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EDITORIAL.

Most members will already know of the resignation of one of our foremost New Zealand chemists, Dr. J. Melville, from the post of Director of the Grasslands Division, D.S.I.R., to take up the position of Director of the Waite Agricultural Institute in Adelaide. Further editorial comment on this loss to New Zealand science seems superfluous and it remains only to pay a very sincere tribute to Dr. Melville's contribution to the Institute, to chemistry and to the whole field of science in this country, to congratulate him on his new appointment and to wish him every success in it. A biographical note on Dr. Melville appears in this issue. Its placing alongside the report of the 1955 Salary Survey is no mere coincidence since they do, to a large extent, represent cause and effect. It is not of course suggested that the disparity in salaries was the only factor which attracted Dr. Melville to his new position, but it cannot be too strongly stressed that it should never have been allowed by Governments of this country to become even a minor consideration. The Waite Institute and the Grasslands Division occupy comparable positions in the agricultural economies of South Australia and our own country. Both carry out the same type of work and both have similar associated research divisions. The population of South Australia is about three-quarters of a million and the value of her gross agricultural production about sixty million pounds per annum. Corresponding figures for New Zealand are a population of two million and a gross agricultural production of some two hundred and fifty million pounds. And yet the Director's salary in South Australia is, in converted currency, almost double that in New Zealand.

The Salary Survey, as well as providing a basis for further highlighting the widening gaps between salaries in this country and overseas, provides interesting information about the distribution within different groups of chemists in this country. General trends can be seen at a glance from the graph, but a casual inspection of this alone could be misleading unless other information given in the tables is also considered. Spread of salaries is most important particularly where the number of returns in a group is limited and it is unfortunate that, without unduly complicating the picture, it is impossible to present these graphically. For example, the University average of £1,555 for the 41-45 age group is made up of six returns ranging from approximately £1,200 to something over £1,950, i.e., a spread from below the Government mean to well off the scale. Salaries too must be considered relative to qualifications and in some cases to the highly competitive nature of the appointment. But, as the Committee points out, much of this information can be extracted from the very comprehensive report presented and the report as a whole certainly merits very careful study.

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SOME PROBLEMS IN THE APPLICATION OF CHEMISTRY TO AGRICULTURAL RESEARCH.

By N. T. Clare, Chief Biochemist, Ruakura Animal Research Station, Hamilton.

(Chairman's Address to the Waikato Branch, September, 1955)

My choice of subject on this occasion has been guided largely by my belief that a chairman's address should deal with wider issues affecting our profession and our Institute. Since members of this branch are mostly engaged in the application of chemistry to agriculture, I wish to consider some factors which influence the effective application of our science.

First of all I would draw attention to the misuse of the terms Agricultural Chemistry and Agricultural Analysis as a description of our functions and as titles for text books. Certain text books, such as Wiley and the A.O.A.C., which deal with the chemistry and analysis of soils, plants, feedstuffs, meat and dairy products, were once the main source of reference for our predecessors who were themselves styled Agricultural Chemists. Today the work carried out at our research stations covers a much wider range of subjects and techniques. In recent years the Animal Research Station has dealt with projects as diverse as the physical chemistry of removal of fat from rubber and the identification of modified plant toxins in honey; while the Soil Research Station shows a similar catholicity of tastes, between effects of the fineness of grinding of limestone and the possible production of growth-promoting substances by earthworms.

This trend away from the old style of agricultural chemistry has occurred for several reasons. The drive for greater and more efficient production has intensified interest in plant and animal health, thereby bringing to the fore many problems which require chemical investigation. The introduction of many synthetic substances—detergents, antibiotics, hormone preparations, weedkillers and insecticides—has increased both the technical resources of the chemist and the range of analytical work involved. But especially I think, that whereas the agricultural chemistry of former years was concerned largely with analytical work aimed at the control of feedstuffs, fertilizers and agricultural products, the need today is for research workers who contribute their knowledge and experience in chemistry as one of several scientific disciplines which may be needed to study a particular agricultural problem. Perhaps this aspect of the application of chemistry to agriculture has been traditionally strong in this country because here analyses of crop products, either for use directly or as animal feeding stuffs, is of minor importance compared with the problems associated with the growth of pasture and the efficient conversion of it into animal products. An essential feature of this change in the nature and

scope of our work is the much closer contact between chemists and other agricultural research workers. We are now no longer expected to do routine analytical work on samples whose history is unknown to us; we are expected to play our part in the planning and running of experiments which give rise to those samples, and to initiate field experiments where these are necessary to chemical projects.

In saying all this, I do not want to suggest that agricultural chemistry was formerly restricted to routine analyses—obviously the demand for such analytical work must have arisen from investigations which established their usefulness—but I believe that much of the work was regulatory, and that our predecessors often had neither the time nor the essential facilities, such as are now available at our research stations, for the further application of their knowledge and skill.

Reflecting on these points has led me to consider some changes which have occurred since I joined the Chemistry Section of the Department of Agriculture in 1937. There were then 17 chemists in the Department, 13 of them in the Chemistry Section situated in the heart of Wellington. To many of us in that laboratory, "pastures" were samples which came by post in paper bags—sometimes the address "Sydney Street" took them to Australia first. Our association with farm animals was even more remote, and samples from them were often received in an unsatisfactory state, both chemically and aesthetically. Today there are 37 chemists in the Animal Research Extension Divisions, located at the Wallaceville, Winchmore, Rukuhia and Ruakura research stations. Almost all of these are engaged on research projects, and their laboratories have been purposely placed handy to the field work. In addition, the Dairy Division, which in 1937 employed 2 chemists, now has 8.

Actually the increase in the number of chemists at the Research Stations is smaller than I had expected to find considering the magnitude and number of projects now being studied. It is particularly interesting to compare the increase from 13 in 1937 to 37 in 1955 with the increase in technicians, assistants, etc. In 1937, there were 4 or 5 technicians, whereas today there are approximately 40, and this last figure does not include farm staff, workshop technicians, etc., whose services are available when required. It is obvious that in the last 20 years we have learned to delegate many of the chores and routine determinations to laboratory assistants. On the other hand advances in instrumentation, and the ingenuity of our workers in streamlining methods, enables us to tackle work on a scale we would not have considered in 1937. The changes in instruments can be illustrated by reference to methods of measurement depending on absorption of radiation. In the chemistry section in 1937, there were a borrowed Lovibond Tintometer and two plunger type colorimeters and there was prob-

ably a third at Wallaceville. I hope none of these is still in use. I think I made the second photoelectric absorptiometer, if I dare to give it such a resounding title, used in the Department—Dr. Moir perpetrated the first. Today I know of at least 17 commercially-made photoelectric instruments measuring absorption or emission within the Department of Agriculture, in addition to two quartz spectrographs. At a conservative estimate the capital outlay in these instruments and their accessories would be over £7,000.

In 1937 it was considered a fair day's work to do Kjeldahl nitrogens on six pasture samples in duplicate. Our technicians can today handle four or five times that number, with less hard labour and without the exasperation caused when the acid sucked back owing to gas fluctuation. Furthermore the amount of reagents used for 60 determinations now is less than that required for 6 twenty years ago.

I have made these points about the scope and the responsibilities of the chemist in agriculture and the facilities available to him, because I think there is still a misapprehension that our work consists mainly of routine analysis by cut-and-dried methods. This misconception is common among young graduates and is, I believe, one of the reasons why more have not entered agricultural work. One often encounters the belief that what is known as "pure chemistry" is a higher vocation than "applied chemistry". Quite recently a friend writing from England deplored the fact that family circumstances might compel him to return to New Zealand because no one here would pay him to do pure chemistry. I am going to quote part of my reply to him:—

"I must take you to task about this "pure chemistry—applied chemistry business". Personally I am not sure where the distinction lies, unless you mean by "pure chemistry", studies which are pursued solely for the sake of the knowledge they will yield, and by "applied chemistry" studies for the sake of the knowledge which it is hoped can be applied to a useful purpose. Is the investigation of the metabolism of phenothiazine in calves, because it is suspected that the photosensitized keratitis in that species is due to a peculiarity of the metabolic path, any less interesting than studying the metabolism of the same drug in rabbits just to see what happens? Actually the work on calves added to the sum of knowledge by demonstrating the production of derivatives not previously found in rabbits, rats or sheep. Is the work of Raistick and his team on mould products, pursued for the sake of extending knowledge, any more noble, or any better chemistry, than that of Chain and his associates in their specified task of isolating penicillin? For myself, I unhesitatingly plump for the latter as the nobler motive. Furthermore it seems to me the better chemistry, in that they started with the knowledge that they were seeking an elusive substance and continued in the face of considerable technical difficulties.

whereas the London team could afford, if they wished, to leave substances which were hard to isolate and concentrate on those which were easier to handle. If you conceive applied chemistry as involving merely the application of text book knowledge to a given problem you are being much too restrictive, for this is rarely the case."

Incidentally I have noticed that one of the commonest ways of defending pure science is to stress the material advantages that have eventually resulted from some disinterested piece of research. In a recent review it was proudly pointed out how Rothschild's hobby of collecting and classifying fleas from all possible species of hosts had proved of tremendous value when the Commission studying bubonic plague in India suspected rat fleas as vectors in transmission of the bacillus, and wanted urgently to know which fleas were carried on which animals. For myself, I think that too much can be made of such coincidences—they indicate that any sound body of information, however recondite the subject, may have application to human welfare; they do not point to any especial merit in pure research itself.

