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EDITORIAL

The interest taken by New Zealand chemists in improving industrial processes and developing new industries of potential value to the country is shown by the action of the council in establishing the industrial essay prize, to be open to competition for the first time next year. In addition to the positive task of devising and advocating schemes which are scientifically and economically sound, the negative and rather unenviable duty of examining and criticising the unsound, is equally incumbent upon us. We should be grateful to Mr G. S. Lambert, who has undertaken this task, by reviewing in this number a book on the industrial future of New Zealand, which we understand is appearing in a third edition. This fact might lead one to think that the publication of this book is an event of great importance. Unfortunately a work which contains no more than the errors and fallacies which Mr Lambert has found time and space to expose, would inevitably be suspect. "The most promising of our younger chemists" indeed promises much. Many will no doubt accept the promises—all of us would like to believe them, for Santa Claus retains his appeal for the most hard-headed of us. But foolish as we would be, and lacking in a sense of responsibility to the people of the present and the future, if we fail to advocate good schemes, we would be more than foolish if we allow the public to be persuaded that untold wealth lies ready to be tapped. Three years ago the present Dominion Analyist found it necessary to speak plainly on the advertising of certain chemical products. Equally valuable is Mr Lambert's protest against the advertising of what the chemical industry is alleged to be capable of doing in New Zealand. There is a course to be set between the Scylla of a pessimism which would reduce us to the level of subsistence farming and the Charybdes of an optimism which would have us attempt the task of erecting a vast industrial structure on the basis of raw materials, many of which we do not possess. It does not appear that Mr Hubbard has succeeded in providing the chart.

COUNCIL MEETING. 22nd May, 1942.

Present: Sir Theodore Rigg (President), Professor F. G. Soper (Otago), Dr. L. H. Briggs (Auckland), Dr. J. K. Dixon (Wellington), Mr. P. White (Canterbury Proxy), and J. A. D. Nash (General Secretary).

Professor P. W. Robertson, Wellington, was elected a Fellow.

The following were elected Associates:—R. P. Newbold, Auckland; J. B. Brown, Auckland; S. H. J. Wilson. Wellington; Patricia W. Broad, Wellington; G. C. Martin, Wellington; F. N. Fastier, Otago; H. W. Henderson, Otago; L. Osgerby, Auckland.

Laboratory Assistants' Certificate.—Resolved that the idea of a Laboratory Assistants' Certificate be approved and that a sub-committee of the Wellington Branch be asked to formulate proposals for the implementing the issue of such certificates.

Register of Chemists.—Resolved that the Branches be asked to co-operate with the General Secretary in bringing the list of Chemical Workers up to date.

Canterbury Branch drew attention to a newspaper report in which a pharmacist gave evidence as to the amount of strychnine present. It was reported that appropriate action had already been taken and it was decided to take no further action.

A report was received in regard to Misleading Advertising. The matter was left in the hands of the President with power to act.

A sub-committee was set up to prepare a report for the next Council Meeting, on the financial position of the Institute.

The alterations to the Rules were discussed. The decisions of Council in regard to this matter will be reported fully in the next issue of the Journal.

In regard to the N.Z. Association of Scientific Workers, it was decided to take no action until such time as their Constitution was established.

The Industrial Future of New Zealand

By Edmund F. Hubbard *Published by W. Stuart Wilson & Assoc.*

(Reviewed by G. S. Lambert)

In this book the author endeavours to outline the manner in which the natural resources of this country may be utilised in its future development. Such an object is highly praiseworthy, the more so in a time of national crisis. It is unfortunate, however, that a perusal of the book indicates that its author possessed neither the knowledge of the resources, nor the appreciation of the problems of their development to enable him to do justice to his subject. Instead of being an informative guide to those interested in the establishment or expansion of industries in the Dominion it is feared that this book is more likely to be misleading and to perpetuate the common fallacy that New Zealand is a country richly endowed with untapped resources which could be immediately exploited for industrial purposes.

