical and Radio-Chemical Research Laboratories and worked for some time on magnetic susceptiblities and exchange reactions of co-ordination compounds. During 1954-55 he worked in Professor C. K. Ingold's laboratory at University College, London under the direction of Dr. D. R. Llewellyn. After gaining his Ph.D. degree he returned to Auckland University College where he is now studying anomalies in the magnetic susceptibilities of nickel complexes and the kinetics of exchange reactions of co-ordination compounds of transition elements.

WAIKATO BRANCH.

Mr. D. F. Waters, Chairman of the Waikato Branch, was appointed as a cadet in the Department of Agriculture, under B. C. Aston, in 1924. He graduated B.Sc. from Victoria College in 1927 and M.Sc. in 1929. During the years 1926-36 he covered a wide range of analyses of agricultural interest — limes, fertilisers, plants and soils. In 1935-36 he was engaged in completing an iodine survey of N.Z. livestock, and since then has been mainly on administrative work. In 1939 he was transferred to control the chemical laboratory, Ruakura where some aspects of facial eczema research were handled, as well as bull fertility and animal feeding. In 1945 the Rukuhia Soil Research Station was established at Hamilton, and Mr. Waters was

D. F. WATERS

appointed as administrative officer in charge of the chemical laboratory. As such he was responsible for all service chemical work of the Extension Division covering fertiliser, plant, soil and miscellaneous analyses. In particular he has been associated with the organisation and development of the soil testing service for advisory purposes. Many of the ingenious contrivances for speeding up analyses on a mass-scale owe their origin to his inventive capacity.

MANAWATU AND WELLINGTON BRANCHES.

W. E. HARVEY

W. A. McGILLIVRAY

Both the Hon. General Secretary and the Editor are Branch Chairmen this year. The Secretary, Dr. W. E. Harvey, is Chairman of the Wellington Branch and the Editor, Dr. W. A. McGillivray, is Chairman of the Manawatu Branch. Biographical notes on both Dr. Harvey and Dr. McGillivray have appeared in recent issues of the Journal (J.N.Z.I.C. **21,** 3 (1957) and **19,** 11 (1955) respectively).

CONFERENCE 1958

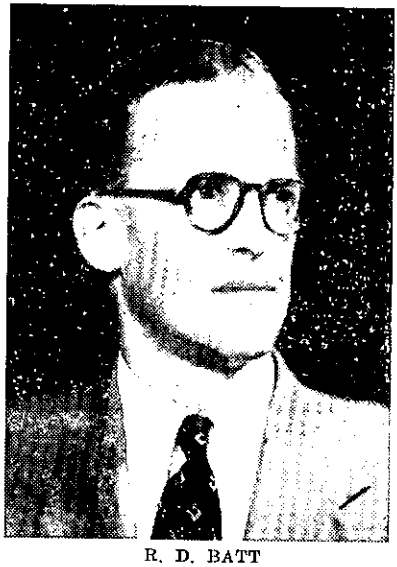
The 1958 Conference will be held at Hamilton on 27th, 28th and 29th August. Full details will appear in later issues of the Journal.

CANTERBURY BRANCH.

This year's Chairman of the Canterbury Branch, Mr. J. Vaughan, is Senior Lecturer in Organic Chemistry at the University of Canterbury. A biographical note appeared in the Journal (J.N.Z.I.C. **15,** 156 (1951)) at the time of the Younger Chemists International Project, sponsored by the American Chemical Society. He revisited the U.S.A. in 1955 as a Fulbright Research Scholar and a recipient of a Carnegie Travel Grant. Mr. Vaughan's research interests are mainly in organic reaction mechanisms and about half of his 20 published papers are the result of fruitful co-operation in this field with Professor J. Packer.

J. VAUGHAN

OTAGO BRANCH.



R. D. BATT

Dr. R. D. Batt, Chairman of the Otago Branch is Senior Lecturer in Biochemistry at the Medical School, University of Otago. A graduate of the University of Otago, Dr. Batt obtained his M.Sc. in 1945 after working on the fractionation of essential oils by a high efficiency column. He was also awarded the John Edmond Fellowship and completed his Ph.D. in Chemistry in 1947, the research work dealing with studies on the structures of sesquiterpenes including γ-curcumene. After a year as Assistant-Lecturer in Chemistry at the University of Otago, Dr. Batt was appointed to a Nuffield Demonstratorship in the Department of Biochemistry, Oxford University. He graduated B.A. in Physiology in 1950, D.Phil in Biochemistry in 1952, and returned to New Zealand via America on a Carnegie Travel Grant in 1953. Since returning to New Zealand Dr. Batt's research interests have centred on studies on the metabolism of pyrimidines and their derivatives by living cells and an interest in the general metabolism of the bacterial species *Norcardia corallina.* In 1953 work was initiated into an investigation of minor constituents of milk sponsored by the Nuffield Foundation.

NEWS AND NOTES.

AUCKLAND BRANCH:

Dr. D. R. Llewellyn arrived recently in Auckland to take up his appointment to one of the Chairs of Chemistry at the University of Auckland. His main interest is in the application of stable radio-isotopes in chemical problems and he plans to set up an isotope school at Auckland. Prior to taking up his present position, Professor Llewellyn was lecturer at University College, London. During the war he participated in work on the Atomic Energy Project in both the Clarendon Laboratory, Oxford, and the Cavendish Laboratory, Cambridge.

A two-day Conference was held in Auckland recently when members of the fertiliser industry and scientists from closely related Government Departments met to discuss technical problems at the New Zealand Fertiliser Manufacturers' Research Association Station at Otahuhu. Papers, ranging from methods of analysis of fertilisers to research in manufacturing problems, were contributed by several Institute members. The Conference, which was very successful, was the first of its kind to be held in New Zealand and is the result of a policy of close collaboration on technical problems within the industry now being achieved by the Research Association.

A recent visitor to Auckland was Dr. J. B. Brown on furlough from the Chemical Endrocrinology Research Unit at Edinburgh. Dr. Brown, who has been engaged latterly on problems connected with breast cancer after successful earlier work on oestrogens, had been invited to two conferences in North America and called at New Zealand on his return trip.

WAIKATO BRANCH:

Dr. W. G. Whittlestone is leaving Ruakura to take up a Readership in Dairy Husbandry, at the University of Sydney. He expects to devote most of his time to research along the lines he has pursued at Ruakura, with more emphasis on the fundamental approach.

Mr. K. J. McNaught has recently returned from overseas.

MANAWATU BRANCH:

The President of the Institute, Dr. C. R. Barnicoat, presented the I.C.I. Medal to the 1957 recipient, Dr. F. H. McDowall, at a social function arranged at Massey College recently by the Manawatu Branch. In addition to Branch members, a number of visitors were present including Mr. H. W. Johnston representing Imperial Chemical Industries (N.Z.) Ltd.