If there is a value in the pursuance of pure research it lies in the freedom of the investigator to continue the line that appeals to him independently of the immediate usefulness of his research. Since we generally work best on a subject that attracts us, this freedom has its advantages. It is undeniably true that if all research were tied to useful purposes much of the fundamental work that leads to great generalisations would not have been undertaken. On the other hand there is an obvious temptation to turn out a succession of researches on the same pattern, using a well tried technique, and to shelve the more difficult aspects of the problem. This accounts partly for the incompleteness of our knowledge of many substances from natural sources—the easily purified ones were studied, the non-crystalline messes were discarded.

Now lest I offend with heresy towards the principle of freedom of a chemist to study what he likes (provided he is not using resources under false pretences in the process) I acknowledge the indebtedness of every chemist to those great ones who have built, and are building, the fundamentals of our science. Without our Daltons, our Wohlers and our Mendeleeffs, there would be little systematic chemistry to apply to agriculture or industry today.

If I have dealt longer than might appear necessary with this old controversy between the merits of pure and applied research, it is because I believe that there should be no rivalry at all. Each has its place and its value and each can learn from and contribute to the other. What I deplore is any attitude of superiority of one toward the other. The comment by Lord Kelvin on this matter was, "There cannot be a greater mistake than looking superciliously upon practical applications of science. The life and soul

of science is its practical application . . . many of the greatest advances that have been made from the beginning of the world to the present time have been in the earnest desire to turn the knowledge of the properties of matter to some useful purpose to mankind."

I have already stated that there is a not uncommon misconception about the scope and intrinsic interest of chemistry as applied to agriculture, and that this is a reason for the failure of more young chemists to undertake it. We are approaching the stage when this is becoming a problem. I had always thought that the chemists in the Department of Agriculture were young men. It has surprised me to find that of the 37 employed at the Research Stations in 1955, 13 graduated 20 or more years ago, 18 graduated 15 or more years ago, and only 10 graduated within the last 10 years. I am aware that there is a world-wide shortage of chemists, that the numbers now completing degree courses in New Zealand are quite inadequate for the demand, and that salaries outside the Public Service, and even more so outside New Zealand, are attractive to young men. Nevertheless the numbers entering agricultural work are relatively low for a country so highly dependent upon primary production.

I can offer no concrete scheme to stimulate the interest of the younger chemist in agriculture. The degree course is already too packed and staff too small to expect University teachers to say much about the application of their subject; nevertheless I think it might be profitable for all concerned if they could occasionally visit our agricultural stations to see what research is going on. They would be in a better position then to advise students on a future vocation, as inevitably they must. I have several times invited members of the Chemistry Departments to visit Ruakura but few have availed themselves of the opportunity. I am sure also that some of our research station staff could provide good chemistry and good entertainment to a student chemical society if they were asked.

A matter of broader policy might be the offerings of scholarships or grants for overseas study at specified institutions to outstanding students; but I would suggest that the student first of all spend one or two years in agricultural work, to obtain a background of New Zealand's requirements before he went overseas.

In the final analysis, however, the attraction of chemists to agriculture is our responsibility for it rests on the quality of the work of the agricultural institutions, and our ability to make it known.

Allied to this problem of rejuvenating the ranks of chemists in agriculture is that of obtaining reliable and well trained technicians. The tenfold increase in numbers of assistants in 20 years which I quoted earlier indicates the extent to which we now depend

on technicians for the routine operations required in most projects. But it is a distressing feature that very few of these have anything more than on-the-job training. Our Institute endeavoured to meet the situation by inaugurating the Laboratory Assistants' Certificate, and this qualification is recognised and rewarded by most employers. I consider the time has come to re-examine the Certificate Course. It was originally devised to encourage study of theoretical chemistry to University Entrance standard. I would not like to see any lower standard but I think that greater emphasis might be placed on certain aspects, especially the basis of quantitative analytical chemistry and the use of instruments, for this is the type of work commonly carried out by our technicians. My own experience in encouraging technicians, especially girls, to sit the L.A.C. examinations is that the Laboratory Art subject is a deterrent, because the tendency for most scientific institutions to have special workshop facilities has reduced the demand for the ordinary laboratory technician to do glassblowing, metalwork, etc. I suggest also that a pass in one of the prescribed subjects at University Entrance while at school could be counted as a unit in the examination for those trainees who come straight from school to laboratory.

Unfortunately the demand for chemical technicians in New Zealand appears too small, and scattered too widely over the country, to warrant the establishment of a technicological institute for their training. The University Colleges do not regard such training as one of their functions. However, the large number of failures in the first year at University makes one wonder whether this is entirely due to the low standard of the students, or partly to too high a standard of examination. Might not some of the students be capable of taking a B.Sc. course which would provide an adequate training for a great deal of the analytical chemistry which is now undertaken by closely supervised technicians, but which could be handled more efficiently by persons with more fundamental knowledge? Such persons would enjoy a better status, and would be equipped also to display initiative in improvement of analytical methods, adaptation of old ones to new purposes, and mechanization of routine operations. I think it is likely, incidentally, that students who have the attributes necessary for a good teacher, given a chemistry training rather lower than the present degree standard, would help to alleviate the shortage in that profession also. Admittedly the teaching profession any more than other professions does not want second raters, but neither does it want people with a chemistry training higher than is necessary, but with no flair for teaching. Very rightly the University Colleges must look askance at any suggestion of lowering standards; but equally they must be on guard lest their standards creep unduly high. Actually, I understand

that suggestions along these lines are being considered at some of the Colleges.

I indicated earlier the development of closer co-operation between chemists and other agricultural research workers—the organisation of work on a team basis. It must be admitted that the chemical side of a project is often a bottleneck. Our veterinary and agricultural science colleagues are used to standard bacteriology and pathology techniques involving comparatively little manipulation and allowing a large number of examinations to be made rapidly. It is sometimes hard to convince them that chemical analyses which they want to include in their observations may involve far more work than they are themselves devoting to their project. Recently I was shown an ambitious programme in which the "incidental" chemical work included determinations for which no satisfactory routine method is available. When a new and unfamiliar determination is required, it is rarely that it can be applied straight from the published description—some study of reagents and conditions and a check on accuracy are usually needed. This is partly the fault of too brief a description of methods in chemical journals—the actual manipulative technique is often the essential feature in the success of a method. In particular, one finds many papers in agricultural science in which conclusions are drawn from chemical determinations with no indication as to how these were obtained. It is incumbent on chemists to see that references to methods, especially essential modification of published procedures, are included in publication of work with which they are associated. It is equally incumbent on us to see that we are not straining for an accuracy far greater than the nature of the problem demands, or the adequacy of the sampling permits. Such "accuracy" is often spurious. Of what value is the decimal point in a weekly blood sugar estimation, when a sample taken from the same animal an hour later may differ by $\pm$ 5 mg. per 100 ml.?

Judgment of the accuracy of an estimation in relation to its purpose, streamlining and mechanisation of repeated manipulations, can reduce time and tedium, and so enable us to undertake work on a scale necessary to overcome many of the biological variations in agricultural research, and even to justify the naive faith in the chemists' powers sometimes shown by colleagues unfamiliar with chemistry. There is scope enough in this direction for the young and enthusiastic chemist to demonstrate his ability.

While all these matters constitute administrative problems in the application of chemistry to agricultural research even greater problems lie in the nature of the research projects themselves. Some of these, such as studies on the composition of the leaf proteins at the Plant Chemistry Laboratory or on the mineral constituents of the milk of various species at Ruakura, may be pursued without an obvious application in mind. In the

main however, the work of our agricultural institutions is undertaken because it has a more or less direct bearing on a plant or animal disease, on a principle of production or management, or to provide a technique of measurement in field studies. The ad hoc nature of such studies frequently introduces difficulties. Because the problems are largely biological the raw material for our chemistry is subject to variations between years and seasons of the year, between animals, between species and breeds, and between districts. It is true that such variations sometimes give the clue to the solution, but frequently (I cite facial eczema as an outstanding example) they are a source of frustration and exasperation. To be able to reproduce the phenomena that one is studying under controlled conditions in which exact measurements can be made is the first aim in most research work. To have to wait a year for the next opportunity to make an experiment, or to have to carry out all chemical operations on an enormous scale because the sheep or cow is the only experimental animal, or to have to make field trials a long distance from the laboratory, are reasons for slow progress and high cost of many of our agricultural studies.

Quite often the chemist who tackles such an investigation must do a considerable amount of preliminary work of a not very chemical nature in an attempt to define the essential nature of the problem and to pin it down to the laboratory bench. Among animal diseases the nature of the problem in hogget illthrift is quite indefinite, while bloat and facial eczema have been only partly dragged within the laboratory door. Despite the multitude of published theories about grass staggers and milk fever, the biochemical approach to these diseases is still uncertain.

