JOURNAL OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY

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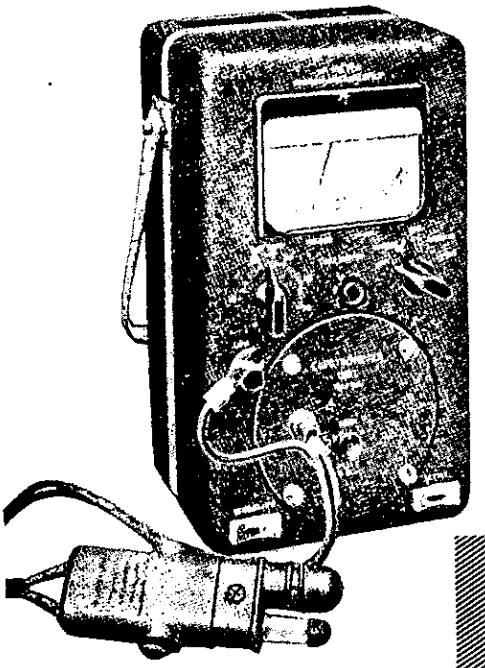
ARSENIC

Arsenic is a steel-grey, brittle, crystalline substance that is sometimes found free in nature. It also exists combined with sulphur or oxygen as an impurity in the ores of lead, copper or gold, and is produced commercially as a by-product of winning these metals. By far the largest producer is a mine at Boliden in the North of Sweden, but arsenic is also recovered during mining operations in Australia, Brazil, Canada and the United States. Arsenic may suggest weed-killers – or even " Old Lace "– but, though a large amount of the world's output is used for killing weeds and insects, it is also employed in many other ways. It is used, for example, in glass making, and by the textile industries in connection with dyeing and calico printing. Arsenic is also an ingredient of some sheep dips, wood preservatives and medicinal preparations. I.C.I. uses arsenic for hardening the lead shot that is loaded into sporting ammunition, and for making wrought copper alloys of which I.C.I. is one of the Empire's largest producers.



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INSTITUTE EXAMINATIONS AND TRAINING THE CHEMIST.

"Training the Chemist" is featured in this issue of the Journal, as the Editorial Committee feels that this vital aspect of our profession should receive the close attention of the Institute.

The Institute is considering conducting its own examination for the Associateship. Are we, as an Institute, ready to take over the responsibility of assessing members of our profession in this academic way? We must bear in mind that if the Associateship of this Institute is to be a valuable distinction to members, then candidates must be properly assessed before being granted the Associateship. This, in the great majority of cases, has been left to the University to assess; but if we are to conduct our own examinations, then a standard of equal merit to that adopted by the University must be met and maintained.

Applicants for examination by the Institute must be trained for this examination. Are we, as an Institute, going to accept this responsibility also? If we do not, will we be justified in examining a candidate and, from the results of this examination alone estimate his worth and potentiality as a member of our profession?

Professor Soper has mentioned in his article that he considers the training given to chemists is inadequate. Mr. Maskell Smith comments on the desirability of training in administration and personal relationships. Should not the Institute and members of the University Science Faculties discuss these extra requirements in the curricula?

Professor Soper raises the point that while the University makes no bones about training doctors and engineers for a definite profession, it is unwilling to do the same for chemists. Perhaps a way may be found out of this and other difficulties in

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Prof. C. K. Ingold, D.Sc., Ph.D., F.R.S., President of the Chemical Society, who is at present in New Zealand under the auspices of the British Council. (The above photograph was taken while Prof. Ingold was in Auckland).

the wider use of the term "chemical engineer" with a broader than usual connotation of the term. No industrial chemist succeeds without some knowledge of engineering (usually gained after he has taken a position) and this could well be one of the units of the broader and longer course suggested. It seems to us more important than an extremely wide and facile knowledge of analytical methods. Maybe the Canterbury Branch could enter the discussion here.

That a wider training of the chemist is desirable is admitted by most of our profession. Why then should the potential chemist, who in endeavouring to widen his practical and applied chemical experience by practising chemistry in industrial and government laboratories, desires to study "part time," be discouraged or even prevented from doing so? The standard of attainment of "part time" chemists need not be lower, and in most cases is equal to that of his "full time" counterpart.

Consider the experience of a graduate "part time" chemist. Firstly he has received at least four years' supplementary training in analysis and plant control. Secondly, in his contact with men, factory or laboratory, he gains an invaluable insight into human nature, which he cannot get in the secluded atmosphere of the University. Thirdly, he has had to give of all his energies in the attainment of his degree, and has consequently graduated with a very sound basis for his future in his profession.—G.M.W.

OXIDISING ENZYMES OF WHEAT

by R. Stern.

Summary of Chairman's Address to the Canterbury Branch, 23rd March, 1952.

The work discussed in the address began at the Wheat Research Institute in 1946, in collaboration with Mr. L. H. Bird.

In 1946 there was a world shortage of wheat and a lack of shipping. These circumstances prompted the N.Z. Government to increase flour production from locally grown wheat, by raising flour extraction from about 73% to 80%. One of the drawbacks of loaves made from high extraction flour is their greyish crumb colour which the public dislikes. For centuries past whiteness of crumb, in the consumer's mind, has been associated with good quality of bread and vice versa. It seemed justified therefore to study the mechanism of crumb darkening, and if possible to find means of preventing it.

Several years before the present experiments were begun, Hullett and Stern found that wheat germ suspensions or pastes, when fermented with yeast, turned pink after a few hours, and later became purple and eventually blackish blue. In this earlier study the process was found to be of an enzymic nature, as it does not take place in boiled germ pastes. The present experiments, in their initial stage, led to the conclusion that the same enzymic darkening of wheat germ is the cause of dark crumb colour. High extraction flour is much richer in wheat germ fragments than low extraction flour.

Our task now was to elucidate the mechanism of this enzymic process. Some of our experiments showed that darkening can occur in unfermented germ suspensions or pastes provided their pH lies between 5.1 and 6. We came to the conclusion that the role of fermentation in the production of the dark colour is merely that of lowering the pH to a value favourable to the enzymic reaction.

Contact with air or oxygen is an essential precondition of the darkening process which therefore only takes place at the surface of germ suspensions. Wishing to obtain more of the dark material we used the Waring Blendor in an attempt to increase the surface in contact with air. The result, however, was negative and this was found to be due to inactivation of the enzyme system concerned. The Waring Blendor with its 10,000 to 14,000 r.p.m. destroys many (not all) enzymes through denaturation of their protein components.

As contact with air is so essential for darkening to occur, it appeared reasonable to assume that oxidising enzymes are involved. Further experiments with the Waring Blendor gave certain clues to the nature of these enzymes.

Treatment in the Waring Blendor of a freshly-made and suitably acidified wheat germ suspension prevented darkening as has been reported above. A suspension, however, which had been allowed to stand until a dark top had formed turned purplish brown when stirred in the Waring Blendor. These observations, together with the finding that peroxidase withstands destruction by intensive stirring, led to the following interpretation of the enzymic reaction: Darkening is due to peroxidatic oxidation of a substrate (phenol or amine) present in wheat germ to a dark quinone. The H_2O_2 necessary for the peroxidatic oxidation is produced by a special enzyme mechanism more labile than peroxidase.

This working hypothesis explains the observations mentioned above: A fresh wheat germ suspension cannot darken when put through the Waring Blendor, because the agitation soon destroys the mechanism which produces H_2O_2. When, however, some H_2O_2 has been allowed to accumulate peroxidatic quinone formation will take place in the Waring Blendor until further supply of H_2O_2 stops owing to enzyme destruction.

The following observations are also in support of this interpretation: When a small quantity of a peroxidase substrate, e.g., catechol or *p*-phenylene diamine, is added to a suitably acidified wheat germ suspension or paste, the darkening reaction is speeded up and intensified. When, on the other hand, H_2O_2 is mixed into a germ suspension, a pink colour, very similar to that of the first stage of the darkening reaction, develops throughout the mass. These experiments suggest that in a wheat germ suspension the peroxidase substrate and the H_2O_2 produced by enzyme action are limiting factors and that the darkening reaction can be intensified by the supply of either of them.

