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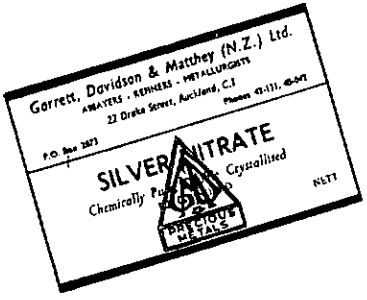

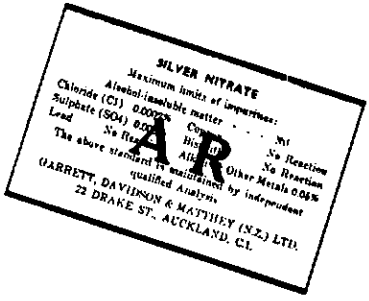

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JOURNAL OF THE NEW ZEALAND
INSTITUTE OF CHEMISTRY

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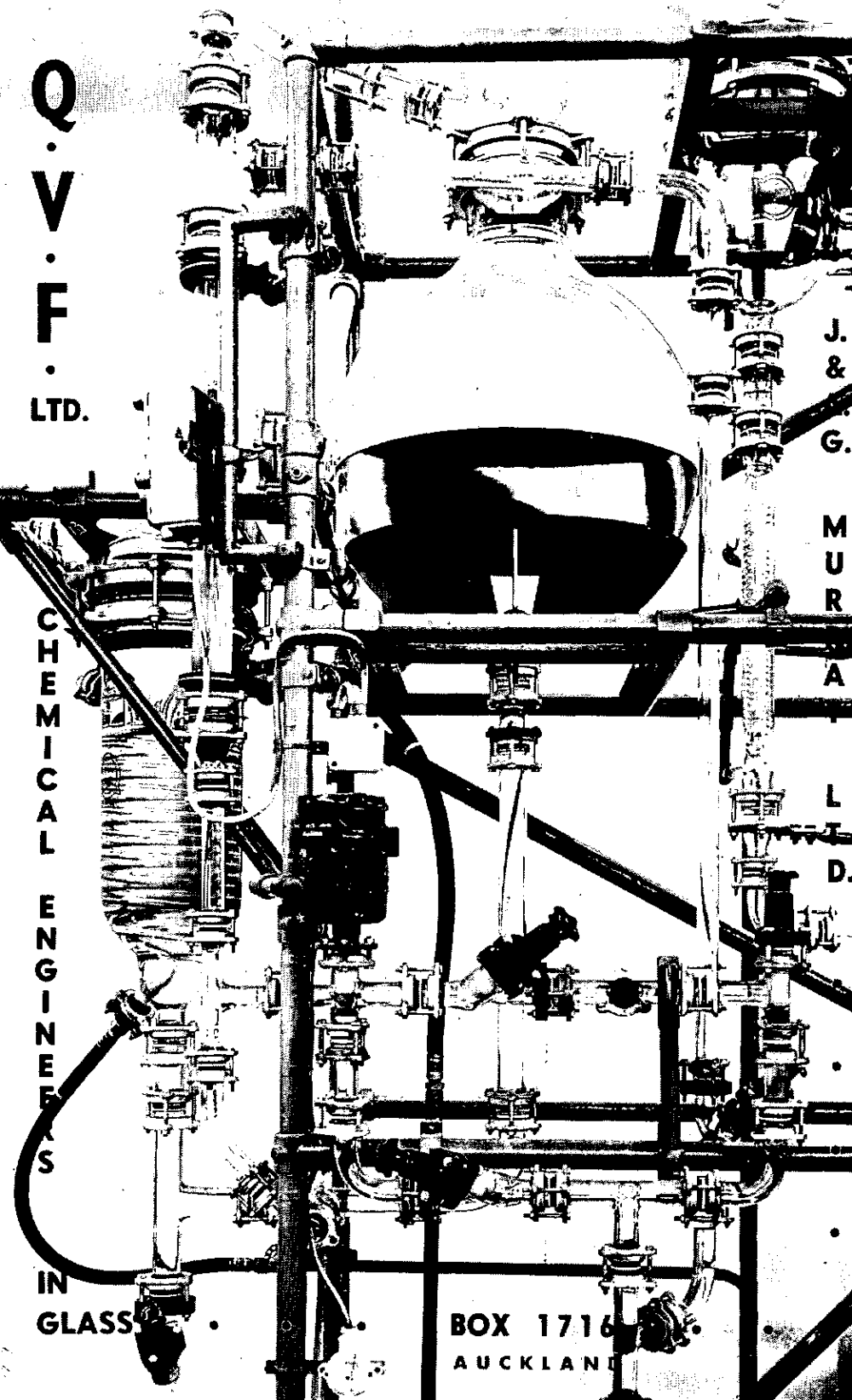
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FACTS AND OPINIONS

At the May Council meeting consideration of the Wellington Branch resolutions on several items of public interest led to a general discussion on the Institute's policy concerning public statements on controversial matters. This is no new issue; it has been raised frequently in addresses by branch chairmen and presidents, and in the 1962 Presidential Address Dr Shorland again touched on it.

In fact the Institute has rarely entered into the lists or sought dragons to slay before the populace. Should it, by statement or debate, take part in public discussion of matters involving the application of chemistry in everyday life? On this question our "aims and objects" are noncommittal. They do not appear to foresee the need, although if one wishes one can read an affirmative into the clause "To collect and circulate statistics and other relevant information relative to any branch of chemistry"; and it can be argued that the general aim "to advance the cause of chemistry" is ill-served by an attitude of aloofness if, as a body, we have anything to contribute to the community. In any case "aims and objects" are not immune from change with change of time and outlook.

There is a general feeling that the Institute may rightly (and some say should) issue statements of *fact* but that it should not express *opinion*. At first thought this establishes an equable and unequivocal policy, and it may well be applicable on many occasions. On second thought the distinction appears as a tight-rope whereon frequently we will tread only at the risk of a tumble.

Let us, for example, make a series of statements which, for the purposes of this argument we agree to accept as well-established fact (with the proper reservation that in the philosophy of science no positive assertions are final): That the incidence of dental caries in children is low if their drinking water contains x ppm of fluoride; that many waters in New Zealand contain appreciably less than x ppm; that water containing $4x$ ppm produces no harmful effects. Should we offer these propositions to the public and leave them to draw their own conclusions? (Even the making of these statements, especially during a public controversy on a proposed course of action, may imply an opinion.) Or do we go further and recommend to appro-

priate authority that the fluoride content of water supplies be controlled, by addition or subtraction, at $2x$ ppm? If we take this latter step have we not leaned toward opinion and tumbled from our tight-rope? Because by favouring that course of action we have expressed an opinion on the rights of those who do not want their water interfered with in this way (even if they have for years accepted filtration and chlorination) and on the merits of this method against others which might achieve the same end.

Perhaps this example reads like a quibble. It has been set up only to stress that to adopt a policy involving nice distinctions between statements of fact and opinion can lead us close to hypocrisy; and talking of hypocrisy reminds us that last year's Annual Meeting, and the Council, had no worries about fact and opinion when they made statements about the Science Bill — but that of course is something which affects us directly.