The chemist in agricultural research must often therefore shelve his bench techniques and study his problem first as nature presents it to him. There is no indignity in this for the chemist is first of all a scientist and the devising of a small-scale biological test or a method of collecting and preserving samples may exercise his basic training, and contribute more to the solving of the problem, than his subsequent chemical work. But even when he is back to the test tube he is frequently not sure into which branch of chemistry he will be led. What looks like a mineral deficiency may resolve into an alkaloid toxicity, but before he decides that he may have to make false starts in several other fields. At this stage he frequently experiences what T. H. Huxley called the "tragedy of science"—the bereavement of seeing his beautiful hypothesis slain by an ugly fact. Usually he cannot choose an investigation because he has a special training in that field, or a leaning towards a certain technique. (On the other hand, where there is some knowledge of what is involved, an investigation may sometimes be better left until the right man is

available for it, until the emergence elsewhere of a suitable technique, or until someone produces a promising idea.) Finally, he may find in the words of Lewis Carroll that "the Snark is a Boojum"—that the chemical principle he has isolated or must estimate is something without well-defined properties, or belongs to a group of which little is known, and an extensive piece of fundamental chemistry may be needed before the final solution is reached. The chemist working on investigations of this sort is often at a disadvantage compared with some of his fellow chemists. The industrial chemist is usually less restricted by the biological variations which I referred to; the pure chemist is more free to choose his subject, to follow these phenomena which he can control readily, or to stay within the bounds of his specialised subject or techniques. To illustrate my remarks may I quote the experience of a fellow chemist. In his studies on alkaloids of the Leguminosae, a field of "pure chemistry" in which he has been able to be selective, he has made valuable contributions and published a large series of papers; in ad hoc investigations on toxic honey, paspalum ergot, and facial eczema, to which he has devoted much more time and no less skill, he has been unfortunate in encountering refractory principles and he would be the last to claim success in any of these. I feel perhaps a moral might be drawn from this—that the chemist engaged on an elusive problem, who perhaps occasionally feels some frustration or inferiority complex when he sees the successful research of contemporaries and colleagues, should turn from time to time to another investigation, particularly one which involves easy routine work in which he is less likely to be hampered by factors beyond his control. Not only does this increase his chance of achieving the satisfaction which results from the solution of a problem, but it also gives the conscious mind that fallow period on the main investigation during which ideas appear to germinate in the subconscious.

I have drawn attention to these problems not because the achievements of chemists in agriculture need excuse or apology but because it is important that they are recognised by both workers in agriculture themselves and their fellow scientists. From the days when the members of the Royal Society in 1665 drew up their 26 "Heads of Enquiries" concerning the application of science to agriculture, chemists have made outstanding contributions. Today the field for investigation is wider and more complex than ever before. In 1813 the French chemist Chaptal published a book entitled "Chemistry applied to Agriculture"[2]. After surveying the history of agriculture in his Introduction, Chaptal wrote: "It remains to us, in this day, to improve agriculture by the application of physical science. All the phenomena which it presents are the consequences necessarily resulting from

those external laws by which matter is governed; and all the operations which the agriculturist performs serve only to develop or modify these laws. It is, then, to the acquisition of a knowledge of these laws in order to calculate their effects and modify their action, that we ought to direct our researches."

One hundred and forty years later I commend his words to you.

COMPOUNDED SUBSCRIPTIONS.

Rule 6.2 makes provision for any Fellow or Associate to pay in one sum an appropriate compounded subscription which will entitle him to retain his status in the Institute during his lifetime without further payment except Branch subscriptions. The compounded fee is a multiple of the current annual subscription. The multiple depends on the member's age and a table of multiples prepared by an actuary has been adopted by the Council. Extracts from the table are as follows:—

Members's Age on 1st Nov.	Multiple
30	20.70
40	17.06
45	14.71
50	11.92
55	8.61
60	4.67
62	2.90
64	1.00

Two examples might be given to make the matter clear. A Fellow, aged 51, would pay the subscription (£3/3/-) multiplied by the multiple for his age, which is 11.30, that is, his compounded subscription would be £35/12/-. An Associate, aged 46, would pay £2/2/- x 14.19 or £29/16/-.

It will be noticed that the multiple for age 64 is 1.00. Whether members pay compounded subscription or not, Council has resolved the following:—"Any member who has attained the age of 65, is financial, and has paid subscriptions for not less than 10 consecutive years immediately prior to reaching that age, shall become a life member and shall be free from the payment of any further subscriptions." Owing to the difficulty of maintaining a watch on the ages of members, any wishing to take advantage of this resolution should make application to the Council.

SALARY SURVEY — JUNE, 1955.

By J. L. Mandeno, J. K. Dixon and G. A. Bottomley.

Salary surveys have been conducted at four yearly intervals; in 1944 (*Jour, N.Z.I.C., 8* (1944) No. 3.), 1948. (*Ibid., 12* (1948) 32; 132) and 1952 (*Ibid., 16* (1952) 144). This is actually the fifth survey authorised by Council, there being no record of the first survey carried out in 1939. Council agreed to this survey only three years since the last one as salaries overseas, particularly in Australia, have increased very markedly recently and there has been an increasing tendency for our chemists to leave New Zealand. This matter has concerned Council and in March they sent an urgent telegram to the Hon. Minister for S.I.R., asking him to give consideration to this situation. The Annual Report of the D.S.I.R. tabled in the House of Representatives in July of this year draws attention to the inadequacy of scientific salaries in the Department. The situation justifies the gathering of further salary information at this time.

The questionnaire and method of reporting results follows the same lines as the 1948 and 1952 surveys so that comparisons can readily be made. The questionnaire was sent out with envelopes stamped and addressed, for return during June, to 436 members and 340 forms were returned. Thus 78% of members replied compared with 66% in the 1948 and 1952 surveys. This has justified the extra expense involved in stamps and envelopes as just mentioned.

Returns: Table I sets out the replies and once more the greatest number is from Industry, followed as before by Government and University. There has been an increase in the number of replies received from the first four groups in the table, but all other groups are approximately the same as for 1952.

TABLE I.
Returns.

Group.	Male.	Female.	Total.
Industry	127	2	129
Government	101	9	110
University	38	4	42
Research Associations, including Cawthron Institute	16	2	18
School Teaching	17	2	19
Local Body	6	0	6
Private Practice	5	0	5
Retired	6	1	7
Unclassified	3	1	4
TOTAL:	319	21	340

Table II shows the average salaries for the age groups in several of the occupational classes. Average salaries have been computed by using the figure in the middle of each salary range (as shown along the top of Table III) as the actual salary for each member in that range. Errors introduced by doing this are probably small except in the over £2,200 group where this figure has had to be taken as the average. This would lower the average in the age groups concerned in Industry. Figure I shows the data from Table II in graphical form for Industry, Government, University and School-teachers. Due to lack of data at the bottom and top of the scales, the lines show only trends in the middle of the age group range. It is noteworthy that salaries in Industry are higher than they are in the Government, ranging from an average of about £140 higher in the lower age group to about £240 higher in the older age groups. University salaries are scattered around the curve for Industry, but do not go as high at the top of the range.

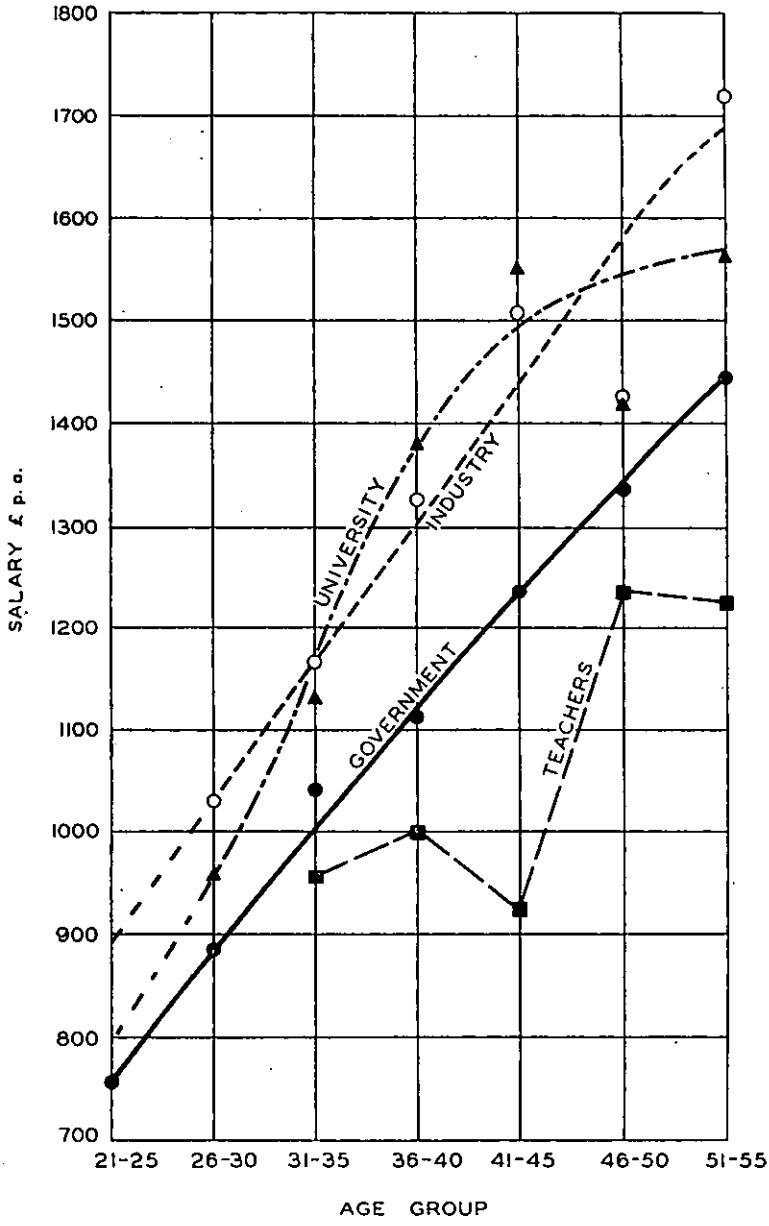
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
SALARY £ p. a.
UNIVERSITY
INDUSTRY
GOVERNMENT
TEACHERS
21-25
26-30
31-35
36-40
41-45
46-50
51-55
AGE GROUP

FIGURE 1.