Wheat germ is rich in catalase as well as in peroxidase, both of which enzymes attack H_2O_2. Hence, the hypothesis of peroxidatic darkening would be invalidated if it were shown that catalase rather than peroxidase reacts with the limited amount of H_2O_2 available. Qualitative and quantitative tests showed that, under the conditions obtaining in the wheat germ suspensions and pastes used, peroxidatic oxidation, i.e., quinone formation, suppresses catalase activity until all of the substrate is oxidised. Then only does catalase take over.

The experiments carried out in this connection, besides demonstrating the relation between peroxidase and catalase activities, also gave clear evidence for the postulated presence in wheat germ of a peroxidase substrate. When H_2O_2 is added to wheat germ suspension an initial suppression of catalase activity accompanied by darkening indicates that a peroxidase substrate is being oxidised to a quinone.

It is known that a group of respiratory enzymes, the so-called yellow enzymes, produce H_2O_2 using atmospheric oxygen as a hydrogen acceptor. It appears probable that a system of this group is the source of H_2O_2 postulated by our hypothesis. This is made more likely by the fact that the yellow enzymes contain vitamin B2 (riboflavin phosphate) as their active group and that wheat germ contains a fairly high amount of this vitamin.

The position is complicated, however, by the presence of a dye in wheat germ having indicator properties. The existence of this dye has been known for years, but our observations suggest that it functions in the yellow enzyme system. This view is based mainly on the remarkable coincidence of its colour change with a change in the respiratory activity of the enzyme system. Over the range pH 5.0 to 6.3, in which the dye is colourless, there appears to be production of H_2O_2, the ultimate hydrogen acceptor being atmospheric oxygen. This is the range in which darkening, ascribed to peroxidatic quinone formation, is taking place. In the pH range of 6.3 to about 9, the indicator dye is yellow and anaerobic enzyme activity takes place by which hydrogen is passed on to a suitable acceptor, not to atmospheric oxygen. At these higher pH values the quinone produced in the more acid range functions as hydrogen acceptor and is thereby reduced to a colourless compound. In this way the darkening occurring at lower pH values, in presence of oxygen and of the colourless form of the indicator dye, is reversed in the higher pH range, in absence of oxygen and in presence of the yellow form of the indicator dye.

Further evidence to the effect that the yellow indicator dye is a component of the enzyme system under discussion can be seen in the following observations. The yellow dye as well as riboflavin is dialysable and heat stable. The enzyme system can be inactivated by dialysis. When the heat stable dialysate is recombined with the heat-labile dialysed residue, darkening occurs again. This is also true when the riboflavin in the dialysate is destroyed by irradiation.

Wheat is known to contain respiratory enzymes capable of producing quinones. These enzymes are tyrosinase and cyto-

chrome oxidase. Our experiments showed that these do not account for the darkening observed in wheat germ, so that the mechanism postulated earlier appears even more likely.

As wheat contains peroxidase and an enzyme producing H_2O_2 these are sufficient to account for the observed oxidation of ascorbic acid added to doughs or germ suspension, and it is unnecessary to assume the presence of ascorbic acid oxidase.

There is one further aspect to the darkening problem, namely, non-enzymic condensation of enzymically formed quinone. When darkened wheat germ suspensions or extracts made from them are boiled to destroy all enzyme activity they darken further on aeration until they are nearly black. It is interesting that these nearly black extracts have acquired oxidative properties—they liberate iodine from KI—whereas the original wheat germ was strongly reducing.

It has been known that oxidising conditions promote dough maturity, and oxidisers like potassium bromate are added to flours to achieve such conditions. Our experiments show that the normal process of dough maturing is one of enzymic oxidation. It has been shown in earlier work carried out at the W.R.I. that elimination of the strongly reducing glutathione was one stage of this process. The present work makes it likely that the production of a quinone having oxidising properties is a further stage.

Darkening of bread crumb could be prevented by shifting the pH of the dough to a value at which the enzyme system producing H_2O_2 does not function. In practice this shift—below pH 5 or above 6.3—was not feasible as it affected the taste of the bread.

THE TRAINING OF THE CHEMIST.

By Professor F. G. Soper, Chemistry Department, University of Otago.

At intervals in connexion with the profession of chemistry, two discourses recur. One is on the organisation of the profession of chemistry, the other is on the training of the chemist. In a sense they are interconnected because both are related closely to the status of the profession of chemistry. Indeed it is difficult to discuss the training of the chemist without a clear idea of what the professional chemist stands for in society, or without a clear idea of what one hopes the status of the chemist may become.

Sometimes at dinners at Annual Meetings we honour the toast of the profession of chemistry and its advancement, and I wonder what precisely it is we are wishing for. There may be an element of hoping that the organisation of chemists will secure for its members a larger share of the total national income. But I think that this is a minor wish. The main wish no doubt is for increased social usefulness and prestige — prestige of course being society's evaluation of one's worth. To-day one can see from the entry of students into the various faculties that financial reward is by no means the major driving force in the choice of a profession. The three main factors which decide entry into a profession I would say, are (a) the intrinsic interest of the work, (b) the desire to do something useful and helpful in the world, and (c) the prestige of the profession.

So when we wish our profession well I am going to assume that what we are wishing, is firstly that the interest of our members in chemistry itself may continue to increase. Such an increase of interest entails advancement in the science of chemistry, better organisation, better meetings, better papers and better discussions. All stimulate that *interest* in chemistry. And secondly, we are wishing that the usefulness and value of chemists in the community will increase—this is the usefulness and prestige side—and to that end we are wishing that our members will have those high standards of conduct and will possess that type of education, both general and specialised, which will enable them to play their full part in the life of the community.

So inevitably any wishes for the continued advance of our profession must sooner or later end in a discussion of education, and it is obvious that if we want increased prestige for the profession, it will not be sufficient for the chemist only to know chemistry; he must also be a fully educated man to play his part in community life.

It is therefore with some surprise that one hears sometimes of well-meaning members of our profession advocating the training of the future chemist by his combining an initial position in chemical industry or as laboratory assistant with part-time studies at the University; indeed, in preference to a University attendance at some technological institution. The result may be an exceedingly useful technologist, so packed with the facts and details of pure and applied chemistry that there is little room left in the mind for those skills and knowledge that are so much required if the chemist is to play his part in the community. I think that to-day we have a choice of educating men for positions analogous to those of foremen, or on the other hand of educating

them so that they pass through the foreman stage to positions of managerial type, or possibly to positions still on the scientific side from which they can speak on a level with the administrators.

In New Zealand industry, the chemist does not pass often enough from the technical to the administrative side. Possibly due to various factors at the present time, the accountant has had the more useful training for administration. Nevertheless, it is my opinion that N.Z. industry would benefit if more managerial staff possessed, in addition to their ability as executives, that full knowledge of the technical implications and possibilities which can only come from a fundamental scientific training plus practical experience. In comparison with other countries we in New Zealand seem to lag behind in this respect.

The first essential for the chemist beyond his adequate training in chemistry and in allied sciences, is the ability to communicate his ideas in clear concise English. How often is he lacking in his command of English, in his ability to hold the thread of argument, in crispness of statement! If only the budding chemist whilst still at school could be encouraged to develop himself in English expression rather than to advance in physics and chemistry how much better it would be. So much of his future will depend on the clarity with which he can express himself. Instead of further study of language he advances at school to first year Univeristy standard in his sciences with the result that when he starts his University course he feels how dull and disappointing it is—"I've done all this before I came here."

If, on the other hand, it is impossible to teach a command of English adequately in the school, owing to immaturity of the pupil or to inadequacy of instruction, then there seems no escape from the conclusion that the study of English must be continued at the University possibly within the scientific department, possibly in other fields which would extend the mental horizons of the student. The alternative is the production of the inarticulate and narrow specialist who not only cannot share ideas with the man in the street, or with a member of some other profession, but who is even in danger of losing contact with members of his own profession.

