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EDITORIAL.

Hon. T. H. McCOMBS, M.SC., A.N.Z.I.C., M.P.

The appointment of Mr. T. H. McCombs to the portfolios of Education and Scientific and Industrial Research is a notable one. He is an original member of the Canterbury Branch of the Institute, and has been an Associate of the Royal Institute of Chemistry since 1930. His interest in chemistry dates back to his schooldays. He worked his way through Canterbury College as demonstrator in chemistry, and, was the first of many of Professor J. Packer's students to work on the glutaconic acids. As a National Research Scholar, he investigated the essential oils of pinus radiata and pinus ponderosa. After a year at the Christchurch Teachers' Training College, he taught in Christchurch and Auckland until he entered political life in 1935, to carry on what had become the McCombs tradition in the Lyttelton electorate.

Mr. McCombs thus brings to his new posts a background of first hand experience. That there are problems, in both education and scientific research, which will make demands on all the experience and ability the new Minister can bring to them, is hardly to be questioned. Many of the problems are material. Educational buildings, from primary schools to universities, are in the same need of rapid development as are other buildings, including those which house scientific workers. All these await the still more urgent call of housing. Staffs are inadequate to the need. Mr. McCombs is already identified, as chairman, with a Parliamentary Committee set up to survey the country's requirements in scientific manpower, and to consider how they are to be met. The latter problem ties in with his duties as Minister of Education, since if it turns out that the production of scientific and technical workers requires to be speeded up, the process must affect the schools as well as the university.

The duties of a Minister of the Crown are onerous. We believe that they are far too heavy, if the solution of short term problems, however pressing, prevents a Minister from finding time to study the long term development of his departments. One problem for consideration of which Mr. Mc-

Combs is especially equipped, is that of higher technical education. We have in New Zealand nothing comparable to the excellent Technical Colleges of England and Scotland, and of Melbourne and Sydney, or the Technisches Hochschules of Europe. The University Colleges attempt, with indifferent success, to play the roles of these, and of academic universities, at the same time. The Technical Colleges are secondary schools with a technical bias, and night schools for apprentices and others. The training of many, though not all, of those who will be needed to increase the efficiency of our industries, in the applied sciences, in engineering, in accountancy, might well be transferred to new institutions which would concern themselves primarily with the application of current knowledge to the solution of immediate problems. The University, freed from its burden of large numbers of students whose bent is not academic, might then be expected to assume that leadership in research, scholarship, and the education of leaders in the community, which its traditions in older countries fit it for. The New Zealand University is feeling its way, cautiously, towards new ways of serving the community. The Minister of Education can, and we believe will, aid it greatly.

GENERAL MEETING—20th May, 1947.

The General Meeting of the Institute for 1947 was held during Conference in the Dominion Museum Lecture Hall, Wellington. The President, Professor F. G. Soper, was in the chair, and about seventy members of the Institute were present.

In his opening address, the President referred to the recent death of Sir Frederick Gowland Hopkins, and while dealing with the work of New Zealand chemists overseas, made special mention of honours conferred on Mr. R. H. Stokes, now of the University of Perth, Australia. Mr. Stokes had been awarded the Meldola Medal and also the Lennie Memorial Medal of the Australian Chemical Institute.

Professor Soper then reported on the meeting of representatives of Commonwealth Institutes of Chemistry in London on 21st June, 1946, and also outlined the activities of the Canadian and South African Institutes.

The following resolution was carried and was subsequently conveyed to the Chemical Society of London:—

"That the New Zealand Institute of Chemistry, realising the indebtedness of the science and profession of Chemistry to the Chemical Society of London over the past hundred years, wishes, on the occasion of the Society's centenary to extend its most cordial good wishes for the continuance of the

Society's eminent world position and for its increasing development as a focus for Chemistry in the British Commonwealth."

The work of the Institute's many sub-committees was reviewed in some detail. Much of the matter covered has already been reported in the Journal or surveyed in the Annual Report for 1946. The latest approach by the Scientific Group Committee of the Public Service on the question of salaries was a group submission to the Appeal Board, for which there was no precedent. Two newly-formed committees for the determination of standard methods of analysis for (a) animal tissue and (b) soils and fertilizers were to hold their first meetings during Conference. Members of the Institute who had material which might be of use to these committees were asked to communicate with the conveners. The syllabus for the Laboratory Assistant's examination has been completely revised, and copies of the new syllabus may be obtained from the Registrar.

A discussion of various points in the reports followed. It had been intended to hold the 1948 Conference in Dunedin during May, to coincide with Otago's Centenary Celebrations. Several speakers, however, expressed the opinion that August was a more suitable time for Conference, and a resolution was accordingly carried recommending to Council that Conference be normally held in the August holidays.

In reply to a query, Mr. Mandeno stated that the Institute's Standard Salary Scale for Laboratory Assistants had been prepared on the basis of salaries actually being paid in industry, and was also related to salaries for this type of work in the Public Service.

Before the meeting closed, some time was devoted to the question of sending food parcels to chemists and their dependants in Great Britain. There was a unanimous feeling that a scheme for this should be inaugurated, and the discussion centred on the best method of carrying out the project. Details of the scheme were ultimately left to Council, with a recommendation to Branches that the sending of parcels should be carried on.

At the conclusion of the meeting a collection was made to inaugurate the Parcels Fund, the final proceeds of which amounted to £42.

COUNCIL MEETING, 21st May, 1947.

This meeting was held during Conference and advantage was taken of this opportunity to receive personal reports from a number of Committees. The following were present by invitation:—Dr. H. N. Parton, Dr. J. C. Andrews, Dr. L. H. Briggs, and Messrs. L. H. James and B. E. Jackson.

Some discussion took place on the increased cost of producing the Journal and the Editor explained the difficulties encountered. It was felt that members would know of many firms who would wish to avail themselves of the Journal's advertising facilities and the Registrar would appreciate information as to any such firms.

Mr. Hughson reported that following further representation the Public Service Commissioner had agreed that a double rise would be granted, irrespective of salary, to persons who qualified for the Laboratory Assistant's Certificate and that it would be dated back to the 1st of December of the year of sitting the final examination.

The following suggestions for increased co-operation among the various Chemical Institutions in the British Commonwealth were adopted:—

1. The notification to other overseas Institutes of impending visits of our own members.
2. The interchange of Journals and News Letters among the five Institutes.
3. The interchange of Rules and Regulations.
4. The arranging of Empire Conferences at intervals.

It was decided to ask Dr. J. K. Dixon and Mr. W. G. Hughson to make enquiries as to the best way to send food parcels. As a result of their efforts the first batch of parcels has already been sent.

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NEW MEMBERS.

HOGG, Elliot Anderson, B.Sc. (1937) 103 Onepu Rd., Wellington, E.3. (Teacher Scots' College) Senior Teacher of Chemistry and Mathematics from 1943 on.

HOY, Kenneth Frederick, B.Sc., Galloway Laboratory, Soil Fertility Research Station, Box 490, Hamilton (Agricultural Chemist). Has been with Department of Agriculture since 1933 except for 4 years Military Service.