There is another attitude to this problem which might be considered — a willingness to express opinion, provided it has been arrived at by rigorous consideration of fact and is not tinged with prejudice.

This article has said little in the way of fact. The reader may judge whether it has been guilty of expressing, or implying, any opinion. It will serve the purpose if it encourages members to forgo, temporarily, the collection of the factual minutiae of chemistry and give some thought to an issue which may be discussed, formally or informally, at Conference.

> At the opposite extreme to this class of propositions, which is usually said to express "facts", is the class of propositions that expresses our "opinions" and our tastes, such statements for example as that Tolstoi is a greater novelist than Balzac, or that coffee is nicer than tea. Concerning such statements we have no expectation of obtaining universal agreement and no desire to obtain it; we recognize that they are personal to ourselves. . . . But intermediate between these two extreme classes comes another which raises great difficulties. There are statements, of opinions rather than of facts, concerning which there is no universal assent and yet are such that the judgements of others than ourselves, differing directly from ourselves, are distinctly relevant. The most obvious judgements of this class are political judgements. . . .
>
> *From* Foundations of Science, *by Norman Campbell (1919)*

* * *

> Now, what I wants is Facts . . . Facts alone are wanted in life
>
> *Mr Gradgrind in* Hard Times, *by Charles Dickens (1854)*

RESEARCH INSTITUTIONS IN PALMERSTON NORTH

These further notes on the work of chemists and chemical laboratories within the territory covered by Manawatu Branch, are published for the information of members attending the 1963 Conference in Palmerston North.

THE DAIRY RESEARCH INSTITUTE (N.Z.)

For the past thirty-two years the Institute has occupied laboratories in the main Massey building and has used the College experimental dairy factory which is situated on the dairy farm about half a mile from the main building. Plans are now being prepared for a new building to house the Institute and to provide for its future expansion. The new building will be situated immediately opposite the dairy factory. This will make for much greater convenience in experimental work on dairy manufacture but there will be a loss of convenience particularly in the use of the library in the main building since the Institute and College libraries have always been combined and will remain so. However, with the expansion of the University College campus the necessity to decentralize would inevitably have meant some loss of convenience in any case. The new building will be of two storeys and will have a total floor space of approximately 22,000 sq. ft. Accommodation is provided for the chemistry, bacteriology and engineering departments and for the administrative offices.

Much of the work of the Institute is of a technological nature but in some directions a more basic approach is necessary and the proportion of fundamental research tends to increase with the need to find new products and new outlets for dairy produce.

FLAVOURS

Attempts are being made to identify the substances which confer the characteristic flavour on fresh cream, cream ripened with bacterial cultures and on cheese as it undergoes ripening. The latest chromatographic techniques are being applied to these problems. The flavouring compounds which it is desired to identify are those present naturally in milk, those present in milk as a result of the cow eating some particular plant and those formed by bacteria in the course of their growth in milk products.

BACTERIOPHAGE

The viruses which attack the lactic streptococci are a potent influence in all dairy manufacturing techniques which depend upon the growth of the streptococci. Various methods for preventing the action of the viruses are being studied. They range from devices for the exclusion of air borne infection to production of resistant bacterial forms and the production of virus antibodies in milk.

BACTERIAL METABOLISM

The metabolism of the lactic streptococci is being studied under conditions where temperature and pH are maintained at constant values in a continuous culture apparatus.

BUTTERFAT COMPOSITION

In collaboration with the Massey College Biochemistry and Dairy Husbandry Departments investigations are being conducted, aimed at clarifying the effects of pasture type, stage of maturity and composition on the composition of the butterfat produced by grazing cows.

DRYING PROBLEMS

Milk products present special problems when they have to be produced in dry powdered form. The engineering department of the Institute is interested in the basic investigation of various drying procedures suitable for the very varied types of material to be handled.

PLANT CHEMISTRY DIVISION, D.S.I.R.

The Plant Chemistry Division was established within the D.S.I.R. in 1938 to study the metabolism of pasture plants under abnormal growth conditions such as those which gave rise to a severe outbreak of facial eczema in the autumn of that year. For a variety of reasons it was decided in the new laboratory to begin an investigation of the nitrogen metabolism of pasture plants. This work is still going on, but with the passage of time the scope of the work has broadened to gain a better insight into the fundamental biochemistry of plant metabolism in relation to herbage quality and animal health.

The underlying aim in the staffing of the Plant Chemistry Division is to bring together people who are experts in a number of fields (*e.g.*, protein and carbohydrate chemistry, plant and animal physiology, bacteriology, biochemistry and biophysics). These people (some 20 scientific officers)

carry out fundamental work in their own fields and also contribute their special knowledge to particular problems under investigation by the Division.

Where particular skills and facilities are available in other institutions near to the Division the policy is to collaborate with these rather than duplicate them. Plant Chemistry is situated close to the Grasslands Division, D.S.I.R., the Dairy Research Institute (N.Z.), and the sheep, dairy and biochemistry departments of Massey College and this has facilitated greatly the conduct of joint projects. In addition, a number of senior staff participate to a small extent in the lecturing programme to advanced students at Massey College. The Division is fortunate in having no responsibility for providing scientific services for other organizations, so that its staff and facilities can be concentrated on research.

The long term aim of the present research programme is to help the plant breeder produce pasture plants which represent the ideal food for grazing animals and to obtain, in addition, fundamental information on the metabolism of the plants and animals.

The ideal pasture for ruminants would be one that:

(a) Is capable of providing the protein and carbohydrate requirements of sheep and cattle.
(b) Contains mineral and accessory food substances essential to animal health in sufficient quantity and in a state of balance within the feed.
(c) Does not contain harmful substances at a level which will cause animal disorders, or a decline in production.

The defining of the ideal balance of chemical compounds in the feed of ruminants, with their two-stage digestive system, is a complicated problem. It is easier to determine what is wrong with plants than to define quantitatively the chemical composition of the ideal pasture. Hence the Division has concentrated on the third requirement with a growing interest in the first and second.

The research activity of the Division can best be summarized under the following project titles:

Protein and nucleoprotein biochemistry: Studies on mucoproteins derived from bovine saliva; starch gel electrophoresis of cattle serum and relationship of β-globulin pattern to fertility and milk yield; sequence studies on DNA degraded by the diphenylamine method; characterization of RNA of various origins by identification of products of ribonuclease digestion; isolation and physicochemical characterization of high molecular weight DNA

from protozoa and plant sources; studies on distribution of DNA in plant tissues; studies on ribosomes of plant tissues; studies on *in vitro* protein synthesis using systems derived from plant tissues; isolation and fractionation of amino acid activating enzymes; and transfer RNA from such tissues.

Non-protein nitrogen: Mechanism of nitrogen fixation in clover root nodules, biosynthesis of cyanoglucosides in white clover; biosynthesis of "beaker test" substances in *Pithomyces chartarum;* peptides in pasture plants; amines in rumen liquor.