The British Universities for the most part, say that the young University student is adequately grounded in general education when he leaves school, and therefore they concentrate on the technical training of the would-be scientist. On the other hand the American Universities are much concerned with the inadequacy of the general education of the student as they receive

him and have followed the lead given by some of their best Universities into requiring a common background of introductory University courses in Science, Social Science, and the Humanities as part of the requirements of a Bachelor's degree irrespective of whether the student is advancing in Arts or Science.

Take as an example of the training of the scientist and engineer the course required by the Californian Institute of Technology. Like all American courses for an initial degree it extends over four years. Indeed it is that difference in time between four years in the American University and the three years in this University which makes it possible to include these cultural or general education courses, whilst keeping a reasonably high standard in the specialised subject. Here is a paragraph from the Californian Technical Catalogue, 1951/52, p. 80: "The Institute offers two four-year undergraduate courses, one in Engineering and the other in Science, both leading to the Bachelor of Science degree. . . The inclusion in the curriculum of a large proportion of non-scientific and non-technical subjects is one of the fundamental elements in the Institute's education policy. The purpose of these studies is to enlarge the student's mental horizon beyond the limits of his immediate professional interest and thus better qualify him to realise his opportunities and fulfil his responsibilities as a citizen and a member of his community.

"Under the general designation of the Humanities (courses) . . . include literature and composition, history and government, economics, philosophy and psychology. To these the student devotes about one fourth of his time during his undergraduate years (and if he proceeds for the degree of Master of Sicence he continues with elective subjects in the Humanities during his fifth year). In addition to these academic and semi-academic pursuits, the Institute encourages a reasonable participation in student activities of a social, literary or artistic nature, such as student publications, debating, dramatics and music, and all undergraduates are required to take regular exercise, preferably in the form of inter-collegiate or intramural sports. In short, every effort is made in the undergraduate section of the Institute to carry on a well-rounded integrated programme, which will not only give the student training in his professional field, but will develop character, ideals, breadth of view, general culture and physical well-being."

The Californian Institute of Technology is a good example of the scientific technical institute which no doubt started out to give a technological education and soon realised that if its graduates were to advance to the higher positions more was needed

than advanced technological training. In spite of all the emphasis on the cultural side scientific standards are very high and the graduate school is strong. Some 40% of the total student population are taking post-graduate courses.

It will be clear from what I have said that if we want the profession of chemistry to advance I am advocating education of the would-be chemist in its fullest sense. The suggestion recently in the Auckland Branch discussion was for a separate Institute of Technology with apparently an emphasis on facilities for the part-time student, an Institute of Technology which could become a live centre for practising scientists and train our members for the profession of Chemistry.

Ideas of a possible more intensive technological training for the scientist have been recently mooted in Great Britain and in "Nature," of May 31st, there is reference to Sir Raymond Priestly's report on the future of technological education in Britain. He is strongly against the idea that Britain should set up a technological university along the lines of the Massachusetts Institute of Technology. Apart from the diversion of already inadequate funds he feels that it would duplicate "a type of education which American educationalists consider to be already outdated and which they are trying to bring into line with the more conventional type of university."

Of course a technological university of the M.I.T. type and a technical college of sufficient standing to train efficiently the chemical technician are poles apart. Probably, as Sir Raymond Priestly suggests, the day of the technological university is past, because even a graduate technologist needs a general education. But on the other hand, every country even with modest industrial activity, needs something more than High School and University. In Britain, there are Technical Colleges of high standard devoted to evening work, from which external degrees of the University of London may be taken,* or certificates obtained in the more technical subjects from the London City and Guilds' organisation. These technical colleges of Britain are much more concerned with technical training than are our New Zealand technical colleges.

If technical colleges of British standard existed in New Zealand, the problem of the part-time student would be largely solved.

* Venables, J. R. I. C., April 1952, however, says that it is now virtually impossible for a part-time student to succeed in obtaining the external B.Sc. degree of the University of London.

We in our New Zealand Institute of Chemistry have quite a difficult problem ahead. The Associateship of our Institute apart from applicants with overseas training is granted to two groups: (a) to those who have taken a B.Sc. degree in which Chemistry has been studied satisfactorily for three years and who have had subsequently two years' experience in chemical work, or (b) to those who, not having a degree, have passed Chemistry III. plus certain other subjects.

Now our Institute is considering preparing examinations in lieu of the University Stage III. Chemistry examinations. The question which is so neglected in this matter is "who trains the candidate?" If the condidate is a worker in the Dominion Laboratory you may say that he will be subjected there to a thoroughly satisfactory practical training. But where is the line to be drawn? You may be content with the training of the candidate from the Dominion laboratory, but what about the would-be candidate who is in a factory? In Great Britain, the practical training of the candidate for the Associateship of the Royal Institute of Chemistry, is examined very thoroughly by lengthy and searching practical examination. Presumably our New Zealand Institute would similarly conduct a searching practical test. If the candidate is not attending the University, practical training for this examination will be required, and one may have to examine the candidate from the government laboratory with its greater variety of equipment and techniques alongside a candidate from a commercial laboratory with perhaps limited equipment. But the technician from industry should not be at a disadvantage as against one from a government department. To institute examination without providing instruction is open to serious objection and a serious charge of unfairness. In Great Britain the situation is different. There the examination for the non-university student is a fair one, because adequate instruction is provided.

I would now like to turn more especially to the subject of the University training of the chemist in New Zealand. I have already suggested the advantage of more training in English and in cultural subjects. If, however, we are to maintain a reasonable standard in chemical training we cannot put more into the existing three-year course, and I should strongly welcome a move to institute a four-year course for the B.Sc. degree. The time allotted to Chemistry in a three-year degree course is already dangerously low in comparison with overseas Universities.

In Scotland in the three-year science course the degree structure is based on four Stage I. subjects, all taken in the first year,

two Stage II. subjects taken in the second year and the third year is devoted to the special subject.

In three years the time which can be devoted to that task mistress of a subject Chemistry, is, on the Scottish plan, quarter-year in the first year, half a year in the second and one year in the third year, a total of 1.75 years.

This in duration of time is very similar to a typical course in a good American college in which Chemistry is the choice of main subject in a B.Sc. degree. To take the course at Yale for example, the time devoted to chemistry is set out in the following table:—

Year	1	2	3	4	Total
Total courses taken	5	6	7	6	
Courses in Chemistry	1	1	4	5	
Time	1/5	1/6	4/7	5/6	Total 1.8 years

The contrast with the University of New Zealand is a marked one. The most common degree structure for the science degree is three units in the first year, three in the second, and two in the third year. The time devoted to chemistry, remembering the equalitarian creed that the demand of one unit is equal in all respects to the demand of any other unit, is in the first year one-third, in the second year, one-third, and in the third one-half, a total of 1.17 years. There are certain degree structures which allow of more time being devoted to chemistry.

One is to take in the third year Chemistry III. and Applied Chemistry, thus obtaining a total of 1/3 + 1/3 + 1 years = 1.67 years of chemistry in the three-year course; the other is to combine Chemistry and Biochemistry. The latter, unless four years are taken offer results in a course deficient in Mathematics owing to the requirement of passing in Zoology and Botany prior to taking Biochemistry.

Before discussing the desirable sciences in a University course for a chemist I would first like to refer to those branches of work in which our New Zealand chemists are engaged. In 1948, Dr. J. K. Dixon and Mr. J. L. Mandeno conducted on behalf of the Institute a Salary Survey in which they circulated all members and received 210 replies, as an indication of how chemists are employed in New Zealand. The grouping is as follows:—

Group	Male	Female	Total
Industry	75	0	75
Government	63	5	68
University	26	3	29

Local Body	4	0	4
School Teaching	14	2	16
Private Practice	2	0	2
Research Assn. or Inst.	8	1	9
Retired and Unclassified	7	0	7

One thing which is clear from this distribution of employment, bearing in mind the diversity of work in Government research departments and in the industries of the country, is that any training given by the University can only be a basic training. The University in this country, whatever may happen overseas, cannot hope to train brewing chemists, paint chemists, chemists for the leather industries, fertiliser works chemists, or any special brand of chemist. All it can hope to do is train a chemist and give him a sufficient background for him to be able to read, mark, and learn those applications of chemistry to a particular industry. But common to all such varied work is the need for ability in those old-fashioned crafts; qualitative and quantitative analysis. This is the main common factor in the future work or at least in the future professional responsibilities of the chemist. To acquire competency in the analytical art requires considerable time and patient endeavour and I doubt whether other sciences which are treated on an equality with chemistry for degree purposes have anything in their practical courses approaching the extensive practical training which should be given to the student advancing in Chemistry. It will be noted that I say "which should be given to the student in Chemistry," for unfortunately with the demand not only of the subsidiary subjects taken for the degree, but also of the illustrative practical work required for an understanding of to-day's physical chemistry or for acquirement of to-day's preparative and purification techniques, there is less time available to-day for such training than when I was myself a student.