WELLINGTON BRANCH:

The Royal Agricultural Society of New Zealand has awarded its prize for research work in Soil Science to Dr. M. Fields of the Soil Bureau, D.S.I.R. Wellington. This is the first award of this prize which will be offered in successive years for contributions in the fields of plant science, agricultural economics, etc., and animal science. Earlier in the year the University of New Zealand conferred the degree of D.Sc. on Dr. Fields.

Mr. R. P. Hansen, who for the past six months has been visiting United Kingdom and American institutions engaged in work related to fats, has now returned to the Fats Research Laboratory, D.S.I.R., Wellington.

Mention was omitted earlier of the retirement of two senior members of the Dominion Laboratory staff. Mr. L. H. James retired from the position of Assistant Director in December, 1956 and Mr. J. J. S. Cornes retired from the position of Senior Chemist, Rocks, Minerals and Clays Section, in March 1957.

CANTERBURY BRANCH:

Mr. A. F. Wilson has completed his Ph.D. at Canterbury and has been awarded a United States National Science Foundation Post-Doctorate Fellowship. He will take up the Fellowship at the Florida State University where he will work with Professor J. Leffler on the mechanism of free radicle reactions.

SOME IMPRESSIONS OF THE 1957 CONFERENCE.

With plans for the 1958 Conference at Hamilton already well in hand, the following impressions of the 1957 Conference submitted by A. M. Kennedy, Dominion Physical Laboratory, D.S.I.R., Wellington, will be of interest particularly to the younger members.

Some time has elapsed since Conference; and, as I look back on the few days spent in Christchurch, my thoughts go out at least as much to the people I met and talked with, as to the material I heard presented at the formal sessions. A statement like this is, I suppose, pretty much of a commonplace; for this kind of reaction must be felt by most people who attend conferences. I emphasise it here if only because, without a social atmosphere of this kind, a conference would be a fairly dull affair, particularly for the younger scientists whose opportunities to meet men working in other fields are normally quite restricted. This year's Conference allowed considerable scope for renewing old friendships and making new contacts, not only during the leisurely tea-breaks but also at the pleasurably informal social function.

For the more formal side of the Conference, I felt that the opening symposium set a particularly good note. It seems that few chemists can work for long in any particular field without getting more or less involved with other branches of science or technology. This applies, perhaps, more particularly to work done in this country than overseas. At any rate, it was interesting to seee the way in which the remarks of the opening speakers were later amplified, as shown, for example, by the implications of biochemical action on the spontaneous ignition of baled wool—or the application of chemical engineering techniques to such diverse problems as the slip-casting of clay or the de-odorisation of cream.

Without attempting to cite individual lectures, I personally enjoyed Dr. Geissman's paper very much — not because I could honestly pretend to understand everything he talked about. But perhaps because he was able to replace with admiration some of the awe in which I have been accustomed to hold those scientists whose task it is to unravel the chemical structure of nature. The Conference Committee were fortunate in securing such an able speaker, for a lecture such as his could have been intolerably dull to a relative layman like myself.

To go over to the debit side, I felt that several of the papers were too long. I suppose that few speakers can fully retain the interest of an audience for more than about 30 minutes—and, indeed, an admirable lecture can be given in 15 minutes as was shown to us at Lincoln. Secondly, I thought that too often an attempt was made to squeeze too much material into the time allotted, thereby limiting the time available for discussion. Discussion of a paper can be valuable to the author as well as the audience; and if an overall period of, say, 45 minutes is to be allowed for a paper I feel that authors could well be asked to limit their presentation to 30 minutes only.

This criticism apart, I found the Conference as a whole most enjoyable; highlighted, of course, by the trip to Lincoln. A great deal of work must have gone into the preparation of the conducted tours around the College and the Crop Research Division, to make them flow so smoothly. The organisers could feel well rewarded by the way in which the outing was obviously enjoyed by all; and by the certainty that they have established a difficult goal for future Conference Committees to aim at when planning their excursions.

GENERAL MEETING.

ABRIDGED MINUTES OF A GENERAL MEETING OF MEMBERS OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY HELD AT CANTERBURY UNIVERSITY COLLEGE, CHRISTCHURCH, ON TUESDAY, 27th AUGUST 1957.

PRESENT:

Mr. W. A. Joiner, President (in the Chair), Dr. W. E. Harvey, Hon. General Secretary, and approximately 50 members.

PRESIDENTIAL REMARKS:

The President briefly reviewed the highlights of the year's activities, mentioning in particular the appointment of Mr. Rollo as Registrar and the negotiations at present being carried on with the Education Department re technician training. With the death of Dr. R. O. Page, the Institute and the profession of chemistry have lost one of their outstanding figures.

PRIZES:

The President announced that the Council had awarded prizes for 1957 as follows:—

I.C.I. Prize: Dr. F. H. McDowall, Dairy Research Institute, Palmerston North for his contributions to the chemistry and practice of butter making.

Morcom Green, Edwards Prize: Mr. T. Marshall, Dominion Laboratory Wellington for his work on corrosion problems associated with the Geothermal power development.

SUB-COMMITTEES OF COUNCIL:

The Chairman remarked briefly on the activities of the various subcommittees of Council, pointing out the debt which the Institute owes to the many members who devote considerable time and energy to these tasks.

JOURNAL:

The Editor submitted a brief report on the state of the Journal mentioning in particular the work of Mr. N. T. Clare and members of the Waikato Branch in compiling the index which was published at the end of 1956. Copy is now coming forward reasonably well. A brief general discussion ensued, dealing mainly with the most suitable type of material for the journal.

AUCKLAND DAIRY CHEMISTS' INDUSTRIAL UNION OF WORKERS:

Mr. G. M. Wallace raised the matter of the recent formation of the above named Union. Various members pointed out that it appeared that most of the members of the Union were not professional chemists but rather laboratory technicians or technologists who did not possess the qualifications necessary for membership of the Institute. It appears that the Union has been formed largely to protect these non-professional chemical workers on whom pressure has been exerted by the Dairy factory workers union. Members expressed most strongly that the word "Chemist" should not appear in the title of the union, and furthermore that there should be no question of pressure being brought to bear on professional chemists to join any union. The question of other workers in chemical industries was of lesser concern to the Institute. After considerable discussion it was *Resolved.*—That this meeting of the N.Z.I.C. re-affirms the view that the Institute should do

all in its power to resist pressure being brought on members to join a union, and instructs Council to investigate the developments in the Dairy Industry and take appropriate action to protect the interests of professional chemists.