TABLE II.

Comparison of 1948, 1952 and 1955 Salaries.

Age Group	Government.			Industry.			University.			School Teaching.		Research Assn.	
	1948	1952	1955	1948	1952	1955	1948	1952	1955	1952	1955	1952	1955
21-25	425	589	758	515	700	(1475)	525	714	—	—	—	—	(775)
26-30	480	707	888	571	828	1028	604	765	963	750	(925)	—	(1000)
31-35	617	871	1039	721	953	1166	779	960	1132	806	958	780	1106
36-40	672	974	1113	850	1086	1321	817	1537	1380	925	1000	1500	(725)
41-45	821	1093	1231	1100	1436	1506	908	1300	1555	1091	(925)	1075	(1450)
46-50	893	1163	1333	844	1171	1432	1370	1300	1425	1187	1231	—	1350
51-55	(850)	1275	1443	950	965	1715	950	1700	1567	(950)	1225	1550	1575
56-60			1350			(1700)			1550		1100		(1200)
61-65			1050			(1063)							
65 +						(1650)			(1850)				

Brackets indicate data insufficient for accuracy.

School Teaching salaries are somewhat lower than Government salaries. In Local Bodies, salaries range from £650 to £1,350 and ages from 21 to 45, while in Private Practice the ranges are £750 to £1,950 and 26 to 60 respectively. In neither case is the lower or higher salary tied to the lower or higher age group.

TABLE III.

Distribution of Salaries in Industry.

REMUNERATION.

Age.	£700 749	£750 799	£800 849	£850 899	£900 949	£950 1049	£1050 1149	£1150 1249	£1250 1349	£1350 1549	£1550 1749	£1750 1949	£1950 2200	Above £2200	Totals
21-25							1					1			2
26-30	2	1	1	4	3	9	6	4	1	2					33
31-35		3	1	1	2	7	4	3	2	6	2	1			32
36-40				1		3	3	3	3	4	2	1			18
41-45			1		1	1	1	2	4	4	1	1	1	4	21
46-50		1				1		2		1				2	7
51-55								1		2	3	2		2	10
56-60			1										1	1	3
61-65					1			1							2
65 +											1				1
Totals	2	5	4	6	7	20	15	16	9	19	9	6	2	9	129

TABLE IV.

Distribution of Salaries in the Government.

REMUNERATION.

Age	£700 749	£750 799	£800 849	£850 899	£900 949	£950 1049	£1050 1149	£1150 1249	£1250 1849	£1350 1549	£1550 1749	£1750 1949	£1950	Totals
21-25	2		1											3
26-30	1	4		5	8	5								18
31-35		2		2	1	7	4	1	2	1				20
36-40				2	2	4	4	4		3				19
41-45		1				2	1	8	6	4				22
46-50								5	6	2	2			15
51-55								2	1	2	1	1		7
56-60								1	1	2				4
61-65						1	1							2
65 +														
Totals		3	7	1	9	6	19	10	21	16	14	3	1	110

Table III shows the distribution of salaries in Industry. It has been suggested to us by a member that we should publish the mode as well as the mean salary for each age group. This information could be readily extracted from Table III for Industry by any members who may be interested. In the Government Service there are well defined salary scales, while in the University each academic post has its own salary range. These

are fairly well known. Despite this, it is considered that members may find useful information in Tables IV and V which show the actual salary distributions in the Government and the University. Similar tables for other occupational classes would probably reveal some individual salaries and so are not published.

TABLE V.
Distribution of Salaries in the University.
REMUNERATION.

Age.	£800 849	£850 899	£900 949	£950 1049	£1050 1149	£1150 1249	£1250 1349	£1350 1549	£1550 1749	£1750 1949	£1950 2200	Above £2200	Totals
26-30			3	3									6
31-35	1			1	2	2	2						8
36-40				1	1	1	3	2		2			10
41-45						1	1	2		1	1		6
46-50							2	1	1				4
51-55				1						2			3
56-60					1							1	4
61-65													
65 +										1			1
Totals	1		3	6	4	4	8	7	1	6	1	1	42

In the 1948 survey, "higher salaries" were considered to be those over £1,000; in 1952 the comparable figure was taken as £1,400, while in the present survey it is considered that this figure can reasonably be taken as £1,550. These figures, which have been arrived at from a consideration both of the Government Statistician's Index for "Weekly money wage rates for adult males", and of the salary groupings on the respective survey forms, all bear an approximately constant ratio to the "Consumer's Retail Price Index", being 1.01 in 1948, 1.10 in 1952, and 1.08 in 1955. Thus these three salaries viz., £1,000 in 1948, £1,400 in 1952, and £1,550 in 1955 are approximately parallel to the rise in cost of living. No account has been taken of the incidence of taxation. The percentage of salaries over these figures are shown in Table VI, so that a comparison with the

TABLE VI.
Higher Salaries.

Group.	No. in Group. 1948	1952	1955	No. Receiving. £1000+ 1948	£1400+ 1952	£1550+ 1955	% of Total in Group. 1948	1952	1955
Industry	74	99	126	14	14	26	19	14	21
Govt.	68	89	109	2	1	4	3	1	4
University	29	88	42	5	6	9	17	18	22
Research Assn.	—	12	18	—	3	3	—	25	17
School Teach.	38	20	19	6	1	—	16	5	0
Others	—	20	11	—	1	2	—	5	18

earlier surveys is possible. It will be seen that Industry and the University are again comparable and both considerably ahead of the Government. The figures for other groups probably do not mean much due to the small numbers involved. Salaries over £2,200 are received by nine members in Industry and by one in the University. There are no salaries above £1,950 in either the Government Service or in Research Associations, while the highest salaries for School Teaching are in the £1,350-£1,549 range. It is of interest that, whereas in the last survey salaries in all the age groups and in all classes of employment had just kept pace with the cost of living since 1948, in the present survey the average salaries in the lower age groups have slightly more than kept pace with the cost of living. In the older age groups (over 35) salaries have exactly followed the cost of living in the Government Service but are slightly ahead in Industry. All other classes of employment are difficult to evaluate because of the small number of returns.

A suggestion was made after the 1952 survey that more useful information would be obtained if salaries could be related not only to age, qualifications, etc., but also to degree of responsibility. Hence, on this occasion members were asked to indicate whether their duties were mainly at the bench or of an administrative nature.

In Table VII are given the results for Industry and the Government. In the University this question is really not applicable as was pointed out by some members in their returns. Other classes of employment are not included in Table VII as, due to the small number of returns, individual salaries might be revealed.

TABLE VII.

Average Salaries for Administrative and Bench Duties.

Age Group.	Industry.			Government.		
	Admin.	Bench.	Both Classes.	Admin.	Bench.	Both Classes.
21-25				—	758	758
26-30	1073	999	1028	—	888	888
31-35	1250	953	1166	—	1039	1039
36-40	1404	1050	1321	—	1118	1118
41-45	1643	1232	1506	1217	1286	1231
46-50	1550	1344	1432	1413	1248	1333
51-55	1715	—	1715	1490	1325	1443
56-60	(1700)	—	(1700)	1375	1325	1350
61-65	(1200)	925	(1063)	—	1050	1050
65 +	(1650)	—	(1650)	—	—	—

It will be seen that in the Government none of the younger members class their duties as administrative. In the older age groups administrative duties command slightly higher salaries. In Industry it appears that bench workers receive on the average about £300 to £400 less than those with administrative responsibility in the same age group.

The Government returns showed 89 bench and 21 administrative workers while Industry returned 48 bench and 81 administrative.

It is clear that while administrative men in industry command better salaries than in the Government, the bench workers in the Government, after a lower salary in the younger age groups, compare favourably over the rest of the range with bench workers in Industry.

Qualifications: Table VIII shows academic qualifications. The percentage of master degrees in Industry and Government is just over 50%, while bachelor degrees account for 40% in Industry and 24% in the Government. The University and Research Associations hold the highest percenage of doctors. This is in line with the last survey.

TABLE VIII.