Organic chemistry: Chemical studies of oestrogens in pasture plants; biogenesis of isoflavones; chemistry of flavonoid compounds.

Carbohydrate chemistry: Carbohydrate constitutents of clovers in relation to sheep nutrition. Carbohydrate metabolism of various species of rumen oligolrich ciliates especially in connection with hemicellulose and cellulose degradation. Galactosidase activity of rumen microorganisms. Carbohydrate metabolism of spores and mycelia of *Pithomyces chartarum.*

Lipids: Fluctuations of plant glycolipids in clover and their release and metabolism in the rumen.

Microbiology: Isolation and culture of rumen bacteria and protozoa and study of their nutrition and metabolism; nitrogen metabolism of *Epidinium ecaudatum;* effect of inoculation of subterranean clover where rhizobia ineffective on this species are already present in the soil; use of serological identification of strains of rhizobia in field experiments; investigation of rhizobia present in agricultural lime; comparisons of nodule weights and rate of fixation in different pasture legumes; nodulation of *Lotus* species; nitrogen transfer from *Lotus* species to grasses; trials with pelleted seeds in problem soils; techniques of pelleting seeds; metabolism of bacteria inside pellets.

Mineral nutrition: Iodine nutrition of sheep; genotypic variations in plant constituents; metabolism of selenium by plants and ruminants.

Ruminant physiology: Composition of bovine saliva; salivary secretion in relation to feeding; analysis of the food bolus; foaming and rates of fermentation of rumen contents; mechanical activity and innervation of reticulum and rumen; treatment and prophylaxis of bloat; nutrition

of sheep fed different strains of ryegrass; factors affecting intake and rate of growth.

Biophysics: Studies on factors influencing foam stability.

As can be seen from the above research programme the name "Plant Chemistry Division" may seem to be rather a misnomer as the Division's activities are by no means confined to the study of the chemistry of plants. This diversity of interest has been deliberately planned. It is felt that a multi-discipline research institute is the best one to make rapid progress in agricultural research.

THE WELLCOME RESEARCH INSTITUTE

The Otago University Wellcome Medical Research Institute was formally opened by the Governor-General, Brigadier Sir Bernard Fergusson, on March 25. The Institute was made possible by a gift of £120,000 from the Wellcome Trust.

The new building which houses the Institute is situated at the corner of Frederick Street and Great King Street. It consists of three floors and a penthouse giving a total of about 15,000 sq. ft of floor space. The interior design of the building is such that the dividing walls between rooms may be removed and repositioned to allow for changes in laboratory requirements.

In addition to the normal laboratories, the building houses workshops and facilities for breeding animals for experimental work.

With the creation of the Institute, research, formerly carried out in the Department of Medicine at the Medical School, will be divided into two parts. Research supported by grants from the Medical Research Council, the Life Insurance Research Fund of Australia and New Zealand, and the Empire Rheumatism Council will be transferred to the Wellcome Institute.

Sir Horace Smirk, formerly Professor of Medicine at the Medical School, is the Director of the Institute and now holds the newly created position of Research Professor of Medicine.

NUCLEAR WEAPONS, ALCOHOL TESTS, FLUORIDATION, INSECTICIDES, AND REGISTRATION

Wellington Branch Discussion

At a meeting on May 1, the Wellington Branch held a general discussion on four controversial topics that might be of interest to others. Each proposition was introduced by speakers for and against, who were allowed three minutes each. The subject was then thrown open to speakers from the floor for 20 minutes with a maximum of 2 minutes each speaker. To confine the discussion to essentials no amendments were allowed. There was a total attendance of 63 but only members voted. The four propositions were:

(1) That the Institute accepts the request by the Campaign for Nuclear Disarmament to support its petition to the Government for a nuclear-weapon-free Southern Hemisphere. *In favour*, 25; *against*, 12.

(2) That the Institute should recommend compulsory blood or breath alcohol tests for drivers involved in traffic incidents. *In favour*, 23; *against*, 13.

(3) That the Institute should recommend the control of fluoride content of public water supplies. *In favour*, 37; *against*, 2.

(4) That the Institute should recommend that steps be taken to control the indiscriminate use of insecticides. *In favour*, 2; *against*, 27.

The meeting also voted on the motion that the question of registration of chemists be actively pursued with the objective of procuring an Act of Parliament for the registration of chemists and that the status committee initiate and carry out the necessary steps to this end. *In favour*, 11, *against*, 23.

The meeting was most successful. It attracted wide interest among the branch membership and an attendance of almost twice last year's average.

CONFERENCE, 1963
ABSTRACTS OF PAPERS

RECENT ADVANCES IN INORGANIC CHEMISTRY

J. F. DUNCAN
Victoria University of Wellington

Recent developments in inorganic chemistry will be discussed. The three currently accepted theories of inorganic chemistry, valence bond, molecular orbital, and crystal field, will be considered in relation to modern developments in technique and analysis (*e.g.*, structural methods of analysis, micro-chemical methods of analysis and separation procedures).

THE GROWTH OF MULLITE IN CLAY-QUARTZ-FELDSPAR MIXTURES AT HIGH TEMPERATURES

L. D. SWINDALE
New Zealand Pottery and Ceramics Research Assn. Inc., Lower Hutt

Mullite is formed in clay-quartz-feldspar ceramic bodies during firing from the clay mineral and feldspar by solid-state transformation and through molten intermediates. The course of the reactions and the nature and amounts of products can be determined theoretically from the phase diagram for the K_2O-Al_2O_3-SiO_2 system. In commercial conditions the reactants are often physically separated and the firing times and temperatures are insufficient for equilibrium conditions to be attained. The phase diagram can still be usefully applied. It describes quantitatively the reactions occurring in the melt and at interfaces between particles, and qualitatively the direction in which the reactions are tending.

The chemical reactions are thought to have first order kinetics, but experimental determinations of reaction rates show that ionic diffusion is the important rate-determining factor. Equations for the time, temperature and particle size dependence of the rate of mullite formation must be determined by semi-empirical means.

Mullite growth from halloysite and kaolinite have different rate constants and activation energies, as can be predicted from the structural and morphological differences between the two minerals.

THE STEREOCHEMISTRY OF SOME RHENIUM COMPLEXES INVOLVING METAL-METAL BONDS

W. T. ROBINSON, MISS J. H. GAINSFORD AND B. R. PENFOLD
Chemistry Department, University of Canterbury, Christchurch

The structure of the trimeric anion in the compound of empirical composition $CsReCl_4$, has been published and differs from that predicted by application of ligand field theory to diamagnetic, rhenium (III) complexes. This prediction will be explained and the bonding in the $[Re_3Cl_{12}]^{3-}$ anion discussed with reference to other structures involving similar features.

Spectra of this compound, and of the compounds $ReCl_3$, and $[(C_6H_5)_4As]_2$ Re_3Cl_{11}, will be discussed together with initial results from an X-ray analysis of the latter complex.

Investigations of this magnitude have been possible only because we have had immediate access to an electronic computer. The computing methods used in the X-ray analyses will be outlined.