LAW, Norman Heyworth, M.Sc., (1935), Dominion Laboratory, Sydney St., Wellington, (Senior Chemist). Elected A.R.I.C. 1937 and F.R.I.C. (E) 1940. 10 years experience with Boots Pure Drug Co. England.

LAWSON, Allan Stuart, A.A.C.I., 38 Hunter St., Taita, Hutt Valley. (Varnish Chemist, Pinchin Johnson & Co. Ltd.) Diploma Industrial Chemistry and Diploma in Chemical Engineering at Sydney Technical College (1938) 15 years experience Raw Material analysis, Oil, Varnish, Paint, etc.

MANGAN, James Lavelle, M.Sc., (1947). 16 Edgeware Road, Palmerston North. (Assistant Chemist, Plant Chemistry Laboratory, Palmerston North). Joined this Laboratory in January, 1944.

RONALDSON, John William, M.Sc. (1946). 13 Mill Street, Hamilton. (First Assistant Chemist, N.Z. Co-op. Dairy Co. Ltd.) Joined above Company in 1946

SCOTT, Gordon Randall, B.Sc. (1944) Dominion Laboratory, Lower High St., Dunedin. (Assistant Chemist and Gas Examiner). Past experience with N.Z. Wool Manufacturers Research Association & Dominion Laboratory, Dunedin.

STOREY, William Stevens, 14a Tama Terrace, Mt. Pleasant, Christchurch. (Chief Chemist, Morrison and Morrison). Associate of Heriot-Watt College Edinburgh (Applied Chemistry). Elected A.R.I.C. 1945. Previously Works Chemist at A. B. Fleming & Co. Ltd., (Edinburgh).

SWANEY, Alan Harding, B.Sc., (1943) Canterbury Frozen Meat Co. Ltd., Box 2, Belfast. (Assistant Chemist). Awarded Diploma of Applied Chemistry (C.U.C.) in 1944.

WESTON, Claude Warwick, B.Sc., (1944), C/o. A. Wander Limited, P.O. Box 7, Papanui, Christchurch. (Works Chemist). Awarded Diploma of Industrial Chemistry (C. U.C.) in 1944.

CONFERENCE — 1948.

N.Z.I.C. **R.I.C.**

will be held in Dunedin from Wednesday to Friday inclusive, August 25th—27th, 1948.

The Combined Committee of the N.Z.I.C. and R.I.C. (N.Z. Section) is anxious to receive as soon as possible opinions concerning the organisation of the meeting. Offers of papers (accompanied by short summary or outline) or themes which chemists or groups of chemists would like discussed will be welcomed.

The conference Secretary is Mr. J. Rogers and all correspondance should be addressed to him at the School of Mines, University of Otago, Dunedin, N.1.

The attention of members is drawn to the enclosed card requesting an indication of your intention to attend conference.

COMMITTEE FOR STANDARDISATION OF PLANT ANALYTICAL METHODS.

The history and constitution of the Committee have already been outlined in this Journal. The stage has now been reached when the Committee is able to make recommendations covering certain analytical procedures, and Council has decided that its findings in the first instance shall be published in the Journal.

In the methods which appear below and in subsequent issues, no attempt is made to cover the ground already covered by available text books. In certain cases references to work only will be given, in others notes will be appended to published methods to clarify doubtful points, while a few methods which in the opinion of the Committee are not satisfactorily dealt with elsewhere will be given in full. The criterion for the acceptance of a method by the Committee is that it has been found satisfactory by two or more laboratories. Where practicable, collaborators have analysed a referee sample.

Delay in publication of any method does not necessarily mean that a satisfactory method does not exist; in most cases it indicates that the method has not been sufficienly tested by collaborators. Information on any method may be obtained from the Secretary of the Committee.

DETERMINATION OF MOISTURE IN DRIED AND GROUND PLANT MATERIAL:

A. For tissues which are relatively low in soluble carbohydrates, e.g. leaves, three methods are accepted:

(1) Drying in a vacuum desiccator for 24 hours. Cf. Official Methods A.O. A.C. 6th Edition P.405 Sec. III, 5th Edition P.354 Sec. III, for general consideration.

(2) Drying in a vacuum oven at 60° for 2 hours at pressures below 10 mm.

(3) Drying in a well-controlled laboratory oven at 100° for 16-24 hours.

These methods will give figures for moisture content varying by as much as 40%, the highest figure being given by (3); but since moisture determinations are performed only to correct the figures of other analyses, this varation is unimportant. The three recommended procedures will cause variations not exceeding + 1.5% in any particular constituent. Drying at temperatures higher than 100° is not recommended, although by careful standardisation of procedure perfectly satisfactory results may be obtained.

B. For storage tissues and particularly for high soluble carbohydrates tissues no recommendation can be made. For a referee sample of dehydrated carrot results by different methods varied from 4.1% (vacuum desiccator) to over 15% (laboratory oven). The difficulties inherent in the determination are discussed in Ind. Eng. Chem. **38**, 725 (1946).

Determination of Ash:

For a discussion of ashing conditions reference should be made to "Soil and Plant Analysis" by C. S. Piper, University of Adelaide Press, 1942, pp. 258 et. seq. The Committee's recommendation is:

Between 1 and 10 g. of dry tissue, according to subsequent analyses, are ignited at 450°-500°C untiil carbonaceous matter is destroyed. Where ignition is difficult, either the sample may be alternately wetted and ignited, or the sample may after the first ignition, be leached with water to remove soluble ash. The insoluble residue is again ignited, the soluble ash added and the whole re-ignited. Both modifications result in a cleaner ash.

Crude Silica: Piper pp. 264-265.

Sodium: Piper pp. 288-291.

Boron: The method of Truog, Soil Science, **59**, 85 (1945) has been tentatively accepted, but confirmation will be postponed until certain modifications now under trial have been thorougly tested.

Chlorine: Imperial Bureau of Animal Nutrition, Technical Comm. No. 9 (1937).

Calcium: After removal of crude silica and making to volume in a volumetric flask, an aliquot corresponding to 2-4 gm, of sample is taken in a 200-250 ml. beaker and neutralized using dilute ammonia in the cold to the methyl-red end point, after addition of solid ammonium chloride. (1) The amount of ammonium chloride to be added is obtained by calculating the quantity of ammonium chloride formed on neutralisation of the HCl present, and then making up to 1 gm. with the solid reagent (this need be approximate only). The solution is then boiled and if the indicator shows an alkaline reaction a drop or two of 10 per cent acetic solution is added untill the solution is just acid. Stand to allow any precipitate to settle and filter when hot, washing with a hot 1 per cent ammonium chloride aqueous solution. The final volume is about 150 ml. unless only small amounts of CaO are present, when the volume of liquid should be kept low (about 50ml). Hot 3 per cent ammonium oxalate solution is added to the solution at 80-90° C. 10 ml or more may be required for complete precipitation. Stir until precipitation is well advanced, keeping the liquid hot for a minute, and then digest on a hot plate at just below boiling point for 15-30 minutes to complete the precipitation and to granulate the precipitate. Filter when cold (or after leaving overnight) using a 9 cm. Whatman No. 40, or equivalent paper. (For a very small precipitate use a 7 cm. paper).