SALARIES:

Some general discussion on salaries took place, the main view expressed being that it was in connection with salary scales that the Institute could be of most direct benefit to members. It was pointed out that certain other organisations scrutinised the salaries advertised for positions and, if they were considered inadequate advised their members accordingly and requested members not to apply for the position. It was generally agreed that the salary surveys conducted in the past had served a useful purpose but the mere compilation of data was not an answer to the general question of striving for increased salaries. It was *Resolved.* —That Council be asked to set up an active Salaries Committee, the duties of the Committee to be to make a further salary survey, to collaborate with other organisations in efforts to obtain better financial rewards for chemists, and to bring any obvious discrepancies in salaries to the notice of the people concerned.

TRAINING OF TECHNICIANS:

The Hon. General Secretary briefly reviewed the discussions with the Education Department. Mr. Keys detailed the views of the Examination Committee stressing in particular that that committee were strongly of the opinion that the L.A.C. serves a useful purpose and should not necessarily be dropped if courses of training are introduced.

EMPLOYMENT OFFICERS:

Mr. Borthwick pointed out that more positions for chemists are being advertised each year and that only a small proportion of these positions were being filled.

BALANCE SHEET:

Members had a few comments to make on the Balance Sheet, it being generally agreed that the financial position of the Institute is sound although the amount due in outstanding subscriptions is undesirably large.

It was pointed out that the tax paid on advertising receipts for the Journal should be regarded as one of the expenses incurred in publishing the Journal and could be shown as such in the Income and Expenditure account.

RULES AND REGULATIONS:

Some discussion took place on the merits of the suggested changes for electing officers of the Institute, and for the date of closing the Institute year. Opinions seemed to be fairly divided and it was finally *Resolved.*—That Council bring down recommendations for submission to Branches.

ROYAL CHARTER:

The Chairman commented on the fine work done by members of the Manawatu Branch in preparing the Royal Charter report. It was agreed that most members had not had time to study the report and consider its implications. Several members pointed out that the main aim appeared to be to get a higher standing for the Institute and the profession but expressed doubts that a Royal Charter, assuming it was granted, would necessarily achieve this end.

TIMBER PRESERVATION AUTHORITY:

Mr. I. S. Hunt pointed out the most unsatisfactory situation that existed in connection with the timber preservation industry through the lack of Institute representation on the Timber Preservation Authority. At least one member of the Institute is on the Timber Preservation Authority but he does not represent the Institute. It was stated that the Timber Preservation Sub-Committee of the Standards Institute (on which the Institute was represented) has been disbanded and if this is so the claim for Institute representation on the Authority is strengthened. After considerable discussion it was *Resolved.*—That Council endeavour to arrange with the Minister concerned to receive a small deputation to discuss the position.

SHORTAGE OF SCIENCE TEACHERS:

Members appeared to be fully aware of the various situations arising through the continuing and increasing shortage of science teachers. Some expressed the view that increased salaries would assist in rectifying this position. This may be true but there is something of a vicious circle in that a shortage of science teachers leads to a shortage of science graduates which means fewer people available to undertake science teaching and it is not easy to see just how this circle can be broken. The Institute is, of course concerned with the production of graduates in chemistry generally, whether or not those graduates go into the teaching profession. It was finally *Resolved.*—That Council look into the matter of the shortage of science teachers particularly with respect to the possible influence of salaries and if it considers it appropriate communicate its views to the Minister of Education.

THANKS:

Votes of thanks to the Chair and the Hon. General Secretary proposed by Mr. Nash were carried with acclamation.

THE TWENTY-SEVENTH ANNUAL REPORT.

FOR THE YEAR ENDING 31st OCTOBER, 1957.

OFFICERS FOR THE YEAR:

President: W. A. JOINER.
Vice-President: Prof. C. R. BARNICOAT .
Delegates: Auckland—W. A. RUSSELL.
Waikato—Dr. E. B. DAVIES.
Manawatu—Dr. W. A. McGILLIVRAY.
Wellington—A. P. OLIVER.
Canterbury—Dr. R. M. ALLISON.
Otago—A. J. ELLIS.
Hon. General Secretary: Dr. W. E. HARVEY.
Editor: Dr W. A. McGILLIVRAY.
Registrar: L J. ROLLO.
Immediate Past President: Dr. M. M. BURNS.

MEETINGS OF COUNCIL:

Meetings of Council were held in November, March and May in Wellington and in August in Christchurch immediately prior to the Conference. A general meeting of members was held during the Conference.

REGISTRAR:

Mr. L. J. Rollo, of Editorial Services Ltd., assumed the post of Registrar in January, replacing Mr. V. J. Wilson who resigned. Mr Rollo has made a great effort to speed up routine matters such as applications

for membership and it is hoped that there will be no further cause for complaint at undue delay in handling routine correspondence A document has been drawn up listing the duties and conditions of appointment of the Registrar.

MEMBERSHIP:

New Members: During the year 20 Associates were elected.
Fellows: During the year 2 Fellows were elected.
Resignations: Eight members resigned.
Leave: One member was granted leave.
Obituary: We regret to record the deaths of the following two members—Robert Owen Page, Clarence Palliser Worley.

Summary: Membership figures for the past three years are as follows:—

	1955	1956	1957
AUCKLAND	87	89	91
WAIKATO	32	33	34
MANAWATU	34	38	40
WELLINGTON	147	150	155
CANTERBURY	77	79	77
OTAGO	64	62	63
OVERSEAS	51	52	53
	480	503	513

SUB-COMMITTEES OF COUNCIL:

The several sub-committees of Council play a vital part in handling Institute matters and many individual members devote considerable time and energy to service on the sub-committees.

CONFERENCE:

The Combined Conference was held this year in Christchurch and was well attended by members of both Institutes. An innovation introduced this year was to transfer the venue of the Conference for one day from Christchurch to Lincoln College where members were shown something of the College and the adjacent Crop Research Division laboratories. With the kind co-operation of the U.S. Educational Foundation in N.Z. the Conference Committee was able to arrange a visit by Prof. T. A. Geissman of the University of California at Los Angeles who travelled briefly through New Zealand and delivered a lecture at the Conference.

EXAMINATIONS:

This committee based in Dunedin supervises the L.A.C. Examinations which continue to attract a considerable number of candidates.

EMPLOYMENT OFFICER:

Mr. E. S. Borthwick has continued to answer any enquiries relating to positions for chemists in New Zealand. It is clear that there are still far more jobs available than qualified chemists to fill them.

JOURNAL:

Dr. W. A. McGillivray has continued to edit the Journal with the assistance of members of the Manawatu Branch. During the year under review an Index covering all the past issues of the Journal was compiled by members of the Waikato Branch under Mr. N. T. Clare.

MEMBERSHIP:

Professor L. H. Briggs, Dr. R. Gardner and Dr. J. K. Dixon have carried out the very important task of scrutinising applications for membership.

STANDARDS COUNCIL:

The Institute continues to be represented on the Standards Council and on all the chemical sub-committees of the Council.