THERMODYNAMICS OF SOME MULTICOMPONENT ELECTROLYTE SOLUTIONS

H. N. PARTON, R. F. SMITH and G. N. MALCOLM
University of Otago, Dunedin, and
Queen's University, Canada

Solutions of mixed electrolytes have been treated in two ways. Guggenheim's treatment for dilute solutions relates the behaviour of the multicomponent system to the properties of the individual electrolytes. Harned discovered an empirical relation between the logarithm of the activity coefficient of one component and the ionic strength fraction of the other.

Using galvanic cells, the systems HCl-$MgCl_2$-H_2O, $NaCl$-$MgCl_2$-H_2O, $NaCl$-Na_2SO_4-H_2O, and $NaCl$-$MgSO_4$-H_2O have been investigated. The results for the first two systems are considered in terms of Guggenheim's theory, which does not apply to them satisfactorily. The activity coefficients of HCl in the first system, and of NaCl in the second and third systems follow Harned's Rule. The last system, which contains the four ions which predominate in sea water, defies interpretation.

THE TEACHING OF BONDING THEORY AT SECOND AND THIRD YEAR UNIVERSITY LEVELS

M. H. PANCKHURST
University of Otago, Dunedin

There are many difficulties in discussing bonding theory at a level at which formal quantum mechanics cannot be

introduced, although some of the results can be discussed. These difficulties arise from the necessity for presenting quantum mechanical procedures qualitatively and dogmatically. Why are molecules stable? What is a covalent (or an ionic) bond? Why do molecules have the shapes they have? Such questions are usually answered by qualitative discussions of approximate theoretical concepts such as those used in Valence Bond theory and Molecular Orbital theory. A complementary approach to teaching the nature of the covalent bond, which is being used at second year level, will be discussed. This approach uses the Virial Theorem to investigate energy changes and changes in electron distribution on bond formation. Recent developments in the teaching of molecular geometry, based on the Pauli Principle and electrostatic interactions, will also be discussed.

THE EFFECT OF β-SITOSTEROL ON CHOLESTEROL AND LIPID METABOLISM IN THE RAT

T. GERSON and F. B. SHORLAND
Fats Research Laboratory, D.S.I.R., Wellington; and
G. G. DUNCKLEY
Nutrition Research Department, Medical School, Dunedin

For the past decade or longer the phenomenon of lowering cholesterol levels in blood following the intake of vegetable oils has been observed by many workers who have been concerned for the most part with the possible relationship between high cholesterol levels and the incidence of atherosclerosis. In vegetable oils, such as, notably, corn oil, the active constituents include β-sitosterol and linoleic acid. To explain the action of β-sitosterol investigators have suggested that β-sitosterol blocks the absorption of cholesterol. However, this hypothesis received a setback when we showed that, although corn oil did in fact lower plasma cholesterol when fed to rats, there was, nevertheless, an increase in the total cholesterol reserves of these rats as compared with those receiving a fat-free diet. More recently we have shown that β-sitosterol alone, when injected into animals, caused an increased synthesis of fat and of cholesterol as judged by the incorporation of C^{14} from radioactive acetate. At the same time, reduction in the levels of cholesterol and lipid under these conditions also indicates a higher rate of degradation as compared with control animals. From these results and from other observations that β-sitosterol is in fact absorbed to some extent through the intestine we consider that it is unnecessary to invoke the action of β-sitosterol as being solely concerned

with the blockage of cholesterol absorption. The observed phenomena can be explained wholly or partly by the action of β-sitosterol on the metabolism of cholesterol within the tissues. Comparing the present results using β-sitosterol alone with the previous results using corn oil it appears that, whereas the β-sitosterol generally lowers the level of fat and of cholesterol, the fatty constituents do not clearly act in this direction.

THE TRANSPORT OF LONG CHAIN FATTY ACIDS IN THE COW

EVAN WRIGHT
Wallaceville Animal Research Station, Department of Agriculture, Wellington

About 50% of the fatty acids of the milk lipids are synthesized in the mammary gland from the products of rumen fermentation. It was found that when labelled stearic acid was fed to a cow the long chain fatty acids of the milk rapidly became radioactive but when the blood lipids were fractionated by chromatography no fraction had a specific activity greater than that of the milk fat. Hence the precursor of milk lipid must be a fraction of low abundance and high specific activity which was masked by the remaining fractions of low activity. Such a fraction was found in the triglyceride moiety of one type of lipoprotein.

FATTY ACID OXIDATION BY *PENICILLIUM ROQUEFORTI*

R. C. LAWRENCE
Dairy Research Institute, Palmerston North

The genera *Penicillium* and *Aspergillus* are remarkable for their capacity to form methyl ketones from fatty acids. The oxidation of straight chain fatty acids from C_2 to C_{18} by *Penicillium roqueforti* has been examined and the conditions necessary for both maximum formation of the corresponding methyl ketones and optimum oxygen uptake have been determined.

The most probable mechanism for the formation of the methyl ketones is the oxidation of the fatty acid to the β-keto acid which is subsequently decarboxylated to give a methyl ketone with one carbon atom less than the fatty acid. Such a theory, however, does not appear to account for the formation of only one ketone since several β-keto acids would be expected during the oxidation of the longer chain acids. Investigations into the mechanism of methyl

ketone formation have been impeded by the impermeability of *P. roqueforti* to the higher fatty acids. Cell-free extracts of the disrupted cells were able to oxidize fatty acids but no methyl ketones were formed. The cell debris however readily formed methyl ketones showing that the decarboxylase is firmly bound in the cell.

CHEMICAL INVESTIGATIONS INTO THE STRUCTURE OF BACTERIAL TEICHOIC ACIDS

A. J. WICKEN
University of Auckland

Teichoic acids are glycerophosphate or ribitol phosphate polymers which occur either as part of the cell wall structure or between the cell wall and the cell membrane of many gram-positive bacteria. They all possess labile D-alanine ester linkages, and sugars or acylaminosugars are frequently attached glycosidically to glycerol or ribitol.

Several of these polymers have been isolated and purified and studies involving various methods of chemical degradation have led to the establishment of the detailed structures of some of these teichoic acids. Several aspects of such structural studies will be discussed.

Little is known of the mode of biosynthesis or biological function of the teichoic acids but some speculation on these topics will be included.

RECENT ADVANCES IN INTERMEDIARY METABOLISM

R. D. BATT
Biochemistry Department, University of Otago, Dunedin

The formulations of chemical pathways in living cells have been advanced to a considerable extent by a continuing interest in the metabolic roles of vitamins and coenzymes. This interest continues at present with many investigators studying the metabolism of vitamins such as biotin, folic acid and vitamin B_{12}. The rapid increase in information concerning cellular reactions has led, in recent years, to the profitable extension of biochemical interest into the field of cell regulatory mechanisms. Some aspects of recent work on these subjects will be considered.