Academic Qualifications. (Percentage in Brackets)

Qualification.	Govt.	Industry.	University.	School Teach.	Research Assn.
No Degree	2 (2)	5 (4)	0 (0)	0 (0)	1 (6)
Bachelor	26 (24)	50 (39)	1 (2)	7 (37)	3 (17)
Master	59 (53)	67 (52)	19 (45)	12 (63)	6 (33)
Doctor	23 (21)	6 (5)	22 (53)	0 (0)	8 (44)

In the 1952 survey there was little difference in salary between bachelors and masters in Industry, but in the present one it appears that on the whole masters receive a slighter higher salary than do bachelors. However, up to and including the 36-40 age group there is little difference. In the higher age groups which include the higher salaries the majority of returns were from masters. Those holding the doctor degree are all in the higher salary range.

In the Government, masters receive higher salaries than do bachelors but doctors seem to receive the same salaries as masters.

In the University all the returns except one were from masters and doctors and the latter form a higher salary group than do the former.

Table IX shows the numbers of Fellows and Associates in the various employment classes. The highest proportion of Fellows to Associates is in the University. In Industry, Fellows, as would be expected, are all in the older age groups, but they do not appear to receive higher salaries than do Associates. In the Government, Fellows are also in the older age groups and generally receive higher salaries than do Associates. In the University, all the highest salaries, with one or two exceptions, go to Fellows. In the Research Associations, Fellows are in the older age groups and receive the higher salaries.

TABLE IX.
Fellows and Associates.

	Govt.	Indus.	Univ.	School Teach.	Res. Assns.
Fellows	15	12	12	0	5
Associates	95	117	28	19	13

Females: It will be seen from Table I that only 21 returns were received from female members. In the Government and University no distinction is made between salaries for males and females. In Industry, however, as was the case in the 1952 survey, the two returns from female members show them to be well below the lowest male salary in their respective age groups.

Superannuation: In the Government, University, Research Associations and local bodies, employees have the right, if they wish, to join the Government superannuation scheme. If the contributors join before the age of 30, the rate is 5% and this is subsidised £ for £ up to a limit, by the employer. For later entry into the scheme, the rate rises 1% for each five years over thirty with a maximum rate of 10% from the contributor.

TABLE X.
Superannuation (Industry Only).

Estimate of Employer's Contribution to Superannuation or Insurance as a Percentage of Salary.								
Percentage Contribution	0	½-2½%	3-4½%	5%	5½-7%	7½-9%	10%	Not Known.
No. in Group	34	8	8	43	13	11	9	3

From Table X it is seen that in Industry some 34 members out of a total of 129, i.e., 26% do not belong to a subsidised scheme. The common rate of employer subsidy is 5% as it is in the Government, and 33% of members get this. The rates, however, vary from ½-2½% to 10%, where there are nine members.

JUBILEE OF THE INSTITUTE.

As mentioned in the last issue of the Journal, it was intended that this October issue should take the form of a special Jubilee issue to suitably mark the 25th Anniversary of the founding of our Institute. However at the last meeting of Council it was decided that a separate Jubilee Publication would be more appropriate. Accordingly this Publication is now being prepared and will, it is hoped, be distributed to members of the N.Z.I.C. during November. An interesting series of articles has been arranged covering not only the history of chemistry in New Zealand, but also the present status and future of our profession. It is hoped that the booklet will receive wide publication and copies will be on sale at 4/- each.

DR. J. MELVILLE

Chemistry in New Zealand will suffer a considerable loss early in 1956 when Dr. J. Melville leaves his present position as Director of Grasslands Division, D.S.I.R. to become Director of the Waite Agricultural Institute in Adelaide.

Dr. Melville was born in Otago and attended the Milton District High School, Otago Boys' High School, and the University of Otago, where he graduated with first-class honours in organic chemistry in 1930. Both for his thesis work and the John Edmond Fellowship, which he subsequently held, his research work was on the essential oils of New Zealand native plants. On his record he was awarded a travelling scholarship in science and spent the years 1932-4 at the Imperial College of Science and Technology under Prof. A. C. Chibnall, F.R.S., working on the synthesis of labile glutamine peptides. After he had graduated Ph. D. (Lond.) he was awarded a Commonwealth Fellowship and in 1934-6 he worked at Yale University and the Connecticut Experiment Station with Professors L. B. Mendel and H. B. Vickery on protein chemistry and plant metabolism. On his return to New Zealand in 1936, he was appointed Assistant Chemist at the Wheat Research Institute.

In 1938, Dr. Melville was appointed Biochemist at the Plant Chemistry Laboratory, Palmerston North, and in the next year was confirmed as Director of this Laboratory. Upon the retirement of Mr. now Sir Bruce Levy in 1951, Plant Chemistry Laboratory and Grasslands Division amalgamated, and Dr. Melville became Director of the enlarged Grasslands Division. Since then he has been largely responsible for enlarging the scope of research carried out at this Division, and his progressive policy has resulted in the Plant Chemistry Section possessing one of the best equipped biochemical laboratories in the country.

Dr. Melville was a Foundation Member of the Otago Branch of the Institute of Chemistry, and Secretary of the Canterbury Branch from 1937 to 1938. He was elected a Fellow in 1943, became Vice-President in 1949 and President in 1950.

NEWS AND NOTES.

Dr. W. E. Harvey, the present treasurer of the Wellington Branch, will became Asst. Secretary to the N.Z.I.C. replacing Mr. B. G. Stanley, who recently left for England.

At a recent meeting of the Wellington Branch, new associates in this area were presented with their associate certificates. It is hoped that this small ceremony will give new members an opportunity of becoming known to the other members of the Branch.

Mr. A. F. A. Adams, since 1939 on the staff of Canterbury Agricultural College, Lincoln, initially as an analyst and subsequently as a Research Officer, was recently appointed Lecturer in Agricultural Chemistry. Mr. Adams who has had wide experience in soil and plant analysis and in animal nutrition will be responsible for organising a chemical services section to handle chemical work for several departments at the College and he will continue to work in close association with the Department of Soil Science under Professor T. W. Walker.

Mr. J. L. Grigg is leaving shortly to take up the position of chemist engaged in plant nutrition work, at the Agricultural Research Institute of the New South Wales Department of Agriculture, at Wagga Wagga.

Dr. R. W. Bailey has been awarded a Ph.D. from Birmingham for his work on enzymatic synthesis of bacterial polysaccharides, and is expected back at the Rukuhia Soil Research Station soon.

Dr. D. S. Letham has also obtained the Ph.D. from Birmingham, and is taking up a position at the Plant Diseases Division at Mount Albert.

Dr. O. K. Sewell another recent Birmingham Ph.D., returned to this country for a short time, and has now gone to England to take up a position with I.C.I. Dyestuffs Division.

Professor J. I. Graham, Head of the Coal Research Department of the School of Mines and Metallurgy, Otago University, is visiting Great Britain and the Continent on Refresher Leave. While in Britain, Professor Graham's headquarters will be at the Royal School of Mines in London, but he will also be visiting other Universities which possess mining departments as well as certain mining areas where special techniques are in operation. He hopes to return to New Zealand by way of the United States.

Mr. J. Vaughan, Senior Lecturer in Organic Chemistry at Canterbury University College, has been awarded a Fulbright Travel Grant and an United States Public Health Research Fellowship. He will work at the University of Michigan and will also visit a number of other Universities on a Carnegie Grant. He also plans to spend four months in Britain.

Professor J. Packer, Professor of Chemistry at Canterbury University College, has been appointed Professorial Board Representative on the College Council.

Mr. H. A. L. Morris has resigned from the Dairy Laboratory, Department of Agriculture, Auckland, to take up the position of Production Manager for Birdseye Foods Ltd., Riccarton. Mr. Morris was also Auckland Branch Editor for the Journal.

Dr. H. C. Holland, Managing Director, of W. Sutherland & Co. Ltd., tanners and merchants of Auckland, has been elected President of the New Zealand Tanners' Association.

Mr. Lionel S. Bush, Chemist for W. Sutherland & Co., Ltd., of Auckland, left last month on a flying visit to Germany, United Kingdom, and United States of America to study latest developments in the leather trade. Mr. Bush expects to be back in New Zealand at the end of October.

B.Sc. HONOURS DEGREE.

Members may be interested in a description of the new B.Sc. Hons. Degree as supplied by the Canterbury Branch Editor. The degree will be a four-year course and can be taken in any of the normal science subjects, but is restricted to Canterbury University College. It involves greater specialisation in the chosen science at an earlier stage than in the present degree. This specialisation starts in the second year and, instancing chemistry, students will actually take it to a higher standard than in the present Master's Degree. There will be only a limited choice of other subjects with many of them compulsory. Some of these other subjects, e.g., Mathematics, will not be the ordinary degree subjects, but will be especially arranged to suit the Honours course. The Degree will not be a research one in that there will be no thesis but the holder will be able to proceed directly to a Ph.D. It does not replace the present B.Sc. and the M.Sc. courses which will continue as in the past, and the two courses will in fact be complimentary with only a limited number of selected students taking the new Honours Degree. The course has been approved by the Senate and pending the signature of the Governor-General-in-Council, it is hoped to commence the course at C.U.C. next year.

CHEMISTRY TEACHING.

With the growing interest in the teaching of chemistry in schools the summary of a discussion on this subject sponsored by the Otago Branch and reported by the Otago Branch Editor is of considerable interest. Two Dunedin Science Masters, Mr. J. W. McChesney, of Otago Boys' High School, and Mr. J. M. McCready, of King's High School, were invited to present their viewpoints.