INSTITUTE PRIZES:

The I.C.I. Prize was awarded to Dr. F. H. McDowall for his work in the field of the chemistry of the butter-making and related processes.

The Morcom Green Edwards Prize was awarded to Mr. T. Marshall for his contribution to the study of corrosion problems associated with the geothermal development programme.

ROYAL CHARTER:

During the year a committee of Manawatu Branch members has produced a comprehensive report covering the acquisition of a Royal Charter. This report up-dates and adds to the information collected in 1948 on the same subject. To date no decision has been reached as to whether or not the Institute should set about applying for a Royal Charter.

TECHNICAL TRAINING:

Discussions have taken place with the Education Department and interested parties with a view to the possible establishment of courses leading to a National Certificate in Chemistry. No final decisions have been made as to the content of the proposed courses, and it is not yet clear what relationship any examination scheme introduced would have to the present L.A.C.

A.N.Z.A.A.S.:

The Australian and New Zealand Association for the Advancement of Science Conference held in Dunedin in January was attended by a considerable number of members who were afforded an excellent opportunity to meet colleagus from Australia and other overseas countries. Most of the organisational work for Section B (Chemistry) was carried out by members of the N.Z.I.C.

FINANCE:

The Institute's finances continue to remain in a healthy position, although the amount due in outstanding subscriptions continues to be a cause for adverse comment.

THANKS:

Thanks are due to many members of the Institute who have served either individually or collectively on committees or in other ways.

For and on behalf of the Council,
W. A. JOINER, President.
W. E. HARVEY, Hon. General Secretary.

COUNCIL MINUTES.

ABRIDGED MINUTES OF A MEETING OF COUNCIL-IN-PERSON OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY (INC.), HELD AT CANTERBURY UNIVERSITY COLLEGE, CHRISTCHURCH, ON MONDAY, 26th AUGUST, 1957.

PRESENT:

W. A. Joiner (President, in the Chair), Prof. C. R. Barnicoat (Vice-president), L. W. Jagger (Auckland proxy), Dr. E. B. Davies (Waikato), P O. Robertson (Manawatu proxy), A. P. Oliver (Wellington), Dr. R. M. Allison (Canterbury), A. J. Ellis (Otago), Dr. W. E. Harvey (Hon. Gen. Secretary), and L. J. Rollo (Registrar). Apologies were received from W. E. Russell (Auckland) and Dr. W. A. McGillivray (Manawatu).

INSTITUTE PRIZES:

After considering the reports of the assessors the Institute Prizes for 1957 were awarded as follows:—

I.C.I.: Dr. F. H. McDowall, Dairy Research Institute, Palmerston North.

Morcom Green, Edwards: T. Marshall, Dominion Laboratory, Wellington.

CONFERENCE, 1957:

Prof. T. A. Geissman: Dr. Harvey reported on the arrangements which had been made for Dr. Geissman's visit to New Zealand. The U.S.E.F. in New Zealand had agreed to pay all travelling expenses and raised no objection to the Institute paying for accommodation. It was estimated that the latter item would amount to £20-30, and it was agreed that the N.Z.I.C. should meet this account in full. The Secretary was instructed to write to the Executive Secretary of U.S.E.F. in New Zealand, thanking him for his assistance in making the visit possible.

CONFERENCE, 1958:

The 1958 Conference will be held in Hamilton and the Waikato delegate reported that planning was already under way.

EXAMINATION COMMITTEE:

Award of L.A.C.: On the recommendation of the Examination Committee, it was *Resolved.*—That the L.A.C. be awarded to D. C. Low, N.Z. Forest Products Ltd.

A.N.Z.I.C. by Examination: The Examination Committee had received an enquiry as to whether it would be possible to sit in one branch of chemistry at a time (see Regulations 1.5.1). The Examinations Committee had interpreted the Regulations as follows:—

> The three papers — organic, inorganic, and physical — are subdivisions of one subject, General Theoretical Chemistry, and all must be taken together. However, the translation from a foreign language may be taken on a separate occasion. It is proper that the subjects, General Theoretical Chemistry and Practical Chemistry should be offered in the same year, provided that in special circumstances and upon application Council may approve of their being offered in different years.

Resolved.—That the above interpretation be approved.

The Examination Committee pointed out the new regulations for A.R.I.C. by examination now included two examinations, one at B.Sc. ordinary level and the second, taken the following year, at B.Sc. honours level.

This information was noted.

L.A.C. Examination: The Examination Committee reported that a total of 34 candidates were sitting examinations this year.

JOURNAL:

The Editor reported that he had had some correspondence with the Editor of the R.A.C.I. Proceedings and they agreed that there was a need for closer liaison between the two Institutes. It was suggested that regular correspondents be appointed, in New Zealand to the R.A.C.I., and in Australia to the N.Z.I.C. Journals. *Resolved.*—That S. G. Brooker be approached as a possible correspondent in New Zealand.

The Editor was given permission to attempt to find a suitable correspondent in Australia.

ROYAL CHARTER:

The report of the Royal Charter committee was received and it was *Resolved.*—That the committee be thanked for their report and requested to continue with their investigations. It was further *Resolved.*—That a letter be sent to the R.A.C.I. thanking them for their assistance in supplying information to the Royal Charter Committee.

TRAINING OF TECHNICIANS:

The Hon. Gen. Secretary reported on the meeting of interested parties called by the Education Department to consider the introduction of courses for training chemical technicians. The meeting recommended that new examinations be established leading to a junior certificate at approximately the same level as the L.A.C. and a senior certificate at a level about that of University Stage I. Chemistry. Provision could also be made for endorsements for specialised or subsequent study. The subjects studied would be Chemistry, Physics, Mathematics and English and there would be a minimum of eight hours per week of study — one hour per week for the theoretical parts and two hours each for the practical work in chemistry and physics. Correspondence students would require a two-week block course of practical work during each of the first two years. All students whether studying by correspondence or not would have a three-week block course in practical work. A sub-committee comprising Drs. B. C. Lee and W. E. Harvey and Messrs. F. Morgan, J. A. D. Nash and P. R. Parr was set up to discuss syllabuses and provisions for endorsements.

BALANCE SHEETS:

The audited balance sheet and statement of accounts for the year ended 31st October, 1956 was received.

MEMBERSHIP:

The following Associates were elected to Fellowships:—

Morton, I. D., Colworth House, Sharnbrook, Bedford, England.
Wallace, G. M., Massey College, Palmerston North.