We in Otago make good use of the course in Applied Chemistry to give the student further training in analytical work and a student who takes in his third year Chemistry III. and Applied Chemistry to complete his Science degree receives a highly satisfactory and all-round training in analytical chemistry, which will be the basis of so much of his future work for a time at least, whether in Government laboratories, industry or in research.

Although I am convinced that the chemist requires the education that only the University can give, not everyone engaged in analytical control work should be thought of as a chemist. A young person can be trained to estimate for example, alkalinity in soap samples and can become quite expert in a limited range of

estimations. He should be regarded as a technician. In Britain the technician can receive a good training at the various Technical Colleges. With a liberal attitude towards education there should be generous provision for the good and keen technician to pass from Technical College to the University. This is quite common in Britain.

For some time I think there has been a conflict of purpose in the training of the chemist in the University. As is clear from the distribution of chemists in the various fields of work, comparatively few chemists who pass through the University will have the opportunity of working on the real frontiers of chemical advance. In the main they will be using well tried techniques and a good deal of not highly advanced chemistry. There is needed in the world a kind of chemical general practitioner who is well trained in analytical procedures and an understanding of the physical and chemical background with a sound knowledge of inorganic, physical and organic chemistry, with a good all-round education including the ability to put forward his ideas in clear English, with perhaps some knowledge of how to set up a small laboratory and the standards and apparatus required; some knowledge of how to find his way about in a library and some guidance from his colleagues as to the ethics of the profession. Such men would fit a large number of the positions normally available whether they are in Government laboratories, private industry or school teaching. The world wants the type of graduate who can be interested in general ethical questions as well as in technological advance, and hence the need too for good general education.

Unlike the training of the medical and dental student the training of the chemist is not specially designed to convert the student into a member of a profession. The training is more designed to prepare the student to carry out research in chemistry. This is particularly noticeable in some overseas Universities. In the training of a medical general practitioner, the frontiers of physiology and of his chemistry are seldom reached unless the point at issue is one likely to affect clinical treatment. The emphasis in training is on the production of a graduate who can render some immediate service to the community, but with sufficient basic medical science for him to continue his reading with understanding.

Now it may be argued that in medicine there is always certain standard work to be done that never changes whereas a science advances rapidly and its application advances and alters rapidly. Hence the general practitioner in science needs to be

taken as far as possible in the science before he can be regarded as useful. I would tend to doubt this from my own small experience.

It may help to focus ideas of standards if I suggest that what is expected of any holder of a Bachelor's degree whether in science, medicine, or mining is that he should possess certain practical skills special to his craft and that he should be able to follow and understand the scientific papers published in his professional journals. If the chemist is a brewing chemist then he should with his Bachelor's degree be able to understand the papers in the "Journal of Brewing." If he is just a chemist he should be able to understand the papers published in "Chemistry and Industry." The standard of the Master's degree is, of course, higher, and it must in the nature of things become increasingly specialised. From the holder of the Master's degree one expects ability to read and understand a paper published in the specialist scientific journals in his field of interest. If the M.Sc. has been taken in physical chemistry, the holder of the degree should be able to understand papers in the "Transactions of the Faraday Society."

I doubt whether, if we accept these standards, we can drop very much from our present three years' courses in chemistry. But perhaps the courses could be oriented more towards the special requirements of students likely to disappear into industry, government labs. or school teaching as soon as the B.Sc. degree is completed. I think that if we thought of our students in this way as disappearing when the Bachelor's degree is obtained, as in fact Medical and Dental graduates disappear, more instruction to enable them to meet their practical problems, more instruction for use and more reference to the profession of chemistry might be given to them. But as is well known this is not the situation in science—the best students stay on the master's degrees and research. With the attempt to reach M.Sc. standard in four years there must be great pressure on University lecturers to put as much as possible into the B.Sc. course. Every subject seems to be much clearer to the lecturer if it is brought right up-to-date and yet in many cases it is the methods of investigation rather than the actual results which will be of most benefit to the B.Sc. student.

In the United States some of these problems have been recognised, but it is too early to say whether they have been solved. Certainly chemistry is presented to the student at a slower rate than in the United Kingdom or in this country. There are four years required for the B.Sc. degree and then graduate school

commences. This post-graduate course of three years combines high level instruction and a research thesis resulting in a Ph.D. degree.

I hope that we in New Zealand can extend our B.Sc. degree course to cover four years' training. In the interests of our profession some extension of the University training is desirable. And with greater fluidity in our courses with, for example, the introduction of some half units such as, say, Calculus from Maths. II. and another half unit covering the use of the polarising microscope from Geology II. (to pick out material of special value to the chemist from existing courses), together with some training on the humanities side, a greatly improved degree for the chemist might result.

The following is an extract from the Chairman's address given by Mr. G. Maskell Smith, of the Wellington Branch.

Having pointed out that the academic training being given to graduates must be of satisfactory standard, because of the considerable movement of trained men to good positions overseas, Mr. Maskell Smith continued:—

"In one respect the training of the chemist does not fit him for the job he will be called to undertake. It is realised that the young graduate may not and, in fact, will not be an experienced and expert analyst. Some years of practical experience will be necessary, and his judgment may not be as good as that of the more experienced man. We know that he may be over enthusiastic in some ways, but, whilst enthusiasm must be encouraged, it has to be tempered with judgment.

"There is, however, one serious lack in the training of many chemists and that is in the skill of what one might call the business aspect of chemistry. What is the chemist trained for? Is it to be a research worker in one of the back rooms of the University governed by a kindly Professor, who has plenty of funds at his command? If the majority of chemists are to do just this then the present training is probably adequate.

"If the chemist is to practice in the field of applied research as in the Government and in industry his training has been inadequate. He has had not training in how to organise a research project, how to estimate costs and the time involved, how to arrange finance, or how to present his reasons for wishing to undertake a project in a manner which will be convincing to his

superiors. However good a chemist is, unless he can sell his ideas to someone else he has failed. That someone else may be an accountant, a company director, or a member of Parliament, and the story must be placed before him so convincingly that he will be prepared to give the chemist the facilities to get on with the job. Having got the job started and producing satisfactory results the chemist is still probably faced with the necessity of convincing the same man that further expenditure is warranted and necessary to exploit the work and reap its full benefit. It is at this stage that many projects fall down and one of the frustrations of the chemist's life is met. Much of this is the chemist's fault which should be overcome—MUST be overcome if we are to do the best for our job and our profession.

"In this respect we are lagging behind the engineering profession for our graduates receive no preparation for an executive position. Whereas in the engineering journals one is frequently coming across articles on organisation and administration similar information rarely, if ever, appears in our chemical literature. Although we, as chemists, are primarily concerned with matter, its form and composition, to achieve any value from our work we must act through human beings, in most cases non-chemists. Should not our chemist, therefore, receive some training in the arts of salesmanship and psychology and in administration, so that his contact with his fellow man will be to their mutual benefit?

"There probably are many difficulties in putting some such extension of studies into a graduate course and there will be many arguments against it, but the necessity for this training remains and if it is not available in a suitable form through the University then this Institute should endeavour to remedy the deficiency by its own activities.

"Everyone who completes a course of study in chemistry is not cast in the same mould. All are not going to be research workers in a University although some will attain that eminence in their career. Some people are not suited to administrative work and while sufficient training hammered home might turn them into reasonably competent administrators, they would find no happiness in such work and it would become a strain on them, with consequent serious effects to their health and the efficiency of their administration. As soon as possible it is necessary to find out one's aptitudes and to develop them to the best advantage. If one is keen on fundamental research and talented at it then such is one's career. If one is keen on such work but not talented at it, then one's energies should be directed into some

other avenue just as satisfying, but where one's abilities can be used to greater advantage. In fundamental research work one MUST be outstanding to be of any use at all. In the same way unless a man shows some interest and ability at administrative work he should not accept such a position."