Wash the precipitate three times with hot water using 15 ml. each time. Change to another beaker to receive further filtrate from continuing the washing of the original beaker and precipitate with a hot aqueous solution of ammonium oxalate (saturated at room temperature). Wash with five or six lots of this solution, using 15 ml. of liquid each time. Discard this second filtrate. It is not necessary to transfer all the precipitate to the filter paper. Reserve the first filtrate for the estimation of magnesium..

After washing is completed, pierce the filter paper containing the precipitate with a glass rod and wash the precipitate of calcium oxalate into the beaker used for the precipitation with hot 10 per cent sulphuric acid solution until a volume of about 100 ml. is reached. (Stir well to dissolve any precipitate that has come through). Heat the liquid to 70-75°C (not above, this temperature) and titrate with N/10 or N/20 potassium permanganate solution, adding the reagent slowly at first so that no permanent pink colour is allowed to remain in the solution on stiring. Later the oxidising agent may be added faster but at no time at a rate greater than 2-3 drops per second. When near the end-point add the filter paper which contained the precipitate to the liquid, wash the filter funnel with hot 10 per cent sulphuric acid solution, adding these washings to the liquid being titrated. Continue with titration, with permanganate until a permanent pale pink colour through the solution is obtained.

1 ml. N/10 potassium permanganate is equivalent to 0.002804 gm. CaO.

Note (1). If it is known that Fe, Al and Mn are low in the sample their removal may be delayed until after the calcium has been determined. For removal of Mn make alkaline with excess of ammonia and add a few ml. of saturated aqueous solution of bromine. Boil off the excess of ammonia and bromine and filter while hot.

Magnesium: Concentrate the first filtrate from the calcium estimation to about 20 ml. and add 15 ml. of concentrated nitric acid. Place the beaker covered with a watch glass on a hot plate or sand bath in the fume-cupboard. When evolution of gas is completed rinse down the watch-glass and sides of the beaker and then evaporate the contents to dryness, until all nitric acid is removed. If there is much residue all the ammonium salts may not have been decomposed. Take up the residue with about 20 ml. of water and add a further 5 ml. of concentrated nitric acid and again take to dryness). The residue is taken up in about 20 ml. of water, 10 ml. of 2N HCl solution is added and the contents are digested on a hot plate for 30 minutes. Fe, Al and Mn (and silica from the glass etc.) are removed by neutralisation with excess of ammonia, and addition of bromine to oxidise the manganese. Boil until free from ammonia and bromine and filter hot, washing with hot water five or six times. It the pyrophosphate method is to be used add 10 ml. of a saturated solution of $Na_2HPO_412H_2O$ and then a solution of strong ammonia using a slight but distinct excess. Stir vigorously, keeping the stirring rod off the sides of the beaker as far as possible. Set aside, after covering with a watch glass, for 30 minutes. After this period stir well and add 10 ml. of concentrated ammonia (0.990) and stir vigorously. Set aside overnight. Next morning filter through a 9 cm. Whatman No. 40 (or equivalent) paper and wash with 2.5 per cent ammonia solution until free from chlorides etc. (at least eight washings). Place the filter paper in a weighed crucible and place in the mouth of the furnace to dry. Then put the crucible further into the furnace to slowly carbonise and burn off the paper. Finally place right into the furnace and ignite for 1 hour at 1000°C. Cool and weigh the magnesium as the pyrophosphate.

If the 8-hydroxyquinoline method is to be used follow the modified directions of Metson, as given below.

One evaporation with HNO_3 as described above is sufficient. Take up in 2 ml. 1 : 1 HCl and dilute to 25-30 ml. Add methyl red, and 1 : 1 ammonia until just alkaline. Heat to boiling, add 5 ml. saturated bromine water and a little more 1 : 1 ammonia to keep the solution alkaline (See "Applied Inorganic Analysis" by Hillebrand and Lundell). Boil for two or three minutes and then filter through a 5.5 or 7 cm. No. 31 or 41 paper, washing with cool 2 per cent NH_4Cl. Add ca. 1 g. NH_4Cl to the filtrate and make the volume 30-150 ml. according to the amount of Mg expected. Acidify with a few drops of 1 : 1 HCl and add sufficient 8-hydroxy quinoline reagent (5% in 2N HOAc) to give a slight excess, heat to ca. 80°, and add enough 1 : 1 ammonia to make the solution distinctly alkaline. Digest 10-15 minutes on the water bath. Cool, and stand at least 3 hours. If properly pptd. and traces of Gr.III metals are absent a granular yellowish ppt. will be obtained. Unless the Fe, Al, Mn, pptn. is made immediately before the Mg pptn. Fe contamination from hot plates is almost inevitable and a greenish flocculent precipitate is the result.

The bromine used destroys the methyl red indicator and if none is added when precipitating the Mg, an excess of 8-hydroxyquinoline is shown by a yellow colour in the supernatant liquid. If a colourless supernatant liquid is obtained, heat again to 80°C, add more reagent and more ammonia if necessary. It is better to do this than to add so much 8-hydroxyquinoline in the first place that it crystallizes out on cooling.

Filter through a 30 or 40 paper, washing once with 10 ml. 95 per cent alcohol saturated with (slightly ammoniacal) Mg oxyquinolate, and then thoroughly with an ammonium acetate-ammonia buffer of pH about 9.5 (Peech's wash solution—to 400 ml. of N/1 NH_4OAc add 200 ml. H_2O and 16 ml. conc. NH_4OH).

The titration procedure is as described in the original paper (N.Z. J.Sci. & Tech.:1940, 22 (B) 125.)

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BRANCH NOTES

AUCKLAND BRANCH.

At the June meeting Dr. R. A. Robinson gave a farewell lecture on "Some aspects of Highly Concentrated Solutions." By highly concentrated solutions is meant those which contain about equal amounts of salt and water. The study of the vapour pressures of supersaturated solutions of calcium nitrate show some resemblance to the adsorption of gases onto solid surfaces in partly obeying the Langmuir isotherm. Langmuir's isotherm holds for cases where only one layer of adsorbed gas is required to saturate the surface. Brunauer, Emmett and Teller have developed a theory for the adsorption of gases on to solids in cases where more than one adsorbed layer is formed as in the case of the adsorption of water vapour on to protein. By applying their concept to the adsorption of water vapour on to ionic lattices we get the following formula

$$\frac{ma}{1-ka} = \frac{1}{x\,kC} + \frac{(C-1)a}{x\,C}$$

where m is the relative amounts of salt and water, a = water activity or relative vapour pressure, k is a constant relating energy change from one layer to the next and is of the order of 0.9, x is the maximum amount of water capable of being taken up by the innermost layer, C is related to the energy of formation of the adsorbed layers from the gaseous state. C involves (a) energy of separation of the positive and negative ions, (b) energy of formation of the dipole formed, and (c) energy of condensation or latent heat of water.