The following were elected Associates:—

Barrack, B. C., Tasman House, Kawerau.
Cambie, R. C., 63 Grafton Road, Auckland.
Carman, R. M., 7 Iti Street, Linden, Wellington.
Dennis, R. A., Kaipara Co-Op. Dairy Company Ltd., Helensville.
Gibson, M. G. C. C/o. Government Analyst, Auckland.
George, J. S. N., 6 Te Whiti Grove, Petone.
Hoe, Y. L., Dominion Laboratory, Lower Hutt.
Jackson, D. W., N.Z. Farmers' Fertiliser Co., Auckland.
Jebson, R. S., Kempthorne & Prosser Ltd., Otahuhu.
Kennedy, A. M., Dominion Laboratory, Lower Hutt.
McCabe, W. J., Dominion Physical Laboratory, Lower Hutt.
Peters, G. W., Felt & Textiles Ltd., Lower Hutt.
Turney, T. A., Chemistry Department, A.U.C.
Walker, J. R. L. Dairy Research Institute, Palmerston North.
Wells, N., Soil Bureau, Wellington.
Wong, L. C. K., 131 Gordon Road, Mosgiel.

The following resignations were accepted: T. G. Nash, J. Urlwin.

The following deaths were noted: Dr. R. O. Page, C. P. Worley.

RULES:

Considerable discussion on the suggested amendments to the Rules took place, but no finality was reached.

DAIRY CHEMISTS UNION:

A letter was received from J. W. Dryden outlining the recent formation of an "Auckland Dairy Chemists' Industrial Union of Workers" which is officially registered as a trade union. It appears that the majority of members of the union are probably not eligible for membership of the Institute, being laboratory technicians, laboratory assistants, etc., rather than professional chemists. Council was strongly of the opinion that the use of the word "chemist" in the name of the union was most undesirable, and it was *Resolved*.—That the Secretary be instructed to write to the Union and attempt to persuade them to eliminate the word "chemist" from the name of the union.

The matter was discussed further at the General Meeting (see General Meeting minutes).

ANNUAL LIST OF MEMBERS:

It has been suggested that the Institute should publish an annual list of members. The Registrar agreed to investigate the cost of such a proposal.

SCHOOL CHILDREN:

The Manawatu proxy reported to Council on the success which had attended the efforts of the Manawatu Branch to interest school children in chemistry. Groups of senior pupils from schools in the district had been taken on conducted tours of laboratories in the Palmerston North area. The children had taken a great interest in the visits and it appeared that a considerable number had become awakened to the possibility of making a career in the profession.

COUNCIL MINUTES.

ABRIDGED MINUTES OF A MEETING OF THE COUNCIL OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY (INC.) HELD IN THE CONFERENCE ROOM, D.S.I.R., SYDNEY STREET WEST, WELLINGTON, ON FRIDAY, 15th NOVEMBER, 1957.

PRESENT:

W. A. Joiner (President—in the Chair), Prof. C. R. Barnicoat (Vice-President), W. E. Russell (Auckland), Dr. E. B. Davies (Waikato), Dr. W. A. McGillivray (Manawatu), A. P. Oliver (Wellington), Dr. R. M. Allison (Canterbury), A. J. Ellis (Otago), L. J. Rollo (Registrar), and Dr. W. E. Harvey (Hon. General Secretary). Mr. D. J. Hogan (Canterbury) attended as an observer.

CONFERENCE, 1957:

The report of the 1957 Combined Conference Committee was received This report showed that a profit of £41/14/11 had resulted from the Conference.

CONFERENCE, 1958:

Dr. E. B. Davies reported on progress to date. The Conference Committee is listed below.

L.A.C. EXAMINATION:

Dr. Davies reported that a complaint had been received about the quality of reproduction and one particular sentence in the L.A.C. French paper. *Resolved*.—That the complaint be referred to the Examination Committee.

JOURNAL:

The Editor suggested that it would be more satisfactory to send the Journal out in envelopes rather than wrappers and it was *Resolved.*—That the present store of Journal wrappers be disposed of, and that from February, 1958 the Journal be distributed in envelopes.

MEMBERSHIP COMMITTEE:

Several members expressed the view that the members of the membership committee were rather loathe to use thir own judgment in considering applications for associateship under Rule 8.3. After some discussion it was *Resolved.*—That the Gen. Secretary write to the members of the Membership Committee and to Branch Chairmen explaining the Council's views on their functions with regard to the processing of associateship applications.

ASSOCIATESHIP AND FELLOWSHIP CERTIFICATE:

It was agreed that these should be forwarded to Branches, so that they could be presented to new members if desired.

ANNUAL REPORT:

The Annual Report for the year ending 31st October, 1957, was received and adopted.

OFFICERS FOR 1958:

Officers and members of sub-committees as listed elsewhere in this Journal, were elected.

HONORARIA:

General Secretary: 35 guineas.
Editor: 20 guineas.
Secretary, Examinations Committee: 10 guineas.

INSTITUTE PRIZES:

It was agreed to offer all the Institute prizes in 1958.
The value of the Chemical Essay Competition will remain at £25.

MEMBERSHIP:

Resignations: The following resignations were accepted—Mrs. P. M. Heine, I. H. Johnson, Dr. H. C. Holland.

Election of Fellow: Rands, Maxwell Barrett, 21 Riddel Road, Auckland (Chief Chemist, Auckland Farmers' Freezing Co., Ltd.).

Election of Associates: The following were elected Associates:—

Hudson, Diana Viviene, B.H.Sc., B.Sc., Patent Office, Wellington (Patent Examiner in Industrial Chemistry).

Staples, Kenneth William, B.Sc., C/o N.Z. Forest Products Ltd., Tokoroa (Chemist).

Snell, Wynne Arbuthnot, B.Sc., N.Z. Co-op. Rennet Co., Eltham. (Chief Chemist and Production Manager).

Ramage, Bruce Bower, B.Sc., C/o Morrinsville College, Morrinsville (Teacher).

Kennedy, John Wallace, A.R.A.C.I., 12 Kahu Street, Auckland. (Chief Chemist, Challenge Phosphate Co.).

Carter, David Michael, M.Sc., 9 Bolton Street, Petone (Chemist, B.A.L.M. Paints).

Hopgood, Raymond Henry, B.Sc., 38 Puriri Street, Christchurch. (Development Officer, Fletcher Industries).

Brown, Desmond Goble, M.Sc., Kempthorne Prosser & Co., Dunedin (Chief Chemist, Pharmaceutical Lab.).

Scrymgeour, Alister Neil, B.Sc., C/o Tasman Vaccine Lab., P.O. Box 29 Upper Hutt (Chemist and Microbiologist).

AUCKLAND DAIRY CHEMISTS INDUSTRIAL UNION OF WORKERS:

The Secretary reported that he had written to the Secretary of the above Union, but had received no reply.

TECHNICIAN TRAINING:

The Secretary reported on progress (or lack of progress) in the last threee months. It is not clear exactly where the responsibility for the inaction lies. It was *Resolved.*—That Council is perturbed at the lack of action and urges that strenuous efforts be made to rectify the situation.