Mr. McChesney discussed the influence of the introduction of General Science in Secondary Schools, which replaced the older system where chemistry or physics were the chief science subjects taught. He considered that the present system has advantages over the old and that chemistry, physics and biology are each taught to quite a high standard giving the intending chemistry student a background of general knowledge which would be of greater value than chemistry alone developed to a higher standard.

Mr. McCready introduced a different aspect of teaching science by discussing laboratory organisation. He considered that in new schools laboratories are of generally good design; allocation of funds was now more or less left to the decision of each headmaster and he thought them sufficient to provide a piece of "luxury" apparatus perhaps once a year.

Finding time to do all that was required of a science teacher was a very real difficulty—there was never enough to round things off. Opinion varied about the value of laboratory assistants—some members of the branch thought they were capable of quite advanced work and assembly of apparatus while others thought that their value was strictly limited without supervision which meant a further demand on time. Discipline was considered to be more important in the laboratory than in the classroom because of the greater possibility of accidents and the importance of good housekeeping, especially where the laboratory was shared by a number of classes and teachers. The increased size of classes presented another problem and classes of about 40 were using laboratories designed to hold about 30.

On the question of salary, it was considered that science teachers were inadequately compensated for the extra work required of them, and further that the teacher who first took his degree before going to Training College had reached middle age before his gross earnings equalled those of his fellow teachers without academic qualifications.

INSTITUTE PRIZES.

THE I.C.I. PRIZE.

The 1955 I.C.I. Prize has been awarded to Mr. R. P. Hansen of the Fats Research Laboratory, Wellington. This is given for the best contribution of published work by a member of the Institute during the last five years. Mr. Hansen is the third member of the Fats Research Laboratory to win this prize,—two former holders being Dr. F. B. Shorland and Mr. L. Hartman.

A graduate of Victoria College, Mr. Hansen, began his career in the Animal Research Laboratory of the Agriculture Department where he worked with Dr. Shorland. In 1940, he joined the N.Z. Army serving until December, 1945, when he returned and took up his present position in the Fats Research Laboratory. Here, once again with Dr. Shorland and with Miss N. J. Cooke, Mr. Hansen worked on the isolation and identification of a number of branched-chain fatty acids and normal odd-numbered fatty acids from butterfat and from meat fats, together with a comprehensive survey of seasonal variations in the fatty acid composition of butterfat. It was this work which constituted the major researches for which the prize was awarded. In collaboration with Mr. A. G. McInnes, Mr. Hansen has also been working on the steam distillate from meat fats in which a consecutive series of lower volatile fatty acids from C_2 to C_{10} has been shown to be present.

In addition to his chemical interest, Mr. Hansen is a keen Rugby follower. Himself a New Zealand University blue, he is now club captain of the Victoria College Football Club.

MORCOM GREEN, EDWARDS PRIZE.

This prize is donated annually by Messrs. Morcom Green and Edwards Ltd., Onehunga, and is for the encouragement of original work by young chemists in pure or applied chemistry. Particular note is taken of work

done in the preceding 12 months. The award this year was made to Dr. A. D. Campbell, an associate of the Institute and Lecturer in Chemistry at the University of Otago.

Dr. Campbell has published several papers on new methods for the synthesis of polycyclic aromatic compounds and as holder of the Corday Morgan Commonwealth Fellowship recently spent a year at Glasgow University working with Professor J. W. Cook, a specialist in this field, particularly concerning the carcinogenic activity of such compounds.

Since 1951, Dr. Campbell has been in charge of the Microchemical Laboratory at the University of Otago. Here small scale analyses are carried out for workers in the other University Colleges or in Research Institutions in New Zealand.

As a member of the Otago Committee and particularly as Secretary of the Examinations Committee, Dr. Campbell has done a considerable amount of work for the recognition of Laboratory Assistants by examination.

GENERAL MEETING

ABRIDGED MINUTES OF A GENERAL MEETING OF INSTITUTE MEMBERS HELD AT MASSEY AGRICULTURAL COLLEGE ON WEDNESDAY, AUGUST 24th, 1955, AT 2 P.M.

PRESENT:

K. M. Griffin, President, in the Chair, W. G. Hughson, Hon. General Secretary and a good attendance of about 70 members.

APOLOGIES:

The President said that the main apology in this Jubilee year came from our first President, Professor Emeritus W. P. Evans, who at the age of 91 years (in November next) is enjoying very good health and maintaining his wide interest in scientific matters. He also maintains his well known cryptic style and sent a message of good wishes to the Conference trusting that the Institute might never have a President with less tact or less initiative than its first President.

Other apologies were received from the Vice-President, Dr. M. M. Burns, who had to leave the Conference for a Senate meeting; Dr. L. H. Briggs, Dr. F. B. Shorland and T. A. Rafter, who were attending an A.N.Z.A.A.S. meeting in Melbourne and representing our Institute; Dr. Askew and Dr. Elsa Kidson, who could not get out of Nelson on account of aerodrome conditions, and Miss M. P. Bartrum, J. Ricketts, C. G. W. Mason, J. M. C. Tingey, B. G. Stanley, F. J. T. Grigg, H. J. Wood, and J. L. Mandeno.

MINUTES:

The Minutes of the previous Annual Meeting were briefly summarised, taken as read and confirmed.

PRESIDENTIAL REMARKS:

The President welcomed the large attendance to the meeting and in his bright and breezy style surveyed the main activities of the Institute and gave credit to the large amount of voluntary work done by members particularly those handling jobs like the Journal, the Examinations and the Professional Status and Salary Reports. He then drew attention to the large number of "Personals" appearing regularly in the Journal and said that time precluded his referring to the movements of so many members. He felt however that he would like to make special mention of the appointment as Principal of the new Cashmere School, Christchurch, of one of our members who, when he was a member of Parliament and Minister for D.S.I.R., had done a great deal for scientists in New Zealand, T. H. McCombs.

PRESENTATION OF PRIZES:

The President announced that the I.C.I. Prize, 1955, had been won by R. P. Hansen, of Fats Laboratory, D.S.I.R., Wellington, and the Morcom Green, Edwards Prize, 1955, by Dr. A. D. Campbell, Chemistry Department, University of Otago. Amid applause the recipients came forward to be congratulated by the President.

ASSOCIATES ELECTED:

The President announced the names of Associates elected to membership of the Institute at the recent meeting of Council.

REPORTS FROM SUB-COMMITTEES OF COUNCIL:

Membership Committee: The President paid a tribute to the Committee for its work in maintaining the standards of admission.

Professional Status Committee: This Committee submitted a long report on the relative standards of admission to the various Commonwealth Institutes of Chemistry. Prof. Slater thought that Branches should give some thought to the question of nominations for membership being supported by sponsors who could be written to for confidential reports. Dr. Nauen asked if it was proposed to go beyond Commonwealth countries. The Secretary replied that it was desired in the first place to obtain unanimity within Empire Institutes. Dr. Dixon stressed the importance of the New Zealand rule requiring two years of practical experience subsequent to the completion of the Bachelor's Degree, before an applicant is admitted to membership.

Journal: The Editor, Dr. McGillivray, gave a general description of what he and his editorial committee, proposed to publish in the special Jubilee publication later in the year. He also drew attention to the comparatively large number of scientific papers delivered before Branches each year and asked for the co-operation of members in obtaining those which were available for publication in the Journal. It was stated that we have at present 11 pages of advertising, but could do with 20 pages if members can assist in any way.

Salaries: It was stated that this was the fifth Salary Survey conducted by the Institute. Dr. Dixon explained certain slight amendments which would be made to the report and to the graphs. He stated that 80% of members had responded to the request sent out which was a very high figure and a good response. Figures for Teachers were not sufficient to enable conclusions to be drawn. Dr. McDowall suggested that the Committee might draw comparable graphs for Australian scientific salaries. The Secretary stated that an Australian Salary Survey had just been authorised and the results would be examined when they came to hand. In reply to a question by E. S. Borthwick, asking why the figures for Government Chemists did not agree with the classification list, it was pointed out that the latest Classification List was almost two years old. Mr. Joiner asked if figures for Government and University could not be set out in table form similar to Table III.

Examinations Committee: C. R. Edmond, Secretary of the Committee, had forwarded the report set out on the agenda. Dr. Bottomley and Dr. Campbell were present as committee members. Dr. Bottomley stated that there were more entries than ever before for the examination. A certain amount of criticism was levelled at the standard of the examination for the Laboratory Assistant's Certificate. Mr. Parr considered it was only equivalent to School Certificate and while satisfactory as a preliminary examination it does not lead anywhere. The Government also was concerned about the relative standards of our examination as compared with

other Government examinations. Other members considered that for the purpose for which it was set up the L.A.C. Examination was fulfilling its purpose. The Committee has recently obtained information from Great Britain regarding the British Association for Technicians and Dr. Campbell saw something of its operations while at Glasgow recently.

Standards Committee: Most of these committees have virtually ceased to function, but like the Timber Committee they are available if required for a specific enquiry. Mr. Stonyer submitted a report.

Employment: Mr. Borthwick said there was little activity apart from requests from abroad regarding possibilities of employment in New Zealand.

Patents: Dr. Nauen gave the meeting some information regarding recent changes in the Patent Act.