There is no doubt much that is true to fact in Mr Hubbard's book and some of his suggestions appear worthy of consideration, but the value of these sections is almost completely destroyed by their association with a mass of loose statements, fantastic proposals, and wishful thinking. It is obvious that the author has made little if any study of the large amount of authoritative information available in papers published by the local scientific societies and in the reports of various Government Departments, nor does it appear that Mr Hubbard has any real knowledge of the industries and processes about which he writes. There is scarcely a page in the book which does not contain some statement which is not open to severe criticism. A few examples from the large assortment of matters treated will suffice to show the general character of the book.

In Section Three under the heading of "Agriculture," the suggestion is made that land too poor for agricultural and pastoral activities could be used for industrial crops such as potatoes, sugar-beet, flax, and soya beans. The possibility of successful economic production of such crops on anything but

suitable land may best be judged from the history of such a similar enterprise as the tung oil industry in this country. This chapter also contains the statement that "cellulose is prepared from almost any plant product," and this knowledge is sufficient for the author to picture a comprehensive cellulose industry in New Zealand producing "films, moulded articles, artificial bristles, buttons, celluloid substitutes, artificial silk, cellophane, celluose lacquers, explosives, and rope." The resources of cellulose suggested are timber, flax, linen fibre, and grasses, but the author is silent on the question of the extensive chemical industry necessarily complementary to the establishment of the above industries.

Section Five on "Ceramics" scarcely seems the logical place to introduce the subject of "flexible, transparent, waterproof plastic glass . . . made from natural gas, coke, salt, limestone, air, and water." Simple recipes such as this appear to be all the author considers necessary in proposing the establishment of an industry.

In Section Six on "Mineral Resources" deposits of some forty minerals, sufficiently extensive to be economically workable are claimed to exist. Unfortunately this is the case in only a very few instances. The author devotes a short paragraph to individual minerals in his list in which he sometimes gives a general account of their properties and uses in terms very reminiscent of descriptions found in most elementary textbooks of chemistry, while at other times his statements recall those so often seen in the prospectuses of the companies which have from time to time endeavoured to exploit the supposed vast resources. In no case is the position of a mineral industry critically examined nor the practicability of the suggestions made established; indeed the information given is often inaccurate or misleading.

To quote but one example: It is claimed that sulphur "exists in great quantities notably at White Island and in the thermal regions. Mining operations have been carried out on a large scale in the past . . ." Reference to the official statements of the Mines Department shows the total quantity of sulphur yet mined in New Zealand to be less than a quarter the present annual consumption and the latest geological estimates indicate that the known ore resources would not supply the demand for more than a few months! A notable omission in this chapter is the absence of any reference to the future of our

gold mining industry. Gold and silver are the only metals that have been produced economically in quantity in New Zealand, their annual production still realising a sum of almost two million pounds. Surely an endeavour to exploit by modern methods some of the low grade gold ores in our mining districts would have been a more reasonable suggestion than "to contemplate the construction of a reduction plant in New Zealand which might produce copper" from ores which **are as yet not known to exist** in workable quantities.

The literary failings of Mr Hubbard's book are scarcely less striking than those of its information. It seems remarkable that such a small book should have appeared in a third edition, complete with a table of errata, and still retain so many errors.

If this book is the only evidence that led the publisher in his preface to acclaim Mr Hubbard as "the most promising of our younger chemists," then the prospects of the industrial future of New Zealand are gloomy indeed.

BRANCH NOTES

AUCKLAND

The first meeting of the Auckland Branch took the form of a film evening when members and several friends were entertained.

The first was an educational film on "Catalysis," and gave some striking demonstrations of different types of catalytic action, including negative catalysts or inhibitors.

This was followed by a film showing the manufacture of "Champion" spark plugs and the tests that they are put to in order to ensure that they are of the highest quality.