The following comments on this subject are also of interest:

A reader who is not an Associate or a graduate has written to the Editor stating that although he is engaged on the same work as graduates and has to show them the work, he cannot enter the Professional Division. He says that the inference from Prof. Worley's statement that technicians are simply workers able to do what they are told, is that graduates do not do what they are told!

CORRESPONDENCE

The Editor,
Journal of the N.Z.I.C.

Sir,—I am glad to act on your request (p. 80) for comment on the subject of "The Training of Chemists." For our present purposes, however, I will confine this comment to the teaching of chemistry to New Zealand residents who seek eventual employment in New Zealand. The simplest approach will be to make points in the form of questions.

1. *Is the N.Z.I.C., as defined by its code and regulations, a sufficiently inclusive body to represent the majority of N.Z. chemists?* No, its code and regulations are those of a society of chemical consultants and analysts which has a broad similarity to the Royal Institute of Chemistry.

2. *In this connection, has the N.Z.I.C. outgrown its code and regulations?* I think it has, as it now includes the majority of New Zealand's professional scientists who have had advanced chemical training, and has become the most suitable existing body for canvassing the opinions of N.Z. chemists.

3. *Should it be the aim of the N.Z.I.C. to maintain this broad representation?* I believe so; for many years there will be too few chemists in N.Z. to support fragmented chemical societies such as have become established overseas, even if this were desirable. I do not feel that our proper function is to compete with the N.Z. branches of these societies in their respective fields.

4. *Has this view any influence on the qualifications to be required of candidates for membership of the N.Z.I.C.?* Inevitably; I would argue that we should admit organic chemists, inorganic chemists, physical chemists, bio-chemists, agricultural chemists, etc., equally with analytical chemists, provided all have the minimum qualifications in theoretical chemistry (N.Z.I.C. Regulations, 1.1).

5. *Where can the necessary training in practical chemistry be obtained ?* Except in analytical chemistry, nowhere in N.Z. outside the University.

6. *Is it desirable to challenge the University's status as the sole trustee of higher education in N.Z.?* I believe emphatically that it is not desirable. The generally cordial and friendly relationships which characterise the N.Z.I.C. are founded on the knowledge that no New Zealander has enjoyed exclusive educational privileges, and they depend on the absence of envy and rancour which spring from the existence of privilege. Co-operative endeavour is not a worthless asset in our community.

7. *Are the constituent Colleges of the University acting effectively as such trustees?* In the present period of full employment, yes. On the evidence of the University teachers, who are best able to judge, few potential science students are at present debarred from taking the course of their choice. One may reasonably doubt the continuance of this national generosity to students when vacant positions become more easy to fill.

8. *Should we favour continuance of the present bursary system?* I think we should not. A man's contribution to the world he lives in depends partly on his ability and partly on his willingness to work, the latter quality being often of greater importance in the end. Our methods of selection for training should show less deference to infant prodigies and give more weight to the habit of continuous and determined effort. Bursaries to assist entry to the University should terminate after one or (at most) two years, and be succeeded in suitable cases by bursaries based on the student's performance in his selected specialty at this mature age. Facilities for part-time students should be available in the larger centres, especially for the first phase of the course, which might (if need be) be extended over a longer period. Bursaries for the second phase of the course should be open to competition from students beginning as part-time students.

9. *Can this be accomplished within the University of New Zealand?* I believe it can if we recollect that N.Z. can employ relatively few chemists whose attention is given mainly to the

latest advances in their science, but can employ many who will use chemical techniques to advance allied sciences or industries. It can employ many "chemical practitioners" (to employ Professor Soper's apt expression). Perhaps we New Zealanders should now start thinking of partitioning the University with respect to the Faculties of Science, Agriculture, Engineering, etc., and re-grouping those studies which are essentially technical in content and in intent in a N.Z. College of Technology attached to the University. This might have branches in appropriate centres, and, as far as chemistry is concerned, would give more emphasis in its teaching to the significance, limitations, and performance of techniques essential to chemistry (analysis, isolations, preparations, etc.) than to the latest overseas trends of chemical theory. Its degrees would be distinguished in some way such as B.Sc. (Techn.) or B. Tec. Sc. I believe that this development would carry greater promise to N.Z. than would any attempt to expand the technical schools, especially since new building will be involved in either case.

10. *Should the N.Z.I.C. introduce its own examination at associateship level?* I believe it should not. In the first place, practical experience outside the University can only be gained in analytical chemistry and I see no reason to compete with the R.I.C. in this field; as I see it, the justification for our existence is that we have an entirely different function to perform. In the second place, this innovation would imply a departure from our N.Z. view that the University is the proper trustee for higher education. I am deeply opposed to any such transference of the University's status and responsibilities, except in the unhappy event that the University itself asks and obtains a release from its trusteeship.

In conclusion, it is quite clear that these are contentious matters which will require some months for full discussion in your columns. May I therefore suggest that no action be taken on the question of an associateship examination, until the matter has been fully discussed and the opinions of the membership of the N.Z.I.C. have been solicited either by postal questionnaire or ballot, or at a suitable general meeting held after an interval adequate for full discussion.

Dunedin, 2/7/52. G. M. RICHARDSON.

1952 COMBINED CONFERENCE OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY AND THE NEW ZEALAND SECTION OF THE ROYAL INSTITUTE OF CHEMISTRY, WELLINGTON, TUESDAY, AUGUST 26th—THURSDAY, AUGUST 28th.

The Conference Programme as set out in the previous (June) issue of the Journal has been confirmed in outline, but some modifications have been necessary to fit in the large number of papers offering.

The Presidential Address is set down for 8 p.m. on the Tuesday evening, when Professor S. N. Slater will take as his subject, "Research for Truth." This meeting will be held in the Palm Lounge of the St. George Hotel, and will be followed by the Social gathering.

Details of the papers to be presented are set out below:—

TUESDAY, AUGUST 26th. 2.30-5.30 p.m.

Two concurrent meetings.

(a) *SYMPOSIUM ON WASTE DISPOSAL* (CHAIRMAN: MR. R. HICKS).

2.30 p.m.—*L. G. NEUBAUER*: "WATER AND AIR POLLUTION PROBLEMS IN THE PULP AND PAPER INDUSTRY."

P. R. PARR: "FREEZING WORKS EFFLUENTS."

F. H. McDOWALL: "DAIRY EFFLUENT."

P. DICKINSON: "BIOLOGICAL EFFECTS OF POLLUTION."

4.00-4.30 p.m.—TEA BREAK.

4.30 p.m.—*F. W. WOODROFFE*: "THE DISPOSAL OF TANNERY EFFLUENT."

D. F. HOBBS: "LEGAL ASPECTS OF POLLUTION."

J. K. DIXON: "COMPOSTING OF WASTE."

(b) *GENERAL, INORGANIC AND PHYSICAL CHEMISTRY* (CHAIRMAN, PROFESSOR A. D. MUNRO).

2.30 p.m.—*W. A. FYFE*: "THE STABILITY OF COMPLEX IONS."

H. D. ORCHISTON: "GAS ADSORPTION ON SOLIDS."

J. ROGERS: "THE FLOTATION OF CEMENT ROCK."

4.00-4.30 p.m.—TEA BREAK.

4.30 p.m.—*K. L. SUTHERLAND* (C.S.I.R.O., AUSTRALIA):

"SOME ASPECTS OF THE WORK OF THE PHYSICAL CHEMISTRY SECTION OF THE DIVISION OF INDUSTRIAL CHEMISTRY."

W. S. METCALFE: "SOME RECENT MEASUREMENTS OF FLUORESCENCE QUENCHING."

WEDNESDAY, AUGUST 27th.—9.30 a.m.-12.30 p.m.

Two concurrent meetings.

(a) *BIOCHEMISTRY* (CHAIRMAN, DR. C. R. BARNICOAT).