POLYOL DEHYDROGENASES OF *PSEUDOMONAS FLUORESCENS*: THE ISOLATION OF A NEW SUGAR: 1-DEOXY-D-TAGATOSE

P. M. BONISH and D. R. D. SHAW
Department of Biochemistry, University of Otago, Dunedin

Pseudomonas fluorescens contains inducible nicotinamide adenine dinucleotide-linked dehydrogenases capable

of oxidizing a large number of polyhydric alcohols to ketoses. D-iditol, D-mannitol and galactitol dehydrogenases have been isolated and their properties studied. These enzymes can account for the polyol-oxidizing activities of crude bacterial extracts. Bacterial cells appear to form two distinct galactitol dehydrogenases: galactitol dehydrogenase D is formed by cells grown on galactitol, while sorbitol induces the formation of galactitol dehydrogenase S. The two enzymes have, qualitatively, the same substrate specificities but oxidize their mutual substrates at markedly different relative rates. The enzymes can be separated by ion-exchange cellulose chromatography.

Galactitol dehydrogenase D oxidizes 1-deoxy-D-glucitol and 1-deoxy-D-galactitol rapidly to reducing sugars with one atom of oxygen consumed per mole of polyol. The polyol oxidation products gave negative colour tests for aldohexose, 6-deoxyaldohexose, 1-deoxy-5-ketohexose and 1-deoxy-3-ketohexose. However, the spectrum obtained in the orcinol colour reaction is the same as that given by 1-deoxypsicose, indicating that the sugars are 1-deoxy-2-ketohexoses. Borohydride reduction of the sugars gave polyol reduction products expected from 2-keto- but not 4-keto-sugars. The enzymic oxidation products of 1-deoxy-D-glucitol and 1-deoxy-D-galactitol are identified as 1-deoxy-D-fructose and 1-deoxy-D-tagatose respectively.

PHOSPHATES IN PLANTS — PATTERNS AND POOLS

R. L. BIELESKI
Fruit Research Division, D.S.I.R., Auckland

Inorganic phosphate-P^{32} when supplied to plant tissues is accumulated, and part of it is esterified. The kinetics of labelling of the phosphate esters indicates that (a) adenosine triphosphate is the first phosphate derivative formed; (b) the inorganic phosphate present in the cell is divided into at least two pools — a metabolic pool of about 5% and a storage pool of about 95% of the total cell inorganic phosphate; (c) inorganic phosphate enters the tissue via the metabolic pool; (d) neither the amount of inorganic phosphate entering the tissue nor the rate of phosphate ester turnover markedly affects the pattern of phosphate esters present in the tissue.

Studies on other plant tissues indicate that the phosphate ester patterns are also very similar one to another. Differences recorded in the literature may often have arisen from the failings of the various experimental methods rather than true differences in the tissues. The implications of this will be discussed.

STUDIES ON MESSENGER RNA FROM NORMAL RAT LIVER

R. K. RALPH
Microbiology Department, University of Auckland

Preliminary studies of rapidly-labelled RNA isolated from rat liver were complicated by contaminating ribonuclease. This enzyme survived phenol extraction procedures used to isolate the RNA and was activated by high salt in subsequent purification steps. The enzymic degradation was reduced by re-extraction of RNA solutions with phenol/sodium dodecylsulphate/6% *p*-amino-salicylate but the enzyme was not removed entirely.

Sucrose density gradient studies of RNA isolated from rat livers at times from 7 min to 21 hr revealed that a high proportion of the rapidly-labelled RNA was associated with DNA/DNP complexes at shorter times.

This rapidly labelled RNA showed a wide range of sedimentation values indicative of great heterogeneity.

The pattern varied over the time sequence studied suggesting different turnover rates of different rapidly-labelled RNA's.

Evidence for DNA/RNA hybrids was found.

Preliminary studies of this RNA by counter current distribution indicate that it behaves quite differently from ribosomal and transfer RNA and can be fractionated from these materials.

NITRILE METABOLISM IN PLANTS

G. W. BUTLER
Plant Chemistry Division, D.S.I.R., Palmerston North

In both flax and white clover seedlings, L-valine and L-isoleucine are excellent precursors of linamarin and lotaustralin (glucosides of acetone cyanhydrin and methyl ethyl ketone respectively). Experiments with N^{15}-labelled L-valine show that the amino-nitrogen atom is probably retained in the biosynthesis of linamarin from valine. DL-α-β-dihydroxyisovaleric acid, α-hydroxyisobutyric acid and DL-β-hydroxyvaline act as competitive inhibitors of linamarin-C^{14} biosynthesis from L-valine-C^{14}. However, α-hydroxyisobutyric acid-1-C^{14} is a very poor linamarin precursor and DL-β-hydroxyvaline (T^2) gave rise to linamarin (T^a) with a much lower percentage incorporation than did L-valine. Experiments to test the hypothesis that *iso*-butyramide, α-hydroxyisobutyramide or α-hydroxyisobutyramide-β-D-glucose are intermediates will be described. In experiments using valine analogues it has been found that both *o*-methyl-*allo*-threonine and *o*-methyl-threonine inhibit

linamarin-C^{14} biosynthesis from valine-C^{14} with marked accumulation of a labelled compound which may be a linamarin precursor.

Administration of $HC^{14}N^{15}$ to these and other seedlings leads to extensive incorporation of C^{14} and N^{15} into the amide group of asparagine, suggesting a novel route for the biosynthesis of asparagine in plant tissues.

EXPERIMENTAL METAMORPHISM OF NEW ZEALAND COALS

J. ROGERS
N.Z. Geological Survey, c/o Department of Chemistry, University of Otago

In the joint high pressure-temperature laboratory of the Chemistry Department, University of Otago and Geological Survey, New Zealand coals, ranging from a lignite to a bituminous coal in rank, have been subjected to controlled water pressures (up to 1000 atmospheres) and temperatures (70 to 500°C) for as long as six months with the aim of studying the effects these variables have in coal genesis. The metamorphism has been followed by proximate analyses (determined by Mr J. Elphick, Dominion Laboratory), ultimate analyses (Dr A. Campbell), analyses of the gases evolved (Miss J. Ross, Dominion Laboratory) and X-ray and infra-red spectra. Changes in free radical content have been measured by Mr M. Collins (Dominion Physical Laboratory) and changes in pollen grains by Mr McIntyre (Geological Survey).

Carbon dioxide and saturated hydrocarbons are the chief gases evolved. Unsaturated hydrocarbons, carbon monoxide, hydrogen and nitrogen were also estimated. With time at 300°C polymerization of the hydrocarbons was found. This observation suggests that over periods of geological time, reactions may proceed with the formation of paraffinic liquids and high molecular weight compounds like pitch which may impregnate the coal to produce the typical bright appearance of high rank coals.

The association in Taranaki of oil and gas, rich in carbon dioxide, with coal measures may be a result of coalification in an environment which has prevented escape of the gaseous and liquid products. Measurements of the C^{12}/C^{13} ratios of the products from the above experiments and of Kapuni coal, oil and gas at the Institute of Nuclear Sciences will be discussed in relation to this possible origin of the oil and gas. The implications for oil search may be important.