(*Note:* Since the Council meeting, steps have been taken to carry the discussions with the Education Department a stage further).

TIMBER PRESERVATION AUTHORITY:

The Secretary reported that he had written to the Minister along the lines of the discussion at the General Meeting. A reply from the Minister expressed his willingness to receive two members of Council to discuss the Authority. *Resolved.*—That the President and the Hon. General Secretary be delegated to see the Minister.

SHORTAGE OF SCIENCE TEACHERS:

Considerable discussion took place on the shortage of science teachers and the Education Department's suggestions for training science teachers for elementary classes by a "pressure cooker" course. The President stressed that if such a scheme is absolutely necessary then it should be urged that persons trained under such a scheme should be used only for teaching pupils taking non-academic courses. Even in junior forms pupils who are likely to proceed to the university need the inspiration of teachers who possess the width and depth of knowledge which can only be gained by studying for a university degree.

Resolved.—That a letter stating the above views be sent to the Minister of Education and a statement released to the Press.

It is agreed that the shortage of scientists is not limited to the teaching profession, and any increase in the number of children who could be attracted to take up science would improve the supply of qualified teachers. After discussion it was *Resolved.*—That Council publish a booklet outlining careers in chemistry in New Zealand. It was further *resolved* that the Canterbury Branch be asked to prepare a draft of a suitable booklet.

RULES AND REGULATIONS:

Considerable discussion took place on the proposed amendments to the Rules. The required alterations in the Rules, based on Council's views on the proposed changes, will be submitted to Branches for consideration before the next Council meeting.

ANNUAL LIST OF MEMBERS:

The chief objection to the publication of an annual list of members was on the grounds of cost and after discussion it was *Resolved.*—That a list of members be published every three years, with a list of alterations published yearly, in the Journal. Canterbury opposed.

STANDARD METHODS COMMITTEE:

Dr. Allison agreed to look into the need for, and possibility of re-instituting, the standards methods committee dealing with methods of plant analysis.

THANKS:

A vote of thanks to the retiring President for his services to the Institute proposed by Dr. Barnicoat was carried with acclamation.

LIST OF OFFICERS.

FOR THE YEAR NOVEMBER 1st, 1957 — OCTOBER 31st, 1958.

President: Dr. C. R. Barnicoat, Massey College, Palmerston North.

Vice-President: Prof. L. H. Briggs, 63 Brighton Road., Parnell, Auckland.

Hon. Gen. Secretary: Dr. W. E. Harvey, Victoria University of Wellington, Box 196, Wellington.

Auckland Delegate: Dr. A. L. Odell, University of Auckland, P.O. Box 2553, Auckland.

Waikato Delegate: Dr. E. B. Davies, 104 Mahoe Street, Hamilton.

Manawatu Delegate: Dr. W. A. McGillivray, Massey College, Palmerston North.

Wellington Delegate: A. P. Oliver, N.Z. Breweries Ltd., Box 211, Wellington.

Canterbury Delegate: D. J. Hogan, Dominion Laboratory, Box 2112, Christchurch.

Otago Delegate: Dr. A. D. Campbell, University of Otago, P.O. Box 56, Dunedin.

Editor of Journal: Dr. W. A. McGillivray, Massey College, Palmerston North.

Past President: W. A. Joiner, D.S.I.R. Box 8018, Wellington.

Registrar: L. J. Rollo, Box 250, Wellington.

AUCKLAND BRANCH

Chairman: Dr. A. L. Odell, University of Auckland, P.O. Box 2553, Auckland.

Secretary: L. W. Jagger, 23 Princess Street, Auckland, C.1.

Treasurer: P. J. Gallagher, 74 Station Road, Papatoetoe.

Committee: S. G. Brooker, H. R. Gapper, B. O. Jones, W. E. Russell.

WAIKATO BRANCH

Chairman: D. F. Waters, Box 490, Hamilton.

Secretary-Treasurer: J. E. Allan, Box 490, Hamilton.

Committee: W. Rolt, R. R. White, Dr. R. P. Newbold, Dr. E. B. Davies.

MANAWATU BRANCH

Chairman: Dr W. A. McGillivray, Massey College, Palmerston North.

Secretary-Treasurer: Dr. G. W. Butler, Plant Chemistry Division, Box 623, Palmerston North.

Committee: Dr. J. Walker, Dr. H. R. Whitehead, Dr. J. W. Lyttleton, Dr. A. T. Johns.

WELLINGTON BRANCH

Chairman: Dr. W. E. Harvey, Victoria University of Wellington, Box 196, Wellington.

Secretary: P. P. Williams, Dominion Laboratory, Box 8018, Wellington.

Treasurer: Dr. H. P. Rathbaum, Dominion Laboratory, Box 8018, Wellington.

Committee: A. P. Oliver, Miss J. B. Ross, H. R. Penhale, P. J. C. Clark Dr. D. Ross.

CANTERBURY BRANCH

Chairman: J. Vaughan, University of Canterbury, Christchurch.

Secretary-Treasurer: D. J. Hogan, Dominion Laboratory, Box 2112, Christchurch.

Committee: A. F. R. Adams, S. M. Betty, A. Fischer, J. S. Pollard.

OTAGO BRANCH

Chairman: Dr. R. D. Batt, Biochemistry Department Medical School, Great King Street, Dunedin.

Secretary-Treasurer: D. F. Nelson, Dominion Laboratory, P.O. Box 562, Dunedin.

Committee: G. W. Broughton, Dr. W. S. Fyfe, A. H. Lewin, J. W. McChesney.

SUB-COMMITTEES, NOVEMBER 1st, 1957 — OCTOBER 31st, 1958.

CONFERENCE COMMITTEE

R. R. White (Chairman), R. J. Lancaster (Secretary), N. T. Clare, M. R. Coup, Dr. R. P. Newbold, J. E. Allan, Dr. E. B. Davies, K. J. McNaught, D. F. Waters, Miss E. Gampey.

EMPLOYMENT COMMITTEE

E. D. Borthwick, C/o Shell Co., of N.Z. Ltd., Box 2091, Wellington.

EXAMINATION COMMITTEE

O. H. Keys (Chairman), Dominion Laboratory, Box 562, Dunedin.
Dr. A. D. Campbell, C. R. Edmond, J. W. McChesney, H. G. Woolman.

JOURNAL EDITORIAL COMMITTEE

Dr. W. A. McGillivray (Editor), Massey College, Palmerston North..
D. G. Howard (Business Manager), Shell Co. of N.Z. Ltd., Box 2091, Wellington.
Dr. G. W. Butler, Dr. R. M. Dolby, C. V. Fife, C. B. Radcliffe, P. S. Robertson, G. M. Wallace.