9.30 a.m.—*J. W. LYTTLETON*: "PHYSICAL METHODS IN BIOCHEMISTRY."

L. HARTMAN AND M. FIELDES: "SOLIDIFYING POINT CURVES AND CRYSTAL SPACINGS OF FATTY ACID MIXTURES."

A. T. JOHNS: "STUDIES IN RUMINANT FERMENTATION."

11.00-11.30 a.m.—TEA BREAK.

11.30 a.m.—*T. A. TURNEY*: "A COLOUR REACTION OF PHENOLS."

R. P. HANSEN: "SEASONAL VARIATIONS IN FATTY ACID COMPOSITION OF NEW ZEALAND BUTTERFAT."

(b) *INDUSTRIAL CHEMISTRY* (CHAIRMAN, MR. P. R. PARR).

9.30 a.m.—*M. S. CARRIE*: "RECOVERY OF WOOL FROM SKIN PIECES."

O. M. F. NAUEN: "THE PROTECTION OF CHEMICAL MANUFACTURE BY THE PATENT LAW."

T. HAGYARD: "INDUSTRIAL APPLICATIONS OF THE FLUIDISED SOLIDS TECHNIQUE."

11.00-11.30 a.m.—TEA BREAK.

11.30 a.m.—*C. R. EDMOND*: "THE TESTING OF DAMAGED GOODS, WITH SPECIAL REFERENCE TO SEA-WATER DAMAGE."

W. VOSE: "THE WORK OF THE NEW ZEALAND POTTERY AND CERAMICS RESEARCH ASSOCIATION."

WEDNESDAY, AUGUST 27th.—2.30-3.30 p.m.

Two concurrent meetings.

(a) *ORGANIC CHEMISTRY*

(CHAIRMAN, PROFESSOR L. H. BRIGGS)

2.30 p.m.—*R. B. JOHNS AND S. N. SLATER*: "REACTIONS WITH DIAZOMETHANE AND LITHIUM ALUMINIUM HYDRIDE IN THE PICROTOXIN SERIES."

C. W. BRANDT: "DITERPENES."

(b) *AGRICULTURAL CHEMISTRY*

(CHAIRMAN, DR. H. E. ANNETT)

2.30 p.m.—*M. FIELDES*: "CLAY MINERALS IN NEW ZEALAND SOILS."

T. MITCHELL: "THE TITAN YELLOW METHOD FOR MAGNESIUM ESTIMATION."

THURSDAY, AUGUST 28th.—9.30 a.m.-12.30 p.m.

Two concurrent meetings.

(a) *ORGANIC CHEMISTRY*

(CHAIRMAN, PROFESSOR L. H. BRIGGS)

9.30 a.m.—*R. N. SEELYE*: "SOLANUM ALKALOIDS."

A. D. CAMPBELL AND S. N. SLATER: "CYCLIC CONJUGATED POLYENES."

J. K. HEYES AND F. B. SHORLAND: "THE CONSTITUTION OF HEXADECATRIENOIC ACID FROM GLYCERIDES OF RAPE (BRASSICA NAPUS L.) LEAF."

(PAPER TO BE PRESENTED BY I. MORICE)

11.00-11.30 a.m.—TEA BREAK.

11.30 a.m.—*J. PACKER AND J. VAUGHAN*: "THE ACID HYDROLYSIS OF AMIDES OF DIBASIC ACIDS."

B. E. SWEDLUND: "THE EFFECT OF ALKYL GROUPS IN ADDITION REACTIONS."

B. D. ENGLAND: "THE USE OF RADIOACTIVE TRACERS IN DEMONSTRATING A NEW METHOD OF SUBSTITUTION IN ANIONOTROPIC SYSTEMS."

(b) *AGRICULTURAL CHEMISTRY*

(CHAIRMAN, DR. H. E. ANNETT).

9.30 a.m.—*F. B. THOMPSON*: "CHEMICAL ASPECTS OF THE DEVELOPMENT OF PEAT LANDS."

H. O. ASKEW: "BORON DEFICIENCY IN HOPS."

K. J. McNAUGHT: "EFFECT OF POTASH DEFICIENCY ON MINERAL AND NITROGEN CONTENT OF PASTURES."

11.00-11.30 a.m.—TEA BREAK.

11.30 a.m.—*T. B. MILLER*: "SOME ASPECTS OF THE CHEMISTRY OF SILAGE."

K. F. HOY: "OXALIC ACID IN RELATION TO SUPERPHOSPHATE MANUFACTURE."

MR. G. A. LAWRENCE AND THE N.Z. STANDARDS INSTITUTE

Mr. G. A. Lawrence was elected last year to the Chairmanship of the Council of the N.Z. Standards Institute after two years as Deputy-Chairman. The appointment comes as a climax to service on the Council since the inception of the N.Z. Standards Institution in 1932, under the aegis of the N.Z. Institution of Engineers. It is not without significance that in a body where engineers have taken a most prominent part, the chief office is now held by a chemist. The Standards Institution was dissolved in 1936, and the Standards Institute set up and given official status with the passing of the Standards Act in 1941. This measure announced the principal functions of the Institute as:—

(a) The formulation of specifications and the promulgation and application of standard specifications, and

(b) The promotion of research in relation to specifications and testing of commodities, processes and practices.

The Institute also has the duty of reviewing standards in the light of changing conditions. The extent of its work may be judged from the fact that it has 200 active committees with a total personnel of about 1,100 putting in a vast amount of voluntary effort. Contrary to the idea held by many, the Institute does not consider the preparation of a standard unless there is a demand for one from a responsible body of people. If the Council considers that the project should be taken further, the Standards Institute then endeavours to bring all interested parties together and, through its staff and committees, to provide machinery for the thorough investigation and final drafting of the standard. In many cases British standards are suitable without alteration, but in other cases local conditions decide our requirement. Last year no less than 18,000 standard specifications were sold in New Zealand.

Most countries have their own standards institutes, the most famous probably being the United States Bureau of Standards, which publishes its own valuable "Journal of Research." These bodies are linked in the International Standards Organization, which has the promise of being a very useful field of international co-operation.

Mr. Lawrence has always been an enthusiast on the value of standards and eager to remove misconceptions with regard to them by good public relations. Besides being our representative on the Council, he has served the N.Z. Institute of Chemistry in many capacities, being President in 1938-9, and President of the N.Z. Branch of the Royal Institute in 1935-6. He maintains a thriving analytical and consulting practice at the well-known address, "The Laboratory, Johnsonville."

SOIL ORGANIC PHOSPHORUS

Summary of a lecture given by Dr. R. H. Jackman to the April Meeting of Waikato Branch.

Up to 80% of the total phosphorus in the top soil could be in organic form. There was chemical evidence that soil organic phosphorus was composed of phospholipids (traces), nucleic acid-like material and inostol bound phosphorus (phytin).

Total organic phosphorus was generally estimated by washing the soil with acid followed by alkali, generally hot. Inorganic phosphorus was measured colorimetrically in the extract, and total phosphorus in the extract following ashing; organic phosphorus was obtained by difference. Fractional precipitation had been used to separate and identify inositol bound phosphorus from "nucleic acid" phosphorus. Such methods in the hands of different investigators had shown little agreement, but advances were now being made using chromatography.

Soil organic phosphorus was probably largely of plant and microbial origin, and was positively correlated with soil carbon. It was not known to what extent it came from the dung of higher animals.

There was conflicting evidence as to the availability of organic phosphorus—it was thought that its availability was relatively low, though some recent work indicates that its availability rose with increasing temperature. The low availability was probably due to precipitation and absorption, i.e., aluminium and iron phytates were insoluble under acid conditions, and calcium phytates under alkaline conditions, while nucleic acid and nucleoproteins were known to be so strongly absorbed by bentonite as to be protected from nuclease attack.

To increase the availability of soil organic phosphorus it was possible (1) to reduce the rate of formation by introducing fertiliser phosphate below the organically rich top soil and (2) to increase mineralization by liming (increased solubility and reduced adsorption), and cultivation (stimulating decomposition of the soil organic matter).