HIGH TEMPERATURE GAS SOLUBILITY IN HYDROTHERMAL CHEMISTRY

S. H. WILSON
Institute of Nuclear Sciences, D.S.I.R., Lower Hutt

Some consideration is given to the methods of deducing gas solubility coefficients at high temperatures for the gases commonly found in hydrothermal solutions. It is shown by graphs that the ratio of gas pressure to water vapour pressure for various concentrations of gas in the liquid phase rises rapidly as the temperature falls below 250°C. From this it is deduced that, for ideal conditions and a low content of gas in water, as at Wairakei, hot water at 200°C should occur below a depth of 1,000 ft, and above this there should be only steam. If the gas content is much higher, say 3 mols carbon dioxide/100 mols water, steam should be present down to 10,000 ft, where there will be water at the critical temperature. High gas content is suggested as the reason why the relatively shallow bores at Lardarello, and "The Geysers", California, have tapped only dry steam. One difficulty is that the escape of steam should leave a residual concentrated solution but, as this type of activity is much less common than the Wairakei type, it is not surprising that such solutions are hard to find.

N.M.R. AND INFRA-RED STUDIES OF INTRAMOLECULAR HYDROGEN BONDING

R. W. HAY and P. P. WILLIAMS
Dominion Laboratory, Gracefield

O-hydroxyaldehydes, ketones and esters, and the enol forms of β-diketones and β-keto esters readily form intramolecular hydrogen bonded chelate rings. Hydrogen bonding leads to a considerable reduction in the carbonyl stretching frequency of these compounds, which is related to the very large paramagnetic shift of the hydroxylic proton resonance signal. The significance of these results is discussed.

THE ACTIVITY COEFFICIENT AND ASSOCIATION CONSTANT OF THALLOUS CHLORIDE FROM SOLUBILITY MEASUREMENTS

M. H. PANCKHURST and J. B. MACASKILL
University of Otago, Dunedin

New measurements of the solubility of thallous chloride in aqueous solutions of sodium chloride and sodium perchlorate are reported. With the usual assumption, implicit

in the use of a Davies' type activity coefficient expression, that the mean ionic activity coefficient of Tl^+ and Cl^- is a function only of ionic strength, and not of the species making up the ionic medium, these measurements give precise values for the association constant, ionic product and activity coefficient of Tl^+ and Cl^-. An alternative type of activity coefficient expression is that introduced by Guggenheim, incorporating Bronsted's theory of specific interactions. Using expressions of this type it is shown that in the solutions considered here the activity coefficient depends on the ionic medium, at a given ionic strength, and the assumption used above is invalid. An alternative method of analysis taking account of this is presented.

DIVERSIFICATION AND THE FOOD INDUSTRIES

H. A. L. MORRIS
Department of Food Technology, Massey University College, Palmerston North

Views are presented that the export potential for N.Z. food products can be considerably extended by (a) diversification in product form of established food exports and (b) development of new food exports particularly those derived from fruit and vegetable crops.

General factors and problems likely to be involved in the development of this potential will be discussed.

PROBLEMS INVOLVED IN DIVERSIFICATION IN THE DAIRY INDUSTRY

W. A. McGILLIVRAY
The Dairy Research Institute, Palmerston North

With changing requirements and development of new markets for dairy products, the outlook of the dairy industry is undergoing a rapid change. This paper will deal with some aspects of ways in which diversification and greater flexibility are being achieved.

DEVELOPMENT OF A POTENTIAL SOURCE FOR A HIGH PROTEIN FOOD

MARY D. CAMERON
Meat Industries Research Institute, Hamilton

Development of a protein food includes investigation of the availability, composition, nutritional value, and present uses of the raw material, preparation of suitable products for the chosen markets, and, finally, trials on acceptability of the product in the market. Sheep and cattle

Continued on page 117

CONFERENCE GUEST SPEAKERS

PROFESSOR A. E. ALEXANDER

Professor A. E. Alexander, Guest Lecturer for the 1963 Conference, graduated B.Sc. at University of Reading and subsequently went to Cambridge where he obtained the B.A., Ph.D. and D.Sc. degrees. He was a Fellow of King's College, 1939-49, and Assistant Director of Research in the Colloid Science Department, Cambridge, under Sir Eric Rideal, from 1944 to 1949. He came to the University of N.S.W., Sydney, as Professor of Applied Chemistry in 1949, and since 1956 has been Professor of Physical Chemistry, University of Sydney. He is a Fellow of the Australian Academy of Science. He is well known as author of the text book *Surface Chemistry*, and is co-author of *Colloid Science*. His main research field is colloids and surface chemistry, and he is interested in the application of these subjects to biological and industrial problems.

PROFESSOR B. J. RALPH

Professor B. J. Ralph, who will lead a discussion on the teaching of biochemistry at the Conference on Thursday, August 22, is Dean of the Faculty of Science and Professor of Biochemistry at the University of New South Wales. He is visiting New Zealand at the invitation of Massey University College of Manawatu and will advise the College on the establishment of a department of biological sciences.

PROGRAMME ALTERATIONS

The following changes were made in the Conference Programme after paging of the *Journal* had been completed.

The paper by House *et al.*, listed for Friday, will replace that by Parton *et al.*, on Monday afternoon. Parton *et al.* will replace Hay *et al.* on Wednesday; and Hay *et al.* will replace House *et al.* in the Friday session.

N.Z.I.C. CONFERENCE PROGRAMME

Massey University College of Manawatu

August 20–23, 1963

Note: Although the papers to be given at the Conference have now been finalized there may be some slight rearrangement of papers in the various sessions subsequent to this programme going to press.

Tuesday Morning, August 20

9.00 a.m. onwards Registration

Tuesday Afternoon

1.30 p.m. Opening of Conference

Industrial Development in N.Z.

2.00 p.m. Gaps in N.Z. Industry (Dr W. B. Sutch)
2.45 p.m. Investigations into the Establishment of an Iron Sands Industry (Mr I. D. Dick)
3.30 p.m. Afternoon Tea
4.00 p.m. The Establishment of Chemical Industries in New Zealand (Dr J. C. Andrews)
4.45 p.m. Panel Discussion by the Above Three Speakers

Tuesday Evening

8.00 p.m. City Council Reception

Wednesday Morning, August 21

9.00 a.m. Recent Advances in Inorganic Chemistry (J. F. Duncan)
10.00 a.m. Morning Tea

Inorganic Chemistry **Pages 103–4**

10.30 a.m. The Growth of Mullite in Clay-Quartz-Feldspar Mixtures at High Temperatures (L. D. Swindale)
11.00 a.m. The Stereochemistry of Some Rhenium Complexes Involving Metal-Metal Bonds (W. T. Robinson, Miss J. M. Gainsford and B. R. Penfold)
11.30 a.m. Thermodynamics of Some Multicomponent Electrolyte Solutions (H. N. Parton, R. F. Smith and G. N. Malcolm)
12.00 a.m. The Teaching of Bonding Theory at Second and Third Year University Levels (M. H. Panckhurst)