U.N.E.S.C.O.: J. A. D. Nash, who represents us as well as the D.S.I.R. on the National Commission of U.N.E.S.C.O, and Dr Falla are the only scientific representatives and it is regretted that our recent nomination of Professor Parton to fill a vacancy was not successful.

COMMONWEALTH INSTITUTES:

We continue to receive Journals from other Commonwealth Institutes and maintain fairly close liaison with Australia particularly as pertaining to A.N.Z.A.A.S. and overseas visitors.

CHEMISTRY IN SCHOOLS:

Mr. Mummery explained his ideas, but it was felt that owing to shortage of time it would not be possible to discuss them fully and that in any case it would be more valuable to have Branches discuss them and report back to Council and to the next General Meeting.

Resolved: THAT the following resolution be referred to Branches and that delegates come prepared to discuss the matter at the November meeting of Council:—

> "That the New Zealand Institute of Chemistry considers that secondary school pupils should receive greater opportunities for studying science. With this aim in view the Institute favours a scheme for general science as a compulsory subject over the first two years, embracing chemistry, physics, biology, and botany.

Thanks: Dr. McDowall thanked the President for his leadership during the Conference and also other Officers of the Council for the work done during the year.

COUNCIL MINUTES.

ABRIDGED MINUTES OF A MEETING OF COUNCIL-IN-PERSON OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY (INC.) HELD IN THE BOARD ROOM, WHARERATA, MASSEY COLLEGE, ON MONDAY, AUGUST 22nd, 1955, AT 2 P.M. AND AT 8 P.M. AND ON THURSDAY, AUGUST 25th, 1955, AT 5 P.M.

PRESENT:

K. M. Griffin, President, in the Chair; Dr. M. M. Burns, Vice-President; C. V. Fife, Auckland proxy; N. T. Clare, Waikato delegate; Dr. F. H. McDowall, Manawatu delegate; J. A. D. Nash, Wellington proxy; F. H. G. Johnstone, Canterbury delegate; Dr. G. A. Bottomley, Otago delegate; V. J. Wilson, Registrar; W. G. Hughson, Hon. General Secretary-Treasurer. Dr. W. A. McGillivray, Editor, was present for part of the time.

CONFERENCE, 1955:

Dr. F. H. McDowall, Manawatu delegate and Chairman of the Conference Committee, reported that about 117 registrations had been received for this year's Conference. Arrangements had been made for the Mayor and Professor Peren to attend the opening ceremony.

Resolved: THAT the Palmerston North 1955 Conference Committee be congratulated on arrangements made for Conference and for the 25th Jubilee Celebrations.

CONFERENCE, 1956 — AUCKLAND:

President to discuss with Auckland Committee the relative advantages of the first or second week of the August holidays for Conference, 1956.

A.N.Z.A.A.S. DUNEDIN, JANUARY, 1957:

Dr. H. N. Parton will be Secretary of Section B.

SALARIES:

Attention was drawn to the report from the Salaries Committee which would be submitted to the General Meeting.

At the adjourned meeting of Council subsequent to the General Meeting it was *Resolved*: THAT the amendments made by the Sub-Committee and the two extra tables suggested by Mr. Joiner be incorporated in an amended copy of the Salary Report, one copy to be sent to the Public Service Commissioner and one airmail copy to Dr. Hamilton with a letter of appreciation of his statement which appeared in the Press during the Conference relating to top salaries in Commonwealth countries.

Resolved: THAT the Salary Report be published in the next issue of the Journal and that 100 reprints be ordered by Council.

Resolved: THAT the Salary Sub-Committee for 1956 be located in Dunedin and that the nominations for this Committee be:—Dr. G. A. Bottomley, Professor H. N. Parton with J. L. Mandeno as Wellington representative. These nominations will come before the Annual Meeting of Council in November.

EXAMINATIONS COMMITTEE:

Certain Government Departments interested in the qualifications of laboratory assistants, and also some of our industrial chemists are questioning the standard and hence the recognition attributable to our Laboratory Assistant's Certificate examination.

A large number of alternative 'Arts' have been added to the syllabus in recent years. The Committee is of opinion that, for the purpose for which it was inaugurated, the present examination should stand. It is, nevertheless, prepared to assist any other agency in the setting up of examinations for different purposes. It was learned with pleasure that Dr. A. D. Campbell is again with the Committee after his sojourn in Glasgow. While in Great Britain, he took an interest in the examinations and in the Association for Technicians. This information will be placed before the Committee.

PRIZES:

I.C.I. Prize:—Resolved: THAT the recommendation of the examiners (The President and the Vice-President) be accepted and that the I.C.I. Prize for 1955 be awarded to R. P. Hansen, B.Sc., of the Fats Laboratory, D.S.I.R., Wellington.

Morcom Green, Edwards Prize:—Resolved: THAT the report of the examiners be received (President and Vice-President) and that the Morcom Green, Edwards Prize for 1955 be awarded to Dr. A. D. Campbell, Lecturer in Chemistry at Otago University. The examiners raised a number of points which could be added to the Prize regulations to facilitate the work of the examiners.

Resolved: THAT the President and Vice-President set out suggested amendments to the Prize Regulations (Regulations 3.1, 3.2, 3.3), in the agenda for the November meeting.

PROFESSIONAL STATUS COMMITTEE:

In the absence of Mr. Ricketts, Auckland delegate and Secretary of this Committee of Council, the President introduced the report and stated that the bulk of the work had been done by Dr. J. C. Andrews.

Resolved: 1. THAT the Professional Status Committee be thanked for the large amount of work done in producing the report. 2. THAT the report be sent in the first place to the Secretary, R.I.C., London. 3. THAT essential points be outlined to members at the General Meeting. 4. THAT Branches be asked to consider the report and especially the question of Sponsorship for the November meeting of the Council.

JUBILEE RECOGNITION:

The Hon. General Secretary reported that in company with J. A. D. Nash and the Registrar, he had taken morning tea with the first President of the Institute, Professor Emeritus W. P. Evans and his two daughters at "Reculver", Rosetta Road, Raumati South. The President said arrangements were in hand for official recognition of the 25th Jubilee Year of the Institute at the Social Evening to be held during Conference.

CHEMISTRY IN SECONDARY SCHOOLS:

It was reported that Mr. Mummery would speak to this question and make some suggestions at the General Meeting.

JOURNAL:

The Editor, Dr. W. A. McGillivray, joined Council at the evening session and reported on Journal affairs.

Jubilee Issue: An outline was given of the material and authors suggested for either the October issue of the Journal or for a special publication.

Copy: The Editor invited Branch Committees and Branch Editors to assist in acquiring copy from the many lectures given per annum before Branches.

Resolved: THAT there be a special Jubilee publication to be produced before Christmas and that it be offered for wide publication, e.g., to Schools at 4/- per copy.

Resolved: THAT Council record its thanks to the Waikato delegate for his offer to prepare an index to the Journal and will be glad to receive a suggested scheme for next agenda.

MEMBERSHIP:

Election of Associates:—*Resolved*: THAT the following be admitted and enrolled as Associates of the New Zealand Institute of Chemistry:—

BARNES, Fred, M.Sc., N.Z. Forest Products Ltd., Box 14, Tokoroa. (Chief Works Chemist).

CHRISTIAN, Kenneth Robert, B.Sc., Ruakura Animal Research Station, P.B., Hamilton. (Assistant Biochemist).

FISCHER, Alfred, B.Sc., Chemistry Department, Canterbury University College, Christchurch. (Assistant Lecturer in Organic Chemistry).

MARTIN, James Keith, M.Sc., Biochemistry Department, Medical School, King Street, Dunedin. (Assistant Lecturer).

SMILLIE, Miss Mary Martin Forbes, M.Sc., Dominion Laboratory, Wellington. (Assistant Chemist).

SPENCER, Miss Hilda, B.Sc., Patents Office, Stout Street, Wellington. (Chemical Patent Examiner).

Applications for Leave: Dr. H. C. Clark, Auckland University College, was granted leave with remission of subscription for two years. (National Research Scholar). B. G. Stanley is on transfer to the Shell London Office possibly for two years and was granted leave of absence.

Resignation: The resignation of O. J. Baker, Auckland, was accepted with regret.

Local Membership: A report from Auckland was tabled regarding action under the Rule which requires that Local Members who obtain the necessary qualifications must apply for the Associateship. The Hon. General Secretary was requested to advise the Auckland Branch Committee that its action was perfectly in order and Council commends them for the action taken. The Auckland report will be considered at the November meeting.

Resolved: THAT the attention of Branches be drawn to the fact that according to Rule 21.7, as Local Members become eligible for Associateship they be invited to apply for full membership in the Institute.

COMPOUNDED SUBSCRIPTION:

Resolved: THAT the Table of Multiples prepared by Mr. Beckingsale, Government Actuary, Wellington, be accepted for use in determining compounded subscriptions, but that each application be considered on its merits. The Registrar was asked to prepare a suitable article for the next issue of the Journal setting out details of the scheme for the information of members.

NOMINATIONS FOR VICE-PRESIDENT AND HON. GENERAL SECRETARY:

Nominations for these positions should be in the hands of the Hon. General Secretary one month before the Annual Meeting of Council in November. Waikato, Manawatu, Wellington and Otago wished to register their nomination of W. A. Joiner, Acting Secretary of the Department of Scientific and Industrial Research, Wellington, for the position of Vice-President for the year 1956.