The values for C calculated from a, b and c, do agree with the values found by applying the B.E.T. equation to the observed vapour pressures of these highly concentrated solutions, the relationship holding up to about 50% saturation of the salt with water vapour (approx. 8 molar.) This agreement indicates that the postulation of adsorption in the hydration of ionic lattices is correct, the water being adsorbed forming layers of water molecules about the positive ions. x for salts forming two ions is usually 4. The solution of an anhydrous salt can be visualised as follows; molecules of water are first adsorbed on to the positive ions, distorting the crystalline lattice and forcing apart the ions to accomodate the water molecules about the positive ions. The first effect of the adsorbed water is the formation of a lattice which is not wholly crystalline but has some properties of a liquid due the hydrated ions. with pieces of the original lattice floating about. On increasing the amount of water the original crystal lattice disappears. Contrast this with dilute solutions where we have a liquid medium in which float ice crystals, demonstratable by X-ray diffractions, and salt ions fit in between the water molecules.

Mr. R. W. Green of Greenwells Ltd., addressed the July meeting on "Molecular Distillation."

Molecular distillation was introduced for the fractionation of substances which decompose under conditions of normal vacuum distillation. The essence of molecular distillation is the use of high vacua of the order of 10 microns to increase the mean free path of the escaping molecules, short distilling distances by close proximity of the condenser to the distilling surface, and thin films of constantly flowing distilland to reduce heating hazards.

Two types of molecular stills were then described, the falling film type where the degassed oil flows in a thin film over an inner heating surface, the more volatile fraction distilling across the highly evacuated space onto the outer cooling jacket. The disadvantage here is that channeling of the heated film occurs and comparatively thick films have to be used. The other still described is commonly known as the whirling frying-pan. Here the oil falls onto a slightly concave heating surface revolving at high speed upon which it is whirled as an extremely thin film. The decomposition hazard is here reduced to about one thousandth of the falling type.

Mr. Green then went on to describe the machine in use at Greenwells Ltd. This was locally made in collaboration with the D.S.I.R. and has a rotor 20'' in diameter, revolving at 3000 rpm. Oil degassed at 110°C and 1mm. pressure is run in at a rate of 15-20 lb. of oil per hour, giving 1½-2 lb. of distillate containing 80% of the original vitamin A or 8% pure vitamin A. Tribute was paid to Dr. Shorland who pioneered this work in N.Z.

The theory of molecular distillation was briefly outlined. Once a molecule leaves the distilling surface it does not return so that the rules of vapour pressure equilibria do not apply. The optimum temperature for separation of a component can be found and is known as the elimination maximum analogous to the boiling point in ordinary distillation. This for vitamin A is 120°C. For the perfect separation of two components their elimination maxima should differ by at least 100°C.

After the paper a film was shown dealing with the manufacture of gelatine capsules.

Dr. E. B. Davies of the Plant Research Dept., Ruakura, addressed the August meeting on "Soil Analysis."

Some five independent soil forming factors are recognised as responsible for the development of a soil. These are climate organisms, topography, parent material, and time. The infinite variety of soils resulting from the operation of these variables fall into a number of soil groups. This grouping depends upon the characteristics of the soil profile, the nature of the parent material, state of maturity etc. The final unit is the soil type depending upon the texture or ultimate particle size of the soil as determined by mechanical analysis and flotation. Cementing substances which form the aggregates naturally occurring in the soil are first removed by treatment with dilute hydrochloric acid and hydrogen peroxide. This size distribution of prime particles does not change under ordinary conditions and the soil type description remains permanent. The most finely divided portion of the soil, the clay fraction, is, together with the colloidal organic matter, the most reactive constituent chemically. Clays are substances synthesised from the products of weathering of the parent rock, and are identified by the use of X-ray diffraction, dehydration curves, base exchange capacities, chemical analysis and the electron microscope. The soil can be pictured as consisting of a skelton of mineral fragments. Coating these and distributed between them are the clay minerals and the organic matter. The organic matter which is made up of the residues of animal and plant remains and the population of living organisms, forms a very vital function in increasing moisture holding capacity and in binding together mineral particles into aggregates thus improving the properties of aeration and drainage. Dissolved in the soil water are the elements necessary for plant nutrition. These are constantly replenished from the exchangeable bases in the clay colloid and organic matter which both have weakly acidic properties in that they can combine with bases with equivalent displacement of hydrogen. If all this hydrogen is so displaced the soil is said to be saturated. The base exchange position is of considerable importance in soil advisory work, and is determined as follows. The soil is treated with neutral ammonium acetate solution, the ammonium displaces the exchangeable bases and hydrogen which appear in the filtrate. A Kjeldahl distillation of the alcohol washed ammonium saturated soil gives the amount of ammonium adsorbed and hence the total base exchange capacity. The filtrate is examined after ignition for non volatile basic oxides (total exchangeable bases) and these are analysed for Ca, Mg, K, and sometimes Na. Lime requirements can be calculated to aim at 60% saturation. Total nitrogen in soils is estimated by the Kjeldahl method. The availability of this nitrogen for plant nutrition is dependent to some extent on the carbon-nitrogen ratio. In mature soils this ratio approximates to 10 which is also the ratio found in the bodies of micro-organisms. If there is a greater preponderance of carbonaceous matter the micro-organisms using this as a source of energy will seize upon any available nitrate present and cause a relative nitrogen deficiency for higher plants. This effect has been well illustrated by Mr. S. B. Thompson in his work on nitrogen deficiency in peat land.

In assessing the amounts of plant nutrients, we are interested mainly in the fraction which is immediately available to the plant. The difficulties in selecting methods here are considerable, the most reliable method being that of actual plant growth. In the Mitscherlich method, which is the most reliable method we have, plants are grown under standard conditions in pots containing the soil under test and to which has been added in known and varying amount the plant nutrient being investigated. By determining the amount of plant growth at the different nutrient levels and extrapolating to zero amount added, we can determine the amount originally available. Dr. Davies then described the work his department is doing in searching for more rapid chemical methods for determining these factors, the Mitscherlich pot method being used to determine reliability. With the diversity of soils in N.Z. there is no one satisfactory rapid method for phosphorus. Methods for potassium however do in general give significant results.

The Branch meeting of September 9th, was addressed by Dr. L. H. Briggs of the Organic Chemistry Department, Auckland University College, and members of his research school. The symposium dealt with current research on the Coprosma dyestuffs and compounds isolated from Melicope Ternata of the Order Rutaceae. Dr. Briggs in opening the symposium described the work of Dr. Aston on dyestuffs from the Rutaceae during the first World War. Methods of extraction have since been greatly improved and the application of chromatography has resolved previously inseparable mixtures into the pure compounds. The yields of dyestuffs are high, for example the bark of Coprosma Australis contains 24% of colouring matter and constitutes probably the best dye plant known. Seven or eight species of Coprosma have already been investigated, the coloured compounds are anthraquinones.

Mr. G. A. Nicholls M.Sc., spoke on the structure and confirmatory synthesis of aureolatin obtained from C. areolata, and also on the colouring matter of C. lucida. Mr. B. R. Thomas B.Sc. spoke on the coloring matters from C. acerosa, and Mr. T. J. Sprott M.Sc. described his polarographic investigation of the anthraquinones and the possibility of determining structures such as the position of —OH groups by this method. Mr. R. H. Locker B.Sc. concluded the symposium by description of his work on compounds isolated from Melicope Ternata.