Biochemistry **Pages 105–7**

10.30 a.m. The Effect of β-Sitosterol on Cholesterol and Lipid Metabolism in the Rat (T. Gerson, F. B. Shorland and G. G. Dunckley)
11.00 a.m. The Transport of Long Chain Fatty Acids in the Cow (E. W. Wright)
11.30 a.m. Fatty Acid Oxidation by *Penicillium roqueforti* (R. C. Lawrence)
12.00 a.m. Chemical Investigations into the Structure of Bacterial Teichoic Acids (A. J. Wicken)

Wednesday Afternoon

1.30 p.m. Recent Advances in Intermediary Metabolism (R. D. Batt)
2.30 p.m. Afternoon Tea

Biochemistry

Pages 107–9

3.00 p.m. Polyol Dehydrogenases of *Pseudomonas fluorescens*; the Isolation of a New Sugar — 1-Deoxy-*D*-Tagatose (P. M. Bonish and D. R. D. Shaw)
3.30 p.m. Phosphates in Plants; Patterns and Pools (R. L. Bieleski)
4.00 p.m. Studies on Messenger RNA from Normal Rat Liver (R. K. Ralph)
4.30 p.m. Nitrile Metabolism in Plants (G. W. Butler)

Inorganic and Physical

Pages 110–1

3.00 p.m. Experimental Metamorphism of New Zealand Coals (J. Rogers)
3.30 p.m. High Temperature Gas Solubility in Hydrothermal Chemistry (S. H. Wilson)
4.00 p.m. N.M.R. and Infra-red Studies of Intramolecular Hydrogen Bonding (R. W. Hay and P. P. Williams)
4.30 p.m. The Activity Coefficient and Association Constant of Thallous Chloride from Solubility Measurements (M. H. Panckhurst and J. B. Macaskill)

Wednesday Evening

8.00 p.m. Guest Lecturer, Professor A. E. Alexander (Professor of Physical Chemistry, Sydney University) *The Chemist and the Community*

Thursday Morning, August 22

Teaching of Biochemistry

9.00 to 10.30 a.m. Paper by Prof. B. J. Ralph (Professor of Biochemistry, University of N.S.W.) followed by invited and open discussion

Diversification of the Food Industries

Page 112

9.00 a.m. Diversification and the Food Industries (H. A. L. Morris)
9.30 a.m. Problems Involved in Diversification in the Dairy Industry (W. A. McGillivray)
10.00 a.m. Development of a Potential Source for a High Protein Food (M. D. Cameron)
10.30 a.m. Morning Tea

Physical Methods

Page 117

11.00 a.m. AutoAnalyzer Techniques (N. T. Clare)
11.30 a.m. Gas/Solid Elution Chromatography (C. G. Pope)
12.00 a.m. Thin Layer Chromatography (J. C. Hawke)

Organic Chemistry **Pages 118–9**

11.00 a.m. Some Transformations on Podocarpic Acid (R. N. Seelye)
11.30 a.m. The Constitution of Pododacric Acid (A. R. Cashmore)
12.00 a.m. The Synthesis of Straight Chain Hydrocarbons by Non-biogenic Methods (C. B. Johnson and A. T. Wilson)

Thursday Afternoon

1.30 p.m. Easterfield Address
3.00 p.m. Afternoon Tea
3.30 p.m. N.Z.I.C. Annual General Meeting
4.30 p.m. R.I.C. Annual General Meeting

Thursday Evening

6.30 p.m. Conference Dinner and Presidential Address

Friday Morning, August 23

9.00 a.m. Recent Advances in Organic Chemistry (L. H. Briggs)
10.00 a.m. Morning Tea

Organic Chemistry **Pages 119–20**

10.30 a.m. Aspects of Diterpene Chemistry (P. K. Grant, N. R. Hill, and M. H. G. Munro)
11.00 a.m. Aromatic Substitution and Infra-red Spectra (R. D. Topsom)
11.30 a.m. The Structure of Pithomycin; Compound 242 (B. R. Davis)

Radiation — Inorganic **Pages 120–1**

10.30 a.m. Radiation Induced Graft Polymerization to Wool (G. S. McNaughton and W. S. Simpson)
11.00 a.m. The Measurement of Strontium 90 in the New Zealand Environment (Miss B. M. Harrison)
11.30 a.m. Some Cyclic Tetramines and their Metal-ion Complexes (D. A. House, G. J. Gordon and N. F. Curtis)

Physical — Biological **Pages 121–2**

10.30 a.m. The Surface Chemistry of Water (A T. Wilson)
11.00 a.m. The Biochemistry of the Early Stages of Seed Germination (D. J. Spedding and A. T. Wilson)
11.30 a.m. Spontaneous Combustion of Hay (H. P. Rothbaum)
12.00 a.m. Formal Closing of Conference

ANNUAL GENERAL MEETING

The Annual General Meeting of the New Zealand Institute of Chemistry (Inc.) will be held at Massey University College of Manawatu, on Thursday, August 22, 1963, at 3.30 p.m.

AGENDA

(1) Apologies, welcome, etc.
(2) Confirmation of the Minutes of the General Meeting held at Lincoln College on Wednesday, August 15, 1962.
(3) Institute Prizes for 1963.
(4) Officers for the coming year.
(5) Annual Report for the year ending July 31, 1963.
(6) Balance Sheet for the year ending April 30, 1963.
(7) New Rules.
(8) Institute policy on public statements, etc.
(9) Association with the Royal Society of New Zealand.
(10) General.

W. E. HARVEY,
Hon. General Secretary.

rumens, which are mostly rendered to inedible fat and meat-meal, have been studied as raw material for a protein food.

AUTOANALYZER TECHNIQUES

N. T. CLARE
Ruakura Animal Research Station, Department of Agriculture, Hamilton

The main units of the AutoAnalyzer ("an instrumental system for automatic chemical analysis") and their operation will be briefly described. Some technical problems in their use will be considered, particularly those encountered in the conversion of conventional methods to the AutoAnalyzer system, with illustrations drawn mainly from the determination of chromium and nitrogen in faeces. Advantages and disadvantages of the instrument in relation to labour and costs will be indicated.

GAS/SOLID ELUTION CHROMATOGRAPHY

C. G. POPE
Chemistry Department, University of Otago, Dunedin

Gas/solid elution chromatography (G.S.C.) has been employed as a technique for separating gas mixtures for many years, but until very recently, it was felt that the method could not be used satisfactorily with less volatile compounds. This was because the resulting elution peaks had shown considerable tailing, which led to low column efficiencies and poor resolving power. Peak asymmetry was readily interpreted as due to curvature of the adsorption isotherm. This curvature is characteristic of gas/solid interactions at moderate to high relative pressures of adsorbate. At very low relative pressures, however, isotherms are characteristically linear, and the range of linearity may be considerably extended by the choice of a suitable adsorbent. The use of such an adsorbent, together with a sensitive detector which enables small samples to be used, allows G.S.C. to become a practical proposition for a wide range of mixtures.

This paper will attempt to review the theoretical advantages of G.S.C., to describe how successful columns have been made, and to indicate the scope and limitations of this technique.