ASSISTANT HON. GENERAL SECRETARY:

Resolved: THAT B. G. Stanley, who is on transfer to London, be thanked for his services as Assistant Secretary over a period of two years and that Dr. W. E. Harvey be appointed to the position. (Dr. Harvey is Treasurer to the Wellington Branch Committee and a Lecturer in the Chemistry Department at Victoria University College).

COUNCIL BUFFET TEA:

At an interval between the afternoon and evening sessions of the Council-in-Person Meeting, Council was invited by Dr. and Mrs. F. H. McDowall and family to a buffet tea to meet the Conference Committee and Dr. C. M. Johnson, Fulbright scholar at the Waite Institute, Adelaide, and from Berkeley University, California. Subsequent to the meeting, Council was the guest at supper of Dr. and Mrs. W. A. McGillivray.

Resolved: THAT Council record its very sincere appreciation to Dr. and Mrs. F. H. McDowall and family and to Dr. and Mrs. W. A. McGillivray for their very much appreciated hospitality on Monday, August 22nd.

BOOK REVIEWS.

ELECTROCHEMISTRY IN BIOLOGY AND MEDICINE.—Edited by Theodore Shedlovsky. Published by John Wiley & Sons, Inc., New York. 369 pages. Price 10.50 dollars.

This book originated in a Symposium on Electrochemistry in Biology and Medicine held in 1953. The papers given in that Symposium are not necessarily presented in the original form, but have in some cases been enlarged and modified. The Editor's introduction, giving a brief review of the early history of the subject, is followed by eighteen chapters by various authors, each discussing some aspect in which he is particularly interested.

The initial five chapters deal with the behaviour of membranes, charged and uncharged, particularly with respect to the potentials which can arise as a result of their selective permeability. These topics lead naturally to the next group of five chapters which deal with the generation and maintenance of bioelectric potentials in living systems, in which such selective membrane action plays a fundamental role.

A series of rather unrelated subjects follows, some of which, dealing with physico-chemical measurements on pure proteins, seem somewhat out-of-place in a symposium such as this, and contain little that is not readily found elsewhere. The book concludes with a group of chapters on electrical techniques in physiology, such as electrocardiography and electroencephalography.

Some of the matter in these essays is not new, but a specialist writing on his own subject, particularly one in which work is actively progressing, is usually stimulating, and that is frequently the case here. Not all the subjects will be of interest to any one reader, but for most workers on the physiology of either animal or plant cells, the earlier part of the book will provide plentiful material for discussion and argument.

The book could not be considered to be a standard text—the subject is perhaps too diverse and too controversial for any such text to be expected as yet—but it would be a stimulating addition to the library of any Institute whose workers are concerned with any of the many aspects of cell physiology.

——J.W.L.

THE KINETIC BASIS OF MOLECULAR BIOLOGY, by Johnson, Eyring and Polissar. Published by John Wiley & Sons, New York, 1954. Price 15.00 dollars.

This book is interesting to a physical chemist as an introduction to the study of the rates of certain biological processes. The major emphasis is on the application of the "absolute reaction rate" theory of chemical reactions to biological processes. Briefly this theory asserts that during the course of any simple or complex reaction there is one point of maximum energy the passage of which controls the rate. The passage of reacting molecules through this critical state is believed to have the universal rate kT/h, and in consequence of this the overall rate is proportional to the concentration of these "critical complexes". It is further assumed that the "critical complexes" are in equilibrium with the reagents and that it is legitimate to calculate their concentration by the usual methods of thermodynamics and statistical mechanics if one can. But as one cannot (save in certain very simple reactions where approximate treatments have succeeded), one must be content to calculate the properties of the critical complex from the observed rate, and the effect of temperature and pressure on it. Thus if the reaction rate rises and then falls as the temperature rises, we deduce that the heat absorbed on formation of the

transition complex passes from positive to negative values. If the rate rises with increasing pressure the critical complex is formed with a reduction in volume. That it is commonly suggestive to view a reaction rate in this way, is the burden of a considerable part of this book.

Other methods must be used to elucidate the separate steps of a complex mechanism, and to find the slowest step under any stated conditions. Particular methods are mentioned in the later chapters, but the book does not give and does not claim to give a balanced coverage of these matters. In this respect the title is disowned in the preface, to the disappointment of the reviewer..

A good knowledge of the terminology of advanced physical chemistry is expected of the reader.

—W.S.M.

NUCLEAR PHYSICS, by Irving Kaplan. Published in the A-W Series in Nuclear Science and Engineering by Addison-Wesley Publishing Company, Inc., February, 1955. *Price* 10.00 *dollars.*

The author states in the preface that his object has been to write an elementary, yet coherent, account of nuclear physics suitable as an introduction to this field. The product can be confidently recommended to chemists as an extraordinarily lucid and orderly presentation of the present state of knowledge in this rapidly-expanding field which is of fairly direct interest to us all.

The book is divided into three parts. Part I, which contains seven chapters, is concerned with the background of nuclear physics. The chemical foundations of atomic theory are first concisely presented and this is followed by a consideration of electrons, X-rays and natural radiations. The development of the concept of the nuclear atom by Thomson and Rutherford is described and the contribution of Moseley in relating nuclear charge to the position of an element in the periodic table by means of the characteristic X-ray spectra of the elements is quite fully developed. The failure of classical physics to describe the niceties of atomic phenomena and the development of the quantum theory of radiation and the special theory of relativity is then treated in two chapters. Part I closes with a more detailed treatment of the relationship between atomic spectra and atomic structure.

Part II contains ten chapters and deals with the physics of the nucleus. The failure of the proton-electron theory of the constitution of the nucleus and the discovery of the neutron are first described and this is followed by a consideration of isotopes. Natural radioactivity and the laws of radioactive transformation are introduced very briefly as these phenomena are to be discussed in a much wider context in later chapters. Successive chapters are then devoted to artificial nuclear disintegration and to the discovery of artificial radioactivity. The properties of the radiations from radioactive substances are then assembled in three excellent chapters on alpha—, beta—, and gamma—decay respectively. In the final two chapters of this section the author has brought us to the stage where the details of nuclear reactions provide clues to nuclear structure and where nuclear models can be confidently discussed.

In Part III, five chapters are devoted to particular applications and special topics. These are neutron physics, nuclear fission, sources of nuclear energy, the acceleration of charged particles and isotope separation. All these topics are of wide interest and could be quite well comprehended without exhaustive reference to earlier chapters. Four appendices are included, notably values of physical constants and an admirable nuclide chart.

There are many diagrams, graphs and figures throughout the text and these are of a high standard. The text is thoroughly documented with a list of general and particular references at the end of each chapter. Problems are also given at the end of each chapter.

We have reached the stage where radiochemistry and radiophysics have penetrated into many phases of research and scientific application. It is therefore fortunate that at this time a text of such wide comprehensibility should have come forward.

—G.W.B.

NEW METHODS OF ANALYTICAL CHEMISTRY, by Ronald Belcher and Cecil C. Wilson. Published by Chapman & Hall, London (1955). *287 pages. English Price 30/- net.*

Methods selected are presented in a uniform manner with theoretical considerations and working details, and are in general those not yet available in standard text books. In contrast to the modern tendency to depend on indirect physical or instrumental method of analysis, the authors have restricted their manual to chemical methods and chiefly to those inorganic in nature. It is interesting to find that a number of the "classical" methods have been modified and improved in the interests of speed and accuracy.

Subjects covered in the seven major sections are:—Separation by precipitation; Separation by extraction; Inorganic precipitants; Organic reagents; Indicators (27 pages on a wide range of general and special indicators); Titrants; miscellaneous methods.

There are over 500 references to published articles [chiefly to those appearing in American and European Continental Journals between 1933 and 1952] and an author and subject index.

—C.R.B.

BIOCHEMISTRY, AN INTRODUCTORY TEXT BOOK, by Felix Haurowitz. Published by John Wiley & Sons, New York. 485 pages. Price 6.75 dollars.

As in most other sciences, in biochemistry we already have a wealth of student texts and authors frequently indicate in their prefaces some diffidence over adding a further volume. This book is one for which no apology is offered and for which none is needed. It is the type of introductory text for which a real need has been felt. The subject is developed in a most logical manner, a reasonable knowledge of chemistry is assumed so that space is not wasted on material that could better be covered in texts on physical or organic chemistry, and the presentation throughout is clear and concise. The emphasis is placed on intermediary metabolism, but the author does not lose sight of the organism as a whole. An interesting innovation is the early consideration of the mechanisms of biochemical reactions. These are discussed before carbohydrates, lipids, proteins, etc., and this treatment would appear to have considerable merit since the chemistry and metabolism of each of the main body nutrients can then be considered simultaneously. The treatment of Enzymes and of Mineral Metabolism is most extensive. One rather brief chapter is devoted to Energy Balances and Nutrition and the concluding chapter deals with Human Biochemistry covering the chemistry of body fluids, organs and tisues. The book is strongly recommended as a student text and a very readable introduction to biochemistry. It does not claim to be a reference book, but contains adequate references to more advanced texts and review articles.

—W.A.McG.