In New Zealand organic phosphorus might be particularly important since the system of grassland farming might be ideal for the formation of organic phosphorus—semi-constant pasture supplying carbon continuously, no cultivation, the application of phosphate to carbon-rich topsoil and the return of phosphate, partly in organic form, in animal dung.

Several slides were shown giving results of Dr. Jackman's own work on sandy silts at Taupo, and on soils at the Soil Research Station. The bulk of the phosphorus in the top layers of soil was shown to be in the organic form.

MINUTES OF A MEETING OF THE COUNCIL, ON WEDNESDAY, 21st MAY, 1952.

Present: Professor S. N. Slater (President), Dr. H. E. Annett, Vice-President; Mr. G. Lambert, Auckland Delegate; Dr. R. M. Dolby, Manawatu Delegate; A. P. Oliver, Wellington Delegate; (Assistant Secretary), Mr. F. H. G. Johnstone, Canterbury Delegate; Mr. O. H. Keys, Otago Delegate; Mr. W. G. Hughson, Hon. General Secretary; Mr. H. K. Palmer, Registrar; Messrs. B. E. Jackson and L. H. James, usual proxies for Auckland and Otago, were present by invitation.

Apology: Apology received from Mr. R. E. R. Grimmett, Waikato Delegate.

Sub-Committees of Council:

Conference, 1952: Wellington reported that arrangements for Conferance were well in hand, and minutes were being circulated regularly.

Resolved: THAT Dr. Sutherland, of Australia, who is being invited to New Zealand by the School of Mines, be invited to present a paper to Conference, 1952.

A motion that Council spend up to £20 in bringing Dr. Sutherland to Conference was lost.

Leave to Attend Conferences: Several Delegates pointed out the right of Government Chemists to attend Scientific Conferences with expenses paid was originally granted in connection with the N.Z. Institute of Chemistry Conference. It was felt that the decision of the Commission against the payment of expenses was inimical to the advancement of Chemistry in this country.

A letter was received from Mr. K. M. Griffin, Auckland, suggesting that the Conference Committee arrange for billeting and that consideration be given to holding Conference in the summer months.

Resolved: THAT Council consult with the Government Departments concerned with a view to making simultaneous protests to the Public Service Commission.

Resolved: THAT the attention of Cabinet be drawn to the matter as being of national importance and that kindred bodies be asked to protest.

Resolved: THAT the President, Vice-President and Hon. General Secretary be empowered to draw up the protest.

Employment Committee: Mr. James stated that a report on the Chemical Manpower situation in New Zealand was nearing completion. The number of members on the Employment Register is decreasing every year and the Committee suggests that it function until the end of the year, its continuation being then reviewed by Council.

Examinations Committee: Draft Regulations for Associateship Examinations are being prepared.

Journal: A report from the Editor was received.

Resolved: THAT the N.Z. Institute of Chemistry continue to issue periodically a list of members.

Resolved: THAT the Wellington Branch be asked to undertake the task of drawing up and printing a new list of members.

Resolved: THAT the Editor be empowered to send gratis copies of the Journal to the Scientific and Technical Documentation Centre, Mexico.

Resolved: THAT Council reaffirms its decision to publish five issues of the Journal per year.

Standards Committee.—Resolved: THAT Mr. Stonyer be appointed to act for Mr. Stewart.

A letter was received from Mr. C. G. W. Mason, N.Z. Institute of Chemistry representative on the Timber Preservation Committee, suggesting ways and means of expediting the Institute's aims.

Resolved: THAT a Sub-Committee be set up to confer with our representative and report.

Resolved: THAT the Sub-Committee consist of the President, Dr. J. K. Dixon, Mr. J. L. Mandeno and the Hon. General Secretary (Convenor).

Patents Committee.—Resolved: THAT Mr. E. Borthwick be appointed to replace Dr. F. B. Shorland.

Salary Survey.—It was reported that the N.Z. Association of Scientific Workers approved of the proposed questionnaire submitted by the N.Z. Institute of Chemistry, and that the N.Z. Association of Scientific Workers will not need to send a second form to our members.

Resolved: THAT Dr. Dixon be asked to proceed with another Salary Survey immediately.

Institute Prizes.—The President reported on a meeting held on May 20th with the Royal Institute of Chemistry representatives covering the proposed Easterfield Prize.

Resolved: THAT the N.Z. Institute of Chemistry express its appreciation of the offer of the Prize by the Royal Institute of Chemistry, and co-operate in administering the Prize.

Resolved: THAT Council approves of the basic proposals outlined by the President, but owing to the difficulty in selecting the Prize winner in time for his lecture to be incorporated in the Conference programme, Council suggests that the giving of the Lecture at Conference be optional.

Resolved: THAT the following amendment to the Prize Essay Regulations be approved. "The Essay should not exceed 8,000 words and shall be submitted in a form suitable for publication." (Regulation 3, Clause 4).

Finance.—Resolved: THAT the Registrar be asked to discuss with the auditors the possibility of reducing the amount of audit work with a corresponding reduction in the suggested cost of £12/12/-.

Membership.—Resolved: THAT Dr. W. A. McGillivray, having fulfilled the requirements of the Rules, be admitted as a Fellow in accordance with the recommendation of the Membership Committee.

Resolved: THAT the following be admitted as Associates:

LYTTLETON, John Westcote, M.Sc., Ph.D., Grasslands Division, Plant Chemistry Laboratory, Palmerston North (Chemist).

BOTTOMLEY, Gerald Andrew, B.Sc. (Leeds), Ph.D. (Leeds), Chemistry Dept., University of Otago, Dunedin (Lecturer in Physical Chemistry).

HICKS, Ronald, A.R.I.C., Auckland Metropolitan Drainage Board, Auckland (Chief Chemist).

Unqualified Chemists, Training.—The Otago Committee has so far received few reports of hardship. Teachers of Chemistry in the University are reminded of the request in Dr. Richardson's motion at the 1951 Annual General Meeting.

Resolved: THAT the Hon. General Secretary inquire about the newly formed National Advisory Council on Education for Industry and Commerce and the possibility of its assisting in the training of Chemists who are not able to attend University.

Overseas Visitors.—It was reported that Professor Guggenheim had already left for home, but that Professor Ingold will be in New Zealand during July and early August. His itinerary will be handled by the N.Z. Professors of Chemistry, to whom Branches should address inquiries about the possibility of local lectures.

Professor Emeleus, 1953.—It was decided to inform that Royal Australian Chemical Institute that New Zealand could very probably raise £200 from the University, the N.Z.I.C., and other sources.

Resolved: THAT the question of raising funds be further explored, the N.Z. Institute of Chemistry being committed to an expenditure of not more than £50.

Subscriptions.—Letters of protest at the increase in subscriptions were received from Mr. K. M. Griffin.

Resolved: THAT Mr. Griffin's letters be received and that the action of Council be further explained.

Science German.—Resolved: THAT Council draw the attention of the Post Primary Teachers' Association to the desirability of teaching German to Science Students.

Resignations, Leave, etc.—Resolved: THAT the following Resignations be received with regret: Dr. I. Cunningham, Mrs. M. Cunningham, Mr. K. W. Glasgow, Mrs. A. A. Ridley, Mrs. E. R. Taylor.

Rules.—Amendments proposed by the Rules Committee were considered and commented on. It was decided to make a complete draft including further proposed amendments, such draft to be considered by Branches and the Rules Committee. The final draft will be submitted to the Solicitor before the Rules are reprinted.

General.—A letter was received from Mr. R. E. Rose, Secretary of the General Advisory Committee, Rukuhia Soil Research Station, about the formation of a central laboratory. It was decided to ask for more specific information.