MEMBERSHIP COMMITTEE

S. G. Brooker, 6 Koraha Street, Auckland, S.E.2.
Dr. J. K. Dixon, Soil Bureau, Molesworth Street, Wellington.
Dr. R. Gardner, 41 Dowling Street, Dunedin.

PROFESSIONAL STATUS COMMITTEE

Not appointed.

STANDARDS INSTITUTE OF NEW ZEALAND

Representative on N.Z. Standards Institute Council, G. A. Lawrence, Chief Representative for all Standards Institute affairs, L. H. Stonyer

Representatives on Special Committees—

(a) Chemical, insecticides, domestic refrigeration, etc., C. L. Stonyer.
(b) Road making materials and methods, etc., I. B. Hyatt.
(c) Electroplating and electro metal finishes, Dr. R. Gardner.
(d) Metal Containers, paints, etc., J. M. C. Tingey.
(e) Textiles, Dr. L. F. Storey.

U.N.E.S.C.O REPRESENTATIVE

J. A. D. Nash.

SALARIES COMMITTEE

G. S. Lambert (Chairman), others to be appointed.

EQUIPMENT PAGE.

(Contributed by Dr. E. B. Davies, Rukuhia Soil Research Station, Hamilton.)

BALANCES:

The standard of craftsmanship set by the Mettler analytical balances is also shown by the K series which handle the heavier laboratory weighing. Giving instantaneous readings, the balances have been found invaluable for routine dry matter determinations on large samples and are very convenient for general laboratory work. As the pan is on top of the balance case, there is no limit to the size of samples, so bulky fodder samples no longer present a problem. Where weighing involves containers of differing weights, the models fitted with a spring taring device greatly speed up work and by obviating arithmetic, reduce potential errors.

The Mettler vibro-spatula deserves to be better known as an aid to speeding up any operation where powdered material is added to a balance to reach a precise weight.

RAPID DELIVERY STILL:

For a rapid supply of distilled water, the Loughborough all-glass still can be commended. As supplied it is fitted with a 3 kw. bare element and stated to deliver 4 litres per hour. To accommodate it to a 10 amp. plug, the element was reduced to 2.3 kw., delivery dropping to 3 litres. The still is highly efficient. The water gives a slightly positive dithizone test for heavy metals. Wrapping of electro thermal heating tape round the trap leading to the condenser to prevent creep improved the quality sufficiently to give a negative test.

GRINDING OF PASTURE SAMPLES:

Dr. P. R. Stout at Berkeley uses a "Wiglbug" amalgamator for grinding of plant samples for trace element analyses. The sample is placed in a plastic screw cap bottle of about 8 oz. capacity with plastic balls. The bottle is clamped by thumb screws in a stirrup, angle mounted on the shaft of a motor to give a rapid figure 8 movement. This results in effective grinding of samples in about two minutes. Obtainable from Crescent Dental Manufacturing Co., Chicago, Illinois. Larger model Series C 5740 115 Volt 600 W. A.C. — 275 dollars.

BOOK REVIEWS.

FREE RADICALS IN SOLUTION, by Cheves Walling. Published by John Wiley and Sons, Inc., New York, 1957, 631 pages. Price 14.50 dollars.

Free radical reactions are a somewhat neglected part of organic chemistry as far as the text book literature is concerned though much important work has been done and is in progress. The only other book of comparable scope to the present one is W. A. Waters' *"The Chemistry of Free Radicals,"* the second edition of which is now eight years old. The appearance of Walling's treatment of the subject is therefore timely.

A considerable part of the book is devoted to various aspects of radical polymerisation (in which the author has a special interest) and much of the material here is available elsewhere. The rest is devoted to a short physico-chemical introduction to the structure and reactivity of radicals and to a survey of other organic reactions which involve radicals either singly or in chains such as halogen addition and substitution reactions, peroxide decompositions, autoxidations and so on. The production of radicals by light and high-energy radiation is briefly treated

and there is a short section on inorganic free radicals. Long-lived radicals of the Gomberg type, described by the author as "a rather esoteric branch of organic chemistry" receive a brief treatment.

The book is intended for the organic chemist and the emphasis throughout is commendably on interpretation and explanation rather than the mere presentation of experimental facts. The author, originally a member of the Kharasch school, has had extensive experience in the industrial and academic spheres. His style is clear and his presentation of the material interesting and attractive. —B.D.E.

ORGANIC REACTIONS, Vol. IX., Edited by Roger Adams. Published by John Wiley and Sons, Inc., New York, 1957. 468 pages. Price 12.00 dollars.

This volume closely resembles earlier ones in the series and includes chapters on the cleavage of non-enolizable ketones with sodium amide, the Gattermann synthesis of aldehydes, the Baeyer-Villiger oxidation of aldehydes and ketones, the alkylation of esters and nitriles, the reaction of halogens with the silver salts of carboxylic acids, the synthesis of β-lactams and the Pschorr synthesis and related reactions. It is unnecessary to extoll the virtues of the Organic Reaction series, which is by now well known to all organic chemists engaged in synthetic studies. The coverage of the individual topics is as complete as could be expected, as examplified by the fact that the chapter on the alkylation of esters and nitriles makes up almost half the present volume and contains nearly 1100 references.
—W.E.H.

METHODEN DER ORGANISCHEN CHEMIE (HOUBEN-WEYL) VOLUME XI PART I. PREPARATION OF AMINES. Published by Georg Thieme Verlag, 1957. 1224 pages. Price D.M. 208.

This volume covers in an exhaustive manner the preparation of primary, secondary and tertiary amines including the conversion of primary to secondary and secondary to tertiary amines. Some idea of the detailed nature of the treatment may be judged by the fact that 63 pages are devoted to the Mannich condensation. The various methods of preparing amines are illustrated by detailed examples from the literature which is covered up to 1955. Author and subject indices are provided in this well bound and produced volume which is a handsome addition to the literature of organic chemistry. —S.G.B.

VITAMIN A, by T. Moore. Published by Cleaver-Hume Press Ltd., London, 1957. 645 pages. Price £3/16/-.

"Vitamin A" will find a very wide use as a reference book in the fields of nutrition, biochemistry, organic chemistry, medicine, physiology and agriculture. Like most of the vitamins, the literature of vitamin A and related carotenoids is relatively young. It dates virtually from Moore's classical work on the conversion of carotene to vitamin A carried out almost 30 years ago. From that time Moore has continued to be actively engaged in research on vitamin A so that he is one of the few authorities who can, from his own personal experience treat the whole subject from an historical point of view. His extensive work as an abstractor has also kept him in close contact with all aspects of vitamin A research and it has always been his ambition that he could write a text in which every reliable paper, which made a contribution to progress in this field, could be mentioned. Clearly, however, even when devoting a book of this size to one single vitamin, this has not been possible to achieve and again Moore is probably one of the few men fitted to sift the huge volume of literature in several widely different branches of science and produce a single co-ordinated text.