The meeting of the Auckland Branch on September 30th was a memorable one. Besides a visit from the Hamilton Branch, Mr. W. A. Joiner delivered his presidential address for the Royal Institute of Chemistry and two arrivals notable in the chemical world were welcomed. These latter were Dr. F. J. Llewellyn, recently appointed Professor of Chemistry at the Auckland University College, and Dr. H. Bloom recently appointed lecturer in physical chemistry.

Professor Llewellyn B.Sc., Ph.D., F.R.I.C., graduated B.Sc. with first class honours from the Birmingham University in 1935 and Ph.D. from that University in 1938. Between 1939 and 1945 he was Senior lecturer in Structural Inorganic Chemistry (Final Honours Course) at Birkbeck College, University of London, and from 1941 to 1945 took over all the Inorganic teaching except the first year. During that time he was also Director of a Ministry of Supply Extra-Mural Research Team at the University of Birmingham and did a considerable amount of research on explosives. From 1945 to 1947 he was Lecturer in General and Crystal Chemistry and Senior Foundation I.C.I. Research Fellow at the University of Birmingham. In addition to published researches, chiefly on structural chemistry, a number of papers are in the press and others, carried out for military purposes, will be published later. Professor Llewellyn is to be furnished with first class equipment by the college and hopes to establish a much needed school in X-rays in Auckland. Professor Llewellyn who is 31 is married and has one son.

Dr. H. Bloom graduated B.Sc. and M.Sc. with first class honours at the Melbourne University, doing research in physical chemistry under Professor E. Heymann. In 1945 after finishing his course at the Melbourne University, he was awarded a Beit Scientific Fellowship which he held at the Imperial College of Science and Technology, London, where he carried out research under Professor H. V. A. Briscoe and Dr. A. J. E. Welch on oxides, sulphides and oxysalts, for his Ph.D. degree. Dr. Bloom intends to carry on his high temperature work on sulphides. It is suggested that he may learn a great deal by climbing into some of our volcanic vents and observing at close quarters the effects on sulphides of the high temperatures there.

The Branch extended a hearty welcome to both Professor Llewellyn and Dr. Bloom and hoped that they would have a happy and prosperous stay in Auckland.

The Hamilton members spent the day in Auckland inspecting some of the local industries. The tour started with the Waitemata Breweries where a liberal lunch was provided. This was hardly fair in view of the strenuous tour which was to follow and some members encountered trouble with the countless number of stairways they had to climb. Visits were paid to the N.Z. Farmers Fertiliser Works at Te Papapa, to the Pottery Works of the Amalgamated Brick and Tile Works at New Lynn, and to Greenwell's Fish-Liver Oil Factory at Freeman's Bay.

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PERSONAL.

It has been recently announced that Dr. L. H. Briggs has been elected to an Associate Professorship in Chemistry at the Auckland University College. Professor Briggs has been Senior Lecturer in Organic Chemistry for many years and is well known in the N.Z. chemical world, and therefore needs no introduction. It is perhaps fitting at this time that we should learn of the success of one of his former pupils, Mr. Cedric H. Hassall, who has been appointed Professor of Chemistry at the newly-established University College of the West Indies, at Kingston, Jamaica. Mr. Hassall, who is 27 years of age and married is a graduate of the Auckland University College, and a former member of the Institute of Chemistry. He completed his B.Sc. degree in 1939 and while on the staff of the Auckland Grammar School in 1940-41 he did his honours work for the Masters degree in organic chemistry. After a short term in industry he was appointed lecturer in chemistry at Otago University. Mr. Hassall went to Cambridge University in 1945 to work under Professor A. R. Todd, and the quality of his work was recognised by the award of a Senior 1851 Scholarship. He is expected shortly to complete his Doctorate of Philosophy at Cambridge.

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WELLINGTON BRANCH.

MELLOR MEMORIAL LECTURE.

The Annual Mellor Memorial Lecture was delivered on July 2nd by Mr. A. D. Monro, Senior Lecturer in Chemistry at Victoria University College, who traced the progress of knowledge on the structure of clays from Mellor's early work to the present time.

In introducing his subject Mr. Monro stressed the astonishing scope of Mellor's interests which ranged from the reaction of hydrogen and chlorine on one hand to the host of ceramic papers on the other. With these diverse interests Mellor combined the compilation of his massive Treatise on Inorganic Chemistry and he maintained a rare balance of wisdom and judgment which is well illustrated by his opinion of the role of mathematics in research.

'There are so many misconceptions about the part played by mathematics in research that I venture to make a brief digression. Thirty years ago I defined mathematics as an economical process of reasoning. I hold the same opinion to-day. A mathematical demonstration is a powerful auxiliary, for it can guide observations in advantageous and remunerative directions; it can bring to light results previously obscure—but they must afterwards be confirmed by observations before they can be accepted; it can give us some confidence in the results of empirical observations by showing that they fit in with general knowledge so that a series of isolated observations becomes a precise, quantitative part of a general system; it can extend, in certain directions, the range of empirical observations; and it can compress an indefinitely large number of measurements into one, more or less simple rule which enables future workers to progress with a greater economy of thought—e.g. the so-called gas laws.

A mathematical demonstration is treacherous and deceptive when it gives an appearance of precision and verity to inferences which may be faulty or even false. To me, H. E. Armstrong's battle with the ionic theory of solutions was a timely protest against the tendency of mathematical reasoning to obscure, by a kind of hypnosis, some fundamentally unsound premises. Mathematical demonstrations always proceed from the assumption that the premises are correct. Consequentally, the conclusions are at least as vulnerable as are the fundamental assumptions on which they are based. For clear, honest thinking, it is therefore important to have as explicit a statement of the assumptions as it is of the conclusions even though that statement might appear to weaken the force of the argument.'

The lecturer then outlined the development of ideas on the structure of clays from the first paper of Mellor and Holdcroft in 1910 to the present day.

The formula for kaolinite suggested by Mellor and Holdcroft was a great advance on the earlier formulae involving mixed oxides of the aluminium salts of imaginary silicic acids, but since Mellor was working some ten years before the Braggs revolutionised silicate chemistry, the molecular formula he proposed is not satisfactory by modern standards.

Modern views on the structure of silicates and aluminosilicates are based on considerations of packing of atoms and ions, a viewpoint from which the most important property of an atom is its size. Proceeding from such considerations it is possible to classify silicate structures into chains, sheets and three dimensional networks in which replacement of one atom by another of similar size frequently occurs.

The speaker next related these general principles of alumino-silicate structure to the particular problems of the clay minerals, and outlined the usually accepted classification of these minerals into Kaolinite, Montmorillonite and Illite groups. Typical examples of each group were discussed and particular attention paid to the isomorphous replacements in the montmorillonite and illite structures and their attendant effects on other properties.

From this point Mr. Monro passed to a review of the role played by water in the behaviour of clays. Following Kelley and Hendricks and Jefferson, he suggested the possibility of water being held closely on broken flake edges, and less closely on the planar faces of the mineral lattices. The broken bond water is probably more important in kaolinite and illites than in montmorillonite minerals. The planar water is considered to be present in hexagonal sheets which are held to the basal oxygen sheets of the mineral lattice by hydrogen bonds. The dimensions of the water hexagons are about the same as those of the hexagonal oxygen networks of the alumino-silicate structures.