Then followed two films kindly loaned by the Canadian Trade Commissioner. One, "Timber," was an account of the Canadian lumber industry. It showed the change of policy from merely getting the timber for timber's sake to the re-afforest-

ing that is now being practiced, and also the safeguards that are made against the ravages of forest fires.

The other film, entitled "The Inside Story," described the salmon canning industry from the time the fish are caught till they are on the table.

Messrs J. E. Brundell, I. S. Hunt, and C. P. Worley are now in camp.

The Auckland Branch has decided to treat its local members who are serving in His Majesty's Forces in the same way as the Institute is treating associates, namely, granting leave of absence. So far this only affects one member, namely, Mr C. Cropp.

WELLINGTON

Dr. J. K. Dixon, chairman for 1942, gave his address under the title "The Influence of Soil on Garden Plants."

The speaker introduced the subject by indicating in a general way the factors that modified the growth of plants. Suitability of climate, presence of fungi and pests, lack of toxic substances, adequate supply of moisture from outside and within, proper aeration, low erodibility both from the nature of the soil and from topography, and a proper supply of nutrients, are all important.

Texture and structure are significant in governing the supply of water to the plant. Hoeing is beneficial through weed destruction, giving a cooler soil and facilitating water penetration rather than by preventing, as is popularly supposed, loss of water by capillarity and evaporation. It is necessary to wet the subsoil during watering for figures show that light waterings may do more harm than good.

Humus is of primary importance both as a supplier of nutrients and as a reservoir for water. A method was given or making compost. C/N ratios are critical because with high ratios, nitrogen is not available to the plant. It is thus unwise to plant seedlings over freshly dug-in vegetable refuse. Leguminous plants are more favourably situated for C/N ratios than are non-leguminous.

While lime is generally very beneficial to plants, there are some, like azaleas, that do not benefit from reduction of soil acidity. Over-liming injury may be really due to boron deficiency, while high fluorine in some superphosphates recombines with the phosphate in the presence of lime to form apatites, one part fluorine being able to tie up twelve parts of phosphate. The effect of lime on hydrangeas is correlated with the lower aluminium content of the pink flowers.

Transplanting solutions containing soluble nutrients are of value in getting a plant growing quickly again after transplating and thus reducing the likelihood of pest invasion. Suitable formulae were given.

Fertiliser placement is replacing broadcasting, especially in America, because fertilisers, if placed beneath and at the side of the root below ground level are more efficiently used. This is well worth introduction here as the supply of high quality phosphate is reduced, and it is necessary, if we are not to feel this lack, to use more effectively what phosphate there is available.

An account was given of the maintenance of lawns and the chemical changes involved in the intensive use of ammonium and ferrous sulphates.

In conclusion the chemical characteristics of the Ngaio silt-loam (the hill soil type in Wellington) and the Hutt soils were dealt with and suggestion made for their improvement.

CHRISTCHURCH

As reported in the last issue of the Journal, Mr. C. G. W. Mason is the Branch Chairman for 1942. Mr Mason is a graduate of Canterbury College, where he took a good Honours degree in 1930, presenting a thesis on a problem arising from his work in the gas industry which won high praise from the examiner. He has been mainly concerned, in his work for the Christchurch Gas Company, with the development of by-products, especially benzol, toluol, and disinfectant materials. Mr Mason is one of New Zealand's industrial chemists whose services to his industry and the community are of the greatest value, and are highly esteemed by his fellow members who know his work

Mr Mason delivered his chairman's address at the April meeting, speaking on matters of current interest and importance to the Institute.