Following an historical introduction, sections deal with the estimation, the chemistry, the comparative biochemistry, the biochemistry and physiology of vitamin A and its pro-vitamins and congeners; the pathology of vitamin A, excess and deficiency, and vitamin A in the human are dealt with and a final section deals with a number of special topics. This includes some of Dr. Moore's own particular interests such as vitamin A and sex. It also includes an extremely good assessment of our present knowledge of vitamin A.

The book is attractively produced and extremely well written; it is clearly illustrated and profusely referenced. Dr. Moore, who has contributed so much to our knowledge of vitamin A, is to be especially congratulated on this latest effort. —W.A.McG.

BOOKS RECEIVED.

BACTERIAL FERMENTATIONS, by H. A. Barker. Published by John Wiley and Sons, Inc., New York, 1957. 95 pages. Price 3.00 dollars.

This book is based on a series of three Ciba Lectures which the author was invited to deliver on bacterial fermentations which he and his associates had investigated over a period of 20 years. The three chapters deal with the biological formation of methane, the chemistry of butyric acid-butanol fermentations and fermentations of nitrogenous compounds. With the exception of the first chapter where considerable attention is also devoted to more strictly biological matters such as the isolation, nutrition and classification of the bacteria, the main emphasis is on the chemistry of the energy yielding processes. Limitations of space have meant the exclusion of much material but the text is a very clear and readable account of the author's own fields of work.

THE HIGHER OXO ALCOHOLS, by Lewis F. Hatch. Published by John Wiley and Sons, Inc., New York, October, 1957. 120 pages. Price 4.50 dollars.

A review of the extensive patent literature on the Oxo process together with added information about the higher oxo alcohols. Individual chapters deal with the Oxo process; product utilisation; plasticizers; agriculture applications; detergents; lubricant applications. There are over 400 recent references..

SOLVENT EXTRACTION IN ANALYTICAL CHEMISTRY, by George H. Morrison and Henry Freiser. Published by John Wiley and Sons, Inc., New York, 1957. 269 pages. Price 6.75 dollars.

The first part of this book deals with the principles of solvent extraction, the second is concerned with the practical aspects of the subject including apparatus and general techniques and the last section surveys extraction systems and a selection of procedures for the extraction of elements.

THE CHEMISTRY OF ORGANIC MEDICINAL PRODUCTS (4th Edition), by Glenn L. Jenkins, Walter H. Hartung, Kenneth E. Hamlin, jun., and John B. Data. Published by John Wiley and Sons, Inc., New York, 1957. 569 pages. Price 10.75 dollars.

The current edition brings this valuable text up to date. It is a complete revision, all the type having been reset. The chemical classification of medicinal agents has been retained. Elementary organic chemistry has been eliminated, but typical syntheses of important medicinal agents have been included, along with a description of properties. Correlations

between chemical structure and physiological activities are pointed out and whenever possible protoplasmic reactions are indicated. Antibiotics are grouped together and covered in a separate chapter.

URANIUM IN SOUTH AFRICA, 1946-56. We have been asked by the South African Chemical Institute to give some publicity to the above publication which they have produced in collaboration with four other scientific societies. The symposium comprises thirty papers covering a wide range of subjects related to the development and production of uranium in South Africa and was due to be publisehd in two volumes about September, 1957. The price is £6/6/- and copies may be obtained from:—

The Secretaries, The South African Chemical Institute, P.O. Box 3361, Johannesburg, Transvaal.

NEW JOURNAL OF ORGANIC CHEMISTRY — "TETRAHEDRON," Published by Pergamon Press, London.

The appearance of each new journal is bound to be greeted with mixed feelings. There will be those who maintain that the existing journals are sufficiently numerous to cope with all the worthwhile material offering in well established branches of the subject, and new publications can only be justified if they cater for some newly developing field. "Tetrahedron" is not just another journal of organic chemistry. As Sir Robert Robinson states in the foreword "the special character claimed for "Tetrahedron" is its fully international scope, since the new journal is envisaged as a forum for the presentation of original memoirs in organic chemistry contributed from all parts of the world." This multilingual journal will welcome larger papers describing the results of extended investigations in a unified manner, in addition to the type of paper commonly found in the national journals. The honorary editorial advisory board under the chairmanship of Sir Robert Robinson has world wide coverage and reads like a Who's Who of organic chemistry, so that "Tetrahedron" if it lives up to its promise, cannot fail to be a most important publication. The price is quoted as £6 per volume to libraries and £3/10/- to individual subscribers although it appears that these prices are bound to be increased in view of the high standard of production.

—W.E.H.

NEW JOURNALS OBTAINED BY EXCHANGE. Two valuable journals, the Russian *"Journal of Applied Chemistry"* and the *"Collection of Chechoslovak Chemicals Communications"* have recently been added to the exchange list. The former is published in Russian while the latter has papers in English, French, German or Russian with a summary in another of those four languages.

The Chemical Institute of Canada has ceased to supply *"Chemistry in Canada"* as an exchange but will supply instead the *"Canadian Journal of Chemical Engineering"* which publishes original papers on that subject and was formerly known as *"Canadian Journal of Technology."*

All our exchange journals are housed in the library of the Auckland Institute and Museum and may be borrowed on application to the Librarian, P.O. Box 9027, Auckland, S.E.1.

—S.G.B.

It shows, in clear print, the full specification of the contents. You know exactly what you have got, you can see its field of use, and you have all the information handy for future reference.

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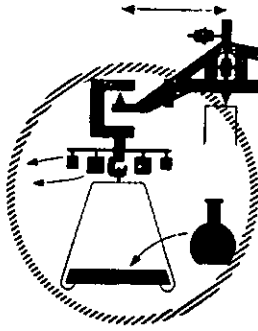

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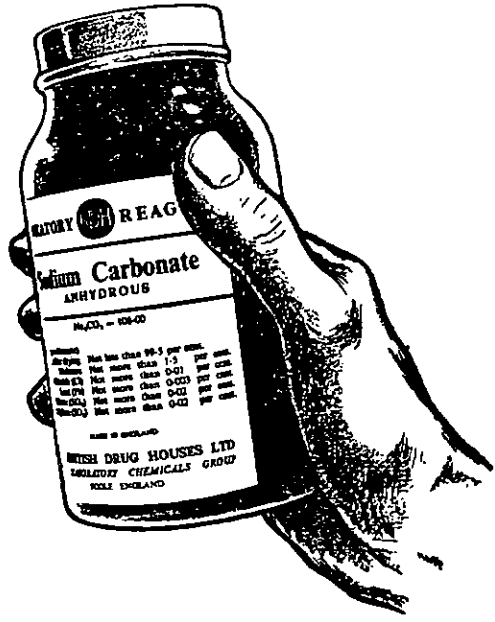

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