Finally Mr. Monro outlined the phenomenon of base exchange in clays, pointing out the difference between exchangeable bases held on broken lattice ends, and those which are required to maintain electrical neutrality in cases where isomorphous replacement has upset the balance of charges in the lattice. The possibility of internal compensation of the lattice was explained and the order of cation replaceability discussed.

At the August Meeting, Mr. S. E. Wright, of the Pharmacy College spoke on "Trends in Modern Medicinals."

During the last two decades we have been privileged to observe a tremendous advance in the development of new therapeutic agents. Much of the old "Materia Medica" has been outmoded and the medical scientist now has at his disposal a host of powerful chemical precision weapons for both preventive and curative treatment.

One of the most important factors contributing towards these advances has been the closer approach of chemistry and biology. Also the necessity for planned research, both pure and applied, has meant the development of research teams, the personnel of which is drawn from many branches of science. This development reached a peak in the war-time work on penicillin and it is to be regretted that such co-operation does not extend to peace time. The synthesis of the most recent member of the vitamin family, folic acid, was accomplished by a team of sixteen workers but the details of the procedures adopted were not disclosed, presumably because they were regarded as trade secrets.

There is no doubt that the Woods-Fildes hypothesis of the mechanism of the action of sulphanilamide helped to rationalise the approach to the discovery of new medicinals. When these workers demonstrated that the essential metabolite p. amino benzoic acid was inhibited in its attraction to enzyme receptor groups by sulphanilamide, a new front of attack was opened. This was to modify the structure of essential metabolites so as to produce substances which no longer inhibit any specific action in the cell economy but which may still block the enzymes concerned in the reaction.

In the sulphanilamide field, the most recent developments have been the production of more efficient antagonists to intestinal infections, whilst the allied aromatic sulphones continued to be explored as chemotherapeutic agents in the treatment of leprosy.

A complete explanation for the enhanced activity of N^1 sulphanilamide derivatives has not been advanced but two opposed theories are worthy of mention.

Bell and Roblin have shown that the activity of the sulphanilamides at pH 7 is determined by the degree of ionisation of the acid group—SO_2NHR, maximum activity being found in compounds having a pK of about 7, which are thus 50 per cent ionised at the test pH. These workers ignore the influence of the basic—NH_2 groups but Kumler and Daniels and others have suggested that the fundamental feature of activity lies not in the negative character of the — SO_2NHR group, but in the resonance form of the entire molecule involving the coplanar — NH_2 group. Point is given to this latter theory by the fact that p. amino thiophenol is antagonised by p. amino benzoic acid.

Competition between chemical substances and essential metabolites has also been demonstrated in the acridine group of antiseptics where the ionisation of the molecules at pH 7 has been definitely correlated with activity. The acridine cation appears to compete with hydrogen ion. A number of new anti-histamine molecules have been recently made known, and their mode of action may be a direct competition with histamine for enzyme groups. The use of B.A.L. (2:3 dimercaptopropanol) in poisoning by heavy metals is also an example of competitive inhibition, but in this case the drug takes the metallic ion away from the —SH groups of the protein.

The development of aromatic diamidines illustrates how, in planned research, an original hypothesis may prove quite untenable and yet successful development along quite another channel may be the result.

Other groups of drugs which continue to be developed by the modification of molecules previously found to be active, are the barbiturates, synthetic sex hormones, atropine and ephedrine substitutes. In the field of anti-malarials, the British compound Paludrine, developed by a series of what could be termed model experiments, appears to be a complete substitute for quinine.

The chemist, always attempting to improve upon nature, appears to have been successful in the development of the curare substitute Myanesin, and in several new modifications of the morphine molecule. The synthesis of folic acid which is a combination of glutamic acid, p. amino benzoic acid, and pterin (present as a pigment in butterfly wings) has opened up new paths in the treatment of important anaemias.

There appears to be an even brighter future ahead for the application of chemistry to medicine, and the fields of endeavour increase as each year passes. Chemistry must continue to serve man, and the alleviation of suffering is surely one of the most worthwhile paths of service.

On 3rd September, Mr. P. J. Clark, Dominion Laboratory, discussed "Recent Advances in Plant Therapeutants."

With the outbreak of war the usual plant therapeutants containing lead, arsenic, copper, pyrethrin and rotenone, became in very short supply, and intensive research was directed towards the finding of substitutes. Probably the most outstanding find was DDT. Commercial DDT consists mainly of two isomers, the pp' and the op', of which the former is the most valuable and useful.

Many efforts have been made to improve on the properties of DDT by varying the type and degree of substitution in the benzene rings. No marked success has as yet been recorded, but it has been proved that substitution in the pp^1 position gives the most insecticidal compounds. The most promising new compound seems to be the pp^1 methoxy derivative.

In the field of agriculture DDT has been used successfully over a range of pests greater than any other insecticide, and this has involved the problem of the determination of residual amounts.

Cabbages and tomatoes dusted and sprayed with DDT have been found to contain residual DDT amounting to approximately one part per million. DDT thus appears safer to use than the arsenates.

Gammexane or hexachlorocyclohexane is also gaining a place in the field of plant therapeutants, and when it is possible to produce it without its disagreeable smell its use will no doubt be multiplied.

The possibilities of selenium and hexaethyl tetraphosphate as newcomers to the field were also touched upon.

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PERSONAL ITEMS.

Mr. N. P. Alcorn, M.Sc., A.R.I.C., A.N.Z.I.C, who, until recently has been on the staff of the Dominion Laboratory in Wellington, has been appointed Government Analyst in Christchurch.

We learn with interest that Mr. S. J. Bennett B.Sc. Tech. (Manc.) has left for China to take a position as a chemist with CORSO and will assist Mr. Rewi Alley for two years.

Mr. S. B. Bowyer who has been ill for some time is making favourable progress.

Formerly chief chemist to the vegetable processing factory at Pukekohe Mr. H. B. Oakley B.Sc. (London) A.N.Z.I.C. is now on the staff of the Plant Chemistry Laboratory in Palmerston North.

Mr. J. L. Mandeno of the Dominion Laboratory staff has had the pleasure of accompanying Sir Reginald E. Stradling C.B., M.C., F.R.S. whilst on his visit to this country. Sir Reginald who was Director of Building Research in Great Britain until the outbreak of the war is now Chief Scientific Advisor to the Ministry of Works and was visiting New Zealand at the request of the Government to advise us on building and civil engineering research.

The Government has also invited Mr. Walter L. Badger, formerly Professor of Chemical Engineering at the University of Michigan and now a consulting engineer to the Dow Chemical Company and the Swenson Evaporator Company, to visit this country to render advice on the preparation of salt from seawater. We are happy to announce that Mr. G. Maskill Smith of the Dominion Laboratory has been selected as his escort during his stay in New Zealand.

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CANTERBURY BRANCH.

DR. J. W. MITCHELL.