He said that he would like to take this opportunity of saying a few words on one aspect of the field of chemistry which is again to be brought to the fore: the training of laboratory technicians and routine analysts. Since 1931 hardly a year has gone by without some aspect of this matter being discussed, for instance, in the presidential address and discussion published in the journal of March, 1940. Now Dr. J. K. Dixon has agreed to formulate a policy to be placed before the Council and members. We may consider how the medical profession has co-opted a wide field of workers to carry out specialised routine work, the nursing profession to undertake practical care of patients, the pharmacist to compound prescriptions, and in chemical work the trained assistants to the pathologists and bacteriologists, usually women, whose standards of ability are recognised by diplomas. The progress of chemistry in industry is controlled by the knowledge and imagination of the chemist together with an organisation which allows the application of these qualities to the maximum without encumbrance by analytical and administrative duties. In England, the "Report of the Committee on the Staffs of Government Establishments" led to a regrouping of the Government laboratory staff, and analysis of the classification shows that there are 56 qualified chemists and 154 assistants of whom 83 are laboratory assistants of the type needed in New Zealand. This organisation in 1938 analysed 562,549 individual samples, a tremendous volume of work, not made up by a high percentage of routine analysis. We need a course of the apprenticeship type, upon which a youth may enter and reach a position with a definite scale of remuneration and safeguards of employment. It will be necessary to formulate safeguards against both the liability to lower the standards of qualified chemists and the possibility of technical assistants being thrown into dead end occupations.

Mr Mason then discussed the recent formation of an Association of Scientific Workers. He considered that it will be necessary for the Institute as a body to have some close touch with the Association. While our Institute is the largest body of scientific workers in New Zealand, if those in other sciences combine they may form a body strong enough to exert

influences in which the interests of our Institute are not sufficiently considered. From literature supplied through the courtesy of Mr J. S. Salmond and Dr. C. O. Hutton, Mr Mason discussed the work of the Australian and British organisations, and stressed the necessity of member giving consideration to the new body.

The speaker went on to say that the matters so far discussed are of similar importance to us as mortgages and next year's holidays are to a man fighting for his life. We are engaged in fighting a war of applied science, and it is pertinent to enquire whether the organisation of science and its applicaton is as satisfactory as it could be. As war develops, control passes more and more to Government Departments. The administrators of the Civil Service have large organisations for investigating their problems, but the link between investigation and application is poorly organised. Initiative within the service is not highly developed, due perhaps to the desire not to make mistakes, the necessity for keeping within the bounds of Treasury control, and the fact that responsibility for decisions regarding the application of the work is invested in the Minister. Further, there is the long-standing mutual suspicion of Civil Service and business men. It is in this atmosphere that we are tryng to build up an effective scientific approach to our urgent problems of war production. The scientific worker at best is asked to comment on certain aspects of the problems, and his opinion is acted upon or not according to established custom. The usual outcome is a floundering in the dark with inevitable delay and waste effort. Between the extremes of red tape and the profit motive, the scientific worker is expected to contribute his maximum war effort. The scientific advisory panel goes a long way towards bridging the gap, but its members can only work within the frame work of the Minister's policy, and while they no doubt influence it, the vicious circle starts again with the Minister's permanent servants.

We all know that valuable work is being done by physicists and others, and that certain aspects of that work cannot be made known. When it can, it is to be hoped that the layman will be made aware of it. It should never be possible for the layman to say when the complete picture is presented, that due to incomplete co-operation, we failed to

accomplish as much as quickly and with the greatest economy of human life and energy as should have been possible.

In the discussion which followed Mr Mason's address, Mr J. Packer said that he was doubtful whether the status of industrial chemists in New Zealand, as shown by the salaries paid to qualified men, is yet such as to enable them to employ assistants at a wage level which would not make the positions a dead end occupation. Dr. H. Parton supported this view, quoting the salaries paid to chemists as revealed by the data collected for the discussion at the 1938 conference. Dr. R. O. Page expressed the opinion that industrial chemical laboratories in New Zealand are likely to remain one or two-man affairs, and the prospects for laboratory technicians are very poor.