BOOKS RECEIVED

AUTOREN-NAMEN ALS CHEMISCHE BEGRIFFE. (Authors' Names and Chemical Concepts). By Kurt G. Wagner; 264 pages. 1951: Verlag Chemie, Weinheim, Germany. DM. 14.80 (26/-). In this book are four lists, arranged alphabetically, of the names of chemists who are commemorated by having laws, reactions, apparatus or other concepts linked with their names, such as Mills-Nixon effect, Mannich reaction, Lieben's test, Caro's acid, Lunge nitrometer. There are 1,492 entries grouped in four sections as follows, (1) Laws, theories, constants; (2) Reactions and tests; (3) Chemicals, reagents and substances; (4) Apparatus and plant. Each entry is followed by references, usually including some recent ones. The reviewer has often felt the need for such a book as this, as to his knowledge only section (3) has been at all covered before (in the Merck Index which lists several thousand qualitative tests under authors' names, and the much smaller "Name Index of Organic Reactions." by Wheeler and Gowan, published by the S.C.I. in 1950). This volume therefore breaks new ground and presents a useful compilation which should be assured of a welcome, because of an increasing tendency to use these names in the literature without references or in some cases with references to old and inaccessible journals. At the same time the book is capable of improvement; there are many omissions such as the Huang-Minlon method, and the West condenser; there are a few errors such as Knopp for Knoop on p. 48, and in the formula for Lauth's violet on p. 94, while the "flow" test (p. 106) is surely derived from a common English word and not an author's name. The book would be more convenient to use if the division into four sections was abandoned; but it is easy to criticise many new ventures, and it is to be hoped that Dr. Wagner's work will go through several editions to fill an increasing demand among the world's chemists.

SURFACE ACTIVITY. By J. L. Moilliet and B. Collie (Research Labs., I.C.I. Ltd.). 379 pages. 1951: London, E. & F. N. Spon, Ltd. 55/-. This book opens with a section of 145 pages on the "Physical Chemistry of Surface-active Agents and Inter-facial Processes," giving the theoretical basis of surface activity. Section 2 deals with technical applications, further subdivided into: Technical wetting-out and waterproofing processes; Preparation of emulsions and demulsification; Dispersion of solids in liquid media; Detergent processes and some other uses. The final section discusses the chemical constitution of the various types of "surfactants." This section is not intended to be complete, which is readily understandable in view of the large and increasing variety of these materials, and the authors refer those seeking further information to the manufacturers' lists. The authors have produced an excellent book on the subject giving sufficient information for all but the specialist, and preserving a good balance between the products of Britain, U.S.A. and the Continent. It would probably have been improved by the mention of more trade-named surfactants, particularly British, and by a fuller subject index as this excellent book will be used both for general purposes and as a work of reference in many laboratories. There are author and trade name indexes.

MANIPULATIONS DE CHIMIE. By Clement Duval. 382 pages. 2nd Edn. 1951: Paris: Masson et Cie. 2500fr. This book is devoted to preparations of inorganic and organic compounds, with a few physical procedures, chosen as typical of the principles and technique involved. They are grouped together in such sections as preparation of gases; perparation of substances by the action of gases on liquids; preparation of substances by

the actions of liquids on solids; and so on. The book will command interest because of the wide range of the material and novelty of some of the preparations selected, including deuterium, boron sulphide (from boron hydrogen, and H_2S at 1500°), nickel carbonyl, potassium nitrilosulphite and finally D.D.T. There are references in nearly all cases and many illustrations. The printing, which is good, is actually done in Belgium, but the reviewer's copy had the first 64 pages duplicated for good measure.

Volume 8 of the *ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY* (Interscience, New York. Subscription price, $25.00) contains long articles on lead and magnesium and their derivatives and on lubricants. There is an interesting section on laboratory design and a very good monograph of 49 pages on literature survey and mechanical searching, including the use of punched cards.

Recent issues from John Wiley and Sons, New York, include Volume 3 of *HETEROCYCLIC COMPOUNDS*, edited by Robert C. Elderfield (422 pages, $12.00), which deals with polycyclic derivatives of pyrrole, polycyclic systems with one nitrogen common to both rings and pyrrindine and related compounds, and Volume 4 (674 pages, $17.00) covering quinoline, isoquinoline and their benzo-derivatives. The international character of the work is shown by contributions by H. R. Ing, Oxford, A. Albert, Sydney, and L. P. Walls, Beckenham, Kent, the rest of the work being American. Volume 31 of *Organic Syntheses*, with R. S. Schreiber as Editor-in-Chief (122 pages, $2.75), contains over forty new preparations. *Vinyl and Related Polymers*, by Calvin E. Schildknecht (723 pages, $12.50) should soon become a standard work on the subject.

Masson et Cie, Paris, have brought out the 4th edition of an interesting and well-produced set on *Industrial Chemistry* by Paul Baud. Volume 1 (865 pages, 5000fr.), deals with the heavy chemical industry. Volume 2 (1,053 pages, 5800fr.), with the metals and their salts, and Volume 3 (1,148 pages, 6800fr), with organic chemical industry. While the covering is broad rather than deep, it gives a good picture of continental practice. There are many illustrations but no references.

NEWS AND NOTES

In May the Otago Branch listened to an address by Mr. L. C. Baker on "Some Trends in Food Technology." Mr. Baker spent some months in the latter part of last year at the Massachusetts Institute of Technology.

Another old member of the Otago Branch, recently on transfer to Auckland, Mr. H. A. L. Morris, has had to resign from the Dominion Laboratory to take up an M.I.T. Studentship. He left recently and has written to say that in his study suite are a Turk and a Japanese. He is to attend a special seminar from June to December, during which time he has a research project to do, which is already under way, and he is to visit industrial plants in Boston and the mid-West.

Mr. A. D. Campbell has been elected an associate member of the Society of Public Analysts and other Analytical Chemists.

Dr. Muriel Bell, of the Department of Health and Nutrition Research Department, Otago University, left recently for a seven-month study leave overseas. She hopes to visit the United Nations' nutrition group in Geneva, to attend the International Dietetic Conference at Amsterdam, and to visit colleges in Great Britain before proceeding to Harvard for special studies. At the request of the Central Milk Council, Dr. Bell will also undertake a tour of Scandinavia.

In the June issue of the Journal on page 81 the following correction should be made:

The last paragraph of the article on "Oxalic Acid Superphosphate and the Manufacture of Oxalic Acid" should read as one sentence.

The correct inference is that 73 tons of nitric acid is involved in the production of 10 tons of oxalic acid; but not *lost* in its production. We apologise to the authors and heave a sigh of relief.

Mr. C. W. Brandt, a senior chemist of the D.S.I.R. and in charge of the Organic section of the Dominion Laboratory, was granted a research Fellowship of the Wayne University in the United States, and has left to take up his study. He will work under Professor Djerassi, mainly on steroid substances related to cortisone.

Mr. P. J. Clark, also a senior chemist and in charge of the Dominion Laboratory's pesticide and general analysis section, has left on a tour of duty to study recent research on pesticides and new analytical methods for their detection. In Europe Mr. Clark will make special study of analytical methods, including the recent advances made in the determination of the minute residues that are left on fruit and vegetables after spraying. In England he will see university, Government, medical, and commercial laboratories and consult leading specialists concerned with research on pesticides. At Amsterdam Mr. Clark is to discuss the methods for DDT and BHC, which depend on infra-red absorption. In France physico-chemical methods, in particular, will be studied. In America he will discuss the latest developments in pesticides with scientists in all fields of work.

Dr. F. B. Shorland, after spending a week visiting research organisations in Sydney and Melbourne, is now on his way to the United Kingdom.

Mr. D. E. G. Sheat, Lecturer in bio-chemistry at Massey College is going to Manchester in July to study plant physiology under Dr. H. E. Street.

We congratulate Dr. W. A. McGillivray, Massey College, on being elected a fellow of the Institute.

Dr. T. Miller, who recently arrived from Aberdeen University to lecture in agricultural bio-chemistry at Massey College, has been notified that he has been awarded the degree of Ph.D. by Aberdeen University.

At the June meeting of the Manawatu Branch the President, Dr. Slater, gave a very interesting address on "The Search for New Aromatic Systems."

Whilst writing of such a search one recalls that at a very interesting address to the Auckland Branch, Dr. J. C. Andrews mentioned that it was the considered opinion of the Commonwealth Science Conference, held recently in Australia, that the most direct approach to the world food shortage lay in Birth Control, and he made the request that all organic research chemists and physiologists consider the problems of contraception and the production of chemical contraceptives which will have a reasonably long duration and will be cheap to manufacture.

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