A distinguished graduate of Canterbury University College recently paid a short visit to New Zealand, and gave freely of his services in the education of students of physics and chemistry. Dr. J. W. Mitchell went to Oxford in 1935 after a career of unusual distinction at Canterbury College, leading to the award of the 1851 Exhibition Science Scholarship. At Oxford he worked under Professor C. N. Hinshelwood, mainly on the nitric oxide—hydrogen reaction. In his third year at Oxford his interests began to turn towards physics. He taught physics at Repton School for a short period, and when war broke out, joined the scientific staff of the Ministry of Supply. He had charge of the development work in high speed photography, and was responsible for the "Arditron" valve, by which high intensity, short duration flashes are produced. He is now Senior Lecturer in Physics at Bristol University, where Professor N. F. Mott heads a very strong school of both theoretical and experimental physics. Dr. Mitchell's special concern is with experimental work on surface reactions, and the teaching of spectroscopy.

During his ten weeks in Christchurch, Dr. Mitchell gave a course of 12 lectures on the solid state. Topics covered included the mechanical properties of single crystals, strength and elastic constants, work and age hardening, zone theory of solids, conductors, semi conductors and insulators, Fermi- Sommerfeld model of a metal, ionic and electronic conductivity in ionic solids, lattice defects, silver halide crystals and luminescence. Much of the work described was that of the Bristol school, and some of it is not yet published. The lecturer's enthusiasm and clarity of presentation made the course a memorable one.

In addition, Dr. Mitchell addressed the Canterbury Branch of the Institute on the theory of covalency. This was a discussion of the application of the molecular orbital method to the simple cases for which a reasonable solution has been obtained, notably of course the hydrogen molecule. In this method, the somewhat artificial concept of "resonance" is not used, and there is little doubt that in principle, the molecular orbital method is more fundamental than the Heitler-London treatment.

Many members also attended the lecture Dr. Mitchell gave to the Canterbury Branch of the Royal Society of New Zealand on "High Speed Photography," in which some remarkable photographs were shown on the flight of bullets and shells, and the piercing of steel plate.

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OTAGO BRANCH.

At the July meeting Prof. F. G. Soper described his visit to Britain last year as a delegate to the Royal Society Empire Conference, and to the British Commonwealth Official Scientific Conference. During this tour Prof. Soper was able to visit many British, American and Canadian Universieies, as well as some research laboratories, such as those of Eastman Kodak, and Distillation Products Inc.

As regards the Universities, what impressed Dr. Soper most was the importance with which research was regarded. Departments with approximately the same number of undergraduate students as Otago had many more post-graduate students—sometimes as many as 30-40 taking the Ph.D. course The space taken up by research laboratories was approximately the same as that of the undergraduate laboratories. The number of staff members was also very much greater e.g. at Leeds there are 3 professors and 21 lecturers and assistant lecturers. At the present time the British Universities are experiencing difficulty in obtaining equipment although a certain amount is being obtained from the Government Disposal Board at £7 per cwt. In America, university laboratories were all extremely well equipped. Whereas a N.Z. department orders a single piece of apparatus, and an English university three, the American university orders by the dozen.

At a time when one hears so much about atomic piles and radio active isotopes it was interesting to learn that Eastman Kodak are concentrating the natural isotopes C_{13} and N_{15} on a commercial scale by distillation methods. Most of the material so produced is being used for tracer work in biochemistry.

Prof. Soper then went on to describe the design and uses of various kinds of equipment he had seen. These included an infra red spectrophotometer used for the identification of organic compounds and for analysis of mixtures e.g. butanol and iso butanol; and a centrifugal molecular still at Distillation Products Inc. which was being used to separate the isomers of vitamin A.

In conclusion Dr. Soper gave a brief account of the set up and activities of the South African and Canadian Institutes of Chemistry.

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BIOCHEMISTRY OF HAEMOGLOBIN AND BILE PIGMENTS.

In August members of the Otago Branch of the Institute of Chemistry were invited to attend a series of six lecures delivered by Dr. Rudolph Lemberg at the Medical School. Dr. Lemberg (formerly a teacher in the University of Heidelberg) is a Senior Research Fellow of the National Health and Medical Research Council of Australia and director of the biochemical laboratory, Royal North Shore Hospital, Sydney. Dr. Lemberg is best known for his brilliant work on bile pigments, but he is also a leading authority on the haem pigments.

The first lecture began with an outline of the occurence of pyrrole derivatives and their fundamental importance in vital processes such as photosynthesis, oxygen transport and cellular respiration. The structure of the pyrromethenes, both open and closed-ring compounds, was discussed in some detail with particular reference to colour and resonance. The diversity of the side chains, and of their arrangements, made the number of possible compounds very large, but in nature the number was limited to a few recurrent patterns. The metal complexes of the porphyrins were described; and attention was paid to the difficult question of the bonding of further addenda like nitrogenous compounds (including proteins), O_2, H_2O_2, CO and CN. The two extra co-valences of Fe were considered to protrude at right angles to the planar structure of the porphyrin nucleus. One of these valences provides a link to protein through the imidazole ring of histidine, a second residue of which approaches the Fe atom from the opposite side of the nuclear plane, leaving a "box" into which a molecule of O_2 or CO could fit. Physico-chemical methods of investigating the porphyrins aind their compounds were described briefly.

The second lecture was devoted to a discussion of individual porphyrins and haem compounds, including haemoglobin. Dr. Lemberg proposed a new nomenclature which removes much confusion from a field in which terms (e.g. haemochromogen) often have little more than historical significance. The terms haemochrome and haemichrome were suggested as a basis for systematic naming of Fe^{II}— and Fe^{III}— porphyrin —N compounds. Haemoglobin is the term for Fe^{II}— protoporphyrin-globin and haemiglobin for Fe^{III}— protoporphyrin-globin (Methaemoglobin). The nomenclature can be extended to the open tetrapyrrolic structures which Lemberg proposes to call cholehaemochromes.

The third lecture contained an historical account of the discovery of the bile pigments. The confused nomenclature was again stressed and the adoption of a systematic classification was urged. The bile pigments are conveniently classed into bilanes, bilenes, biladienes and bilatrienes. Colour is related to the number of conjugated double bonds. The formation of complex salts, the chemistry of the Gmelin reaction, and the chemistry of the urobilins and stercobilins were discussed. Dr. Lemberg described an elegant, but simple method, for the preparation of crystalline biliverdin from pyridine haemochrome.

The fourth lecture dealt with the mechanism of the breakdown of haemoglobin to bile pigment (**in vitro** as well as **in vivo**) and with the discovery of choleglobin. The formation of bile pigment in the animal body takes place in cells of the reticulo-endothelial system and involves several steps. Opening of the protoporphyrin ring by oxidative removal of the alpha-methene C gives rise to choleglobin; removal of Fe and globin gives the primary bile pigment, biliverdin, which is reduced to bilirubin. The reduction is linked to dehydrogenase systems of which lactic dehydrogenase is particularly active.

The fifth and sixth lectures were devoted to medical aspects of haemoglobin breakdown and resynthesis. The following topics were considered from a biochemical standpoint:— The life span and decay of the red blood cell; the storage of iron in ferritin and haemosiderin; serum bilirubin; the enterohepatic circulation of bile pigments and the phenomena of jaundice; the metabolism of porphyrins, porphyrin excretion and the congenital porphyrias; the synthesis of porphyrins by bacteria and yeast and the occurrence of porphyrin in diphtheria toxin; the anaemias and the factors which influence haemopoiesis—antipernicious anaemia principle, pteroylgutamic acid, and other B vitamins, hormones and minerals.