The March meeting was addressed by Mr. J. Packer on "War Gases and their Identification." He first gave an outline of the properties of the poisonous substances which have so far been used in warfare, the tear gas, arsenical sneezing gases, lung irritants and vesicants. Dealing with methods of detection, he discussed the vesicants in greatest detail. Mustard gas is detected by methods depending on it reducing power and the formation of co-ordination compounds with heavy metals. Lewisite is shown by the presence of arsenic and the liberation of acetylene. A scheme of analysis was explained, and the method of handling small quantities of material by absorbents such as charcoal and silica gel demonstrated.

PERSONAL NOTES

Mr F. H. G. Johnston is temporarily with the Auckland branch of his firm, the Dominion Compressed Yeast Company. In his absence Mr G. J. Warren is acting as branch secretary. Mr Warren came to Christchurch from Jeyes, Ltd., of London, and has already proved a valuable addition to the branch.

OTAGO BRANCH

The chairman, Mr M. V. B. King, spoke on "The Study of Metabolism with Isotopes." He first reviewed some of the more important methods of separating isotopes; emphasising that as their physical properties were almost identical, their separation was extremely difficult. Only with hydrogen had

complete separation been effected on other than a minor scale. All processes consisted of many stages, only a slight enrichment occurring at each stage. For biological work a complete separation was unnecessary. The methods of separation used included fractional electrolysis for deuterium ("heavy hydrogen"); fractional distillation for the enrichment of water in ^{18}O; diffusion, especially recently thermal diffusion; and chemical exchange reactions between the gaseous and solution phase. Artificial radioactive isotopes were prepared by bombarding elements with neutrons, or by the use of a cyclotron.

The general principle of the method was illustrated by the first experiment of its type, when Hevesy, in 1923, placed a plant in a solution of a lead salt containing some radium D (an isotope of lead). After some hours the radioactivity of the leaves was a measure of the rate of diffusion of radium D and so of lead. In all this work it was assumed that isotopes were treated alike by living organisms, and the general consensus of opinion was that this assumption was justified.

Very delicate methods were used to analyse elements for their isotopic content. The Geiger counter was used for radioactive isotopes. Hydrogen was oxidised to water and the density of this, determined to one part in a million by the "falling drop method," was proportional to the amount of deuterium. For other elements a mass spectograph was used.

A splendid survey of his work on phosphorus metabolism was given in a lecture by Hevesy published in this Journal of the Chemical Society,, 1939, P. 1213. He injected sodium phosphate, containing a small amount of radioactive phosphorus, into animals, and then after some time analysed the various organs for their content of radioactive phosphorus. This enable him to find the rate at which phosphorus in a given organ was replaced by new atoms of phosphorus. It was fast in the liver, slower but still present in the bone, and slowest in enamel.

The field of non-radioactive isotopes had been largely pioneered by Shoenheimer (who died last year) and Rittenberg. Their work was published in the Journal of Biological Chemistry. Using deuterium they did work of fundamental importance on the metabolism of fat. The fatty acids from olive oil were completely saturated with deuterium and fed to mice. The body fats subsequently isolated were shown to contain,

besides fatty acids containing deuterium (by which is meant more than the amount of deuterium present in normal hydrogen and hydrogen compounds), unsaturated acids containing deuterium, whih proves that the body has the power of dehydrogenation. Similarly it had been shown that the body could hydrogenate unsaturated acids, could convert stearic to palmitic acid and vice versa, while cetyl alcohol was oxidised to palmitic acid and vice versa. These reactions were thus proved to be continually taking place in the normal organism.

Rats were fed tyrosine in which the nitrogen contained extra 15N. After a time the body proteins were found to contain tyrosine with the "labelled' nitrogen, showing that there must be a continual hydrolysis and synthesis of protein. Furthermore the nitrogen of some other amino acids was shown to contain increased amounts of the heavy isotope, indicating an exchange f nitrogen between amino acids.

The field of research opened up by the use of isotopes was enormous. Already problems which could not be solved by other means had been settled, and remarkable advances could be anticipated.