THIN LAYER CHROMATOGRAPHY

J. C. HAWKE
Department of Chemistry and Biochemistry, Massey University College, Palmerston North

At present, thin layer chromatography (TLC) is finding its greatest application in the separation of lipids. Paper

chromatographic techniques have not been used very successfully in the separation of this class of compound despite numerous attempts to adapt the method, *e.g.*, the use of paper impregnated with silicic acid. However the recent application of TLC to the separation of lipids and lipid derivatives, especially when used in conjunction with gas-liquid chromatography, has greatly benefited investigations on the structure and metabolism of lipids.

Silicic acid is the most commonly used adsorbant at the present time. Diethyl ether/petroleum ether mixtures are used in the separation of neutral lipids and chloroform/methanol mixtures in the separation of polar lipids.

The technique will be described and its applications to the separation of lipid mixtures discussed.

SOME TRANSFORMATIONS ON PODOCARPIC ACID

R. N. SEELYE
Chemistry Department, University of Auckland

The abundant resin acids — abietic and podocarpic acids — are possible intermediates in the synthesis of steroids. Towards this end the modification of ring A of podocarpic acid to a steroid type has been studied. Comparative experiments on Schmidt and Curtius degradations have led to the high yield sequence: podocarpic acid → *o*-methyl podocarpic acid → *o*-methylpodocarpoyl azide → 16-*nor*-12-methoxypodocarp-8,10,12-trien-4-isocyanate and corresponding amine. Studies on this t-carbinamine include (a) de-amination by nitrous acid; (b) methylation and quaternization followed by Hofmann degradation; (c) attempted N-oxide formation; (d) the Ritter reaction on the N-acyl amines; (e) von Braun degradation of the N-benzoyl derivative.

The tricyclic compound *bisnor*-12-methoxy-8,11,13-podocarp-4-one has been prepared which may be transformed to a Δ^4-3-keto system by known methods.

THE CONSTITUTION OF PODODACRIC ACID

R. A. CASHMORE
Chemistry Department, University of Auckland

Pododacric acid ($C_{20}H_{28}O_5$) occurs with podocarpic acid and other oxygenated diterpene acids in the heartwood of *Podocarpus dacrydioides*.

The five oxygen atoms are accounted for in a carboxyl group, a phenolic hydroxyl, and two primary alcoholic groups attached to a totarane skeleton. The presence of a 1,3-glycol system is confirmed by formation of an acetonide and a cyclic carbonate. N.M.R. studies, acidity constants, and U.V. absorption spectra support a totarane skeleton,

an axially oriented carboxyl group at C_1 (steroid numbering) with normal A/B trans ring junction and a C_{12} phenolic group. Oxidation studies on the monomethyl ether methyl ester, still in progress, are explicable only on the assumption that the modified isopropyl group is situated at C_{14}.

Thus the pododacric acid structure represents another exception to the isoprene rule, and furthermore it cannot be accommodated in the Wenkert hypothesis for the biogenesis of totarol.

THE SYNTHESIS OF STRAIGHT CHAIN HYDROCARBONS BY NON-BIOGENIC METHODS

C. B. JOHNSON and A. T. WILSON
Chemistry Department, Victoria University of Wellington

Recent findings of straight chain hydrocarbons in meteorites (1) raises the interesting question of the possible synthesis of these on meteorite surfaces (2) in free space. An experiment will be described to show that it is possible to form hydrocarbons in straight chain configurations on a surface. The example taken is the synthesis of nonadecanoic acid (nC-19) from palmitic acid (nC-16) on water at $-10°C$ using methyl radicals (3).

(1) Nagy, B., Meinschein, W. G., Hennessy, D. J. (1961): *Ann. N.Y. Acad. Sci., 93*: 25.
(2) Wilson, A. T. (1962): *Nature, 196*: 11.
(3) Milas, N. A., Surgenor, D. M. (1946): *J. Amer. Chem. Soc., 68*: 205.

RECENT ADVANCES IN ORGANIC CHEMISTRY

L. H. BRIGGS
Chemistry Department, University of Auckland

Trends in the development of organic chemistry which were observed on a recent overseas visit will be discussed.

ASPECTS OF DITERPENE CHEMISTRY

P. K. GRANT, N. R. HILL and M. H. G. MUNRO
Chemistry Department, University of Otago, Dunedin

Following the isolation from *Dacrydium colensoi* of colensensone and the subsequent synthesis of its dihydro derivative from 2-ketomanoyl oxide, the synthesis of isocolensanone is described. In addition the current structural investigations of two new diterpenes from *D. colensoi* will be discussed.

AROMATIC SUBSTITUTION AND INFRA-RED SPECTRA

R. D. TOPSOM
Chemistry Department, University of Canterbury, Christchurch

The use of the characteristic absorptions arising from out-of-plane vibrations of the C-H bonds of substituted benzene compounds is a well-established and reliable aid in determining the position of substituents in the aromatic

ring. This will be illustrated briefly and it will be shown that the method can readily be extended to bicyclic systems when the second ring is not aromatic.

Since 1955, investigations have been conducted to see if substituted naphthalenes give rise to similar characteristic absorptions. It will be shown that the position of substitution in mono-, di- and even tri-substituted naphthalenes are reflected in their infra-red spectra. A similar result has also been found with monosubstituted acenaphthenes. The nature of the substituent also affects the absorption frequency when it is in the 2-position in naphthalene.

THE STRUCTURE OF PITHOMYCIN, COMPOUND 242

B. R. DAVIS
University of Auckland

A minor metabolite of the facial eczema producing fungus, *Pithomyces chartarum*, known as compound 242 or pithomycin, is shown to be a cyclic depsipeptide built up of two molecules of D-β-hydroxy-β-phenylpropionic acid, and one each of L-α-hydroxyisovaleric acid, L-N-methylalanine and L-alanine, in that order. Structural evidence has been obtained by hydrolytic and reductive methods. The extensive use made of nuclear magnetic resonance spectra, including spin decoupling experiments, and of the mass spectrum, will be discussed.

RADIATION INDUCED GRAFT POLYMERIZATION TO WOOL

PART 1

G. S. McNAUGHTON
Institute of Nuclear Sciences, D.S.I.R., Lower Hutt

Overseas work on the radiation grafting of polymers to wool is reviewed.

At Gracefield 44 and 48's crossbred wool has been irradiated with *gamma* radiation, acrylonitrile added and the rate of polymerization measured dilatometrically. The effect of radiation dose on reaction rate and the proportions of grafted and non-grafted polymer is discussed.

PART 2

W. S. SIMPSON
Wool Research Organization, c/o Dominion Laboratory, Gracefield

The wool-copolymer fibres are modified in their physical properties, and some techniques that are being employed to measure these changes will be discussed. The distribution of polymer throughout the fibre, and the amount present may also change some of the chemical properties reflected in dye accessibility, solubility and reactivity of side-chains.

THE MEASUREMENT OF STRONTIUM-90 IN THE NEW ZEALAND ENVIRONMENT