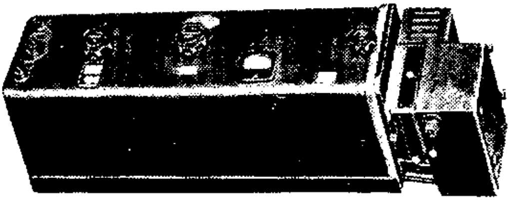
Dr. Lemberg put forward some very interesting speculations with regard to the vital synthesis and evolution of the porphyrins. The suggestions were based on the natural occurrence of certain dipyrromethenes, which, combined in several different ways, could give rise to uro—and copro-porphyrins I and III and to protoporphyrin. The pyrrole ring itself might arise from alpha-keto-glutaric acid in the Krebs Cycle. It was significant that a derivative of alpha-pyrrolidone—carboxylic acid had been isolated from liver by Dakin and West (1931).

PERSONAL.

Mr. P. A. Ongley, transferred to this branch from Wellington some four or five years ago, to take up a position in the Department of Medicine. He took a keen and active interest in Institute matters and for the last three years was the Branch Editor for the Journal, a little publicised office, but one involving a great deal of work. In September he left for Glasgow, where he is to work with Prof. J. W. Cook and hopes to take his Ph.D.

BOOK REVIEWS.

Mr. L. M. Simmons, whose Comprehension Textbook of Theoretical Chemistry was reviewed in this Journal, Vol. XI, No. 1, has written two companion volumes: "Chemistry for Leaving Certificate Honours Classes" and "Practical Work for Leaving Certificate Chemistry Students," both published by William Brooks and Co. Ltd., 99 Pitt St., Sydney. Both works will be of considerable interest to teachers of senior forms in New Zealand schools, partly because they maintain the excellent standard of the author's larger book, and partly because the Honours Course for the Leaving Certificate in New South Wales has no direct counterpart in New Zealand. It is in fact a specialised course comparable with Stage I Chemistry. Topics such as liquefaction of gases, fractional distillation, hydrolysis and corrosion not usually included in Entrance Scholarship papers, are part of the syllabus. A very



useful guide is given in Chapter VIII to the method of answering comparison questions e.g. of the halogens, or the alkaline earth metals. The author regards these, rightly, as an exercise in writing comparative scientific reports, as well as illustrative the periodic law.

The practical text is also first rate. The syllabus covers preparation of gases and salts, reaction of cations and anions, simple gravimetric and volumetric analysis. Much greater stress is placed on familiarising pupils with the reactions of salts than on carrying out identifications. The reviewer regards this as sound. Identification procedures, important as they are at a later stage, readily degenerate into blind following of the instructions, cook book chemistry. Mr. Simmons is an active investigator as well as a teacher, as a recent paper in the Australian Chemical Institute Journal and Proceedings Vol. 14, No. 2, 1947 shows. He is thus unusually well equipped for his task, and his books will be an asset to any teacher.

The Post-Primary School Bulletin Vol 1, No. 14, "Scientific Institutions in New Zealand" will be of interest to New Zealand chemists, because its subject is "The Dominion Laboratory" and its author the former Director, Mr. R. L. Andrew. It is one of the objectives of School Certificate Chemistry that pupils should become familiar with the chemical industry, especially in their own region, and its allied services. Mr. Andrew has succeeded in compressing into a short bulletin, a sketch of the history of the laboratory and a clear account of the principal among its many functions. Such a work deserves a wider circle of readers than secondary school pupils.

Mr. Andrew has called attention, at the end of the bulletin to the existence of the Institute of Chemistry, and of its purposes. For this, we are in his debt.

It is not obvious in what year the Laboratory will qualify for a jubilee, since it grew out of the Colonial Laboratory (1865) and took its present name in 1907. But whenever it may be, it is to be hoped that the full history of the Laboratory will be written, and there are two men in Mr. Donovan and Mr. Andrew, well qualified for the task.

H.N.P.

The Institute as a whole is not responsible for statements and opinions appearing in this Journal.

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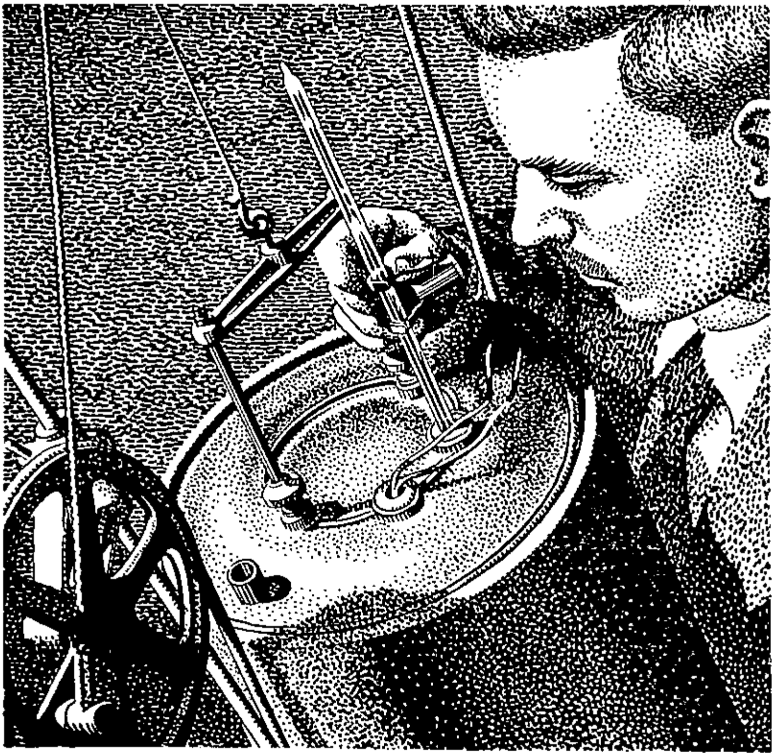
The address of the Hon. Secretary is P.O. Box 250, Wellington.

How hot is fuel?



How much heat is there in a lump of coal? The chemist can tell you accurately by using a harmless kind of bomb, called a fuel calorimeter, which is illustrated here. A sample of the fuel under test is ground to a fine powder, weighed and placed in the apparatus. The sample is then burnt electrically. During the test the bomb is submerged in water which naturally becomes heated by the burning fuel. By observing the rise in temperature and weighing the quantity of water heated, the amount of heat produced by the fuel can be calculated. This information may be important in several ways. For example, if a factory is to be efficient and economical, the heat-producing powers of the fuel used must be accurately known. The fuel calorimeter is also used to discover the amount of heat produced when chemical substances other than fuels are burned. From this "heat of combustion" it is often possible to calculate how much energy would be necessary to build up a compound synthetically, or to predict whether a certain chemical reaction is a possibility, and if so, what kind of plant would suit the process. The fuel calorimeter, in short, not only enables the British chemical industry to run its own factories economically, but helps the chemist to devise new and better manufacturing methods that will benefit the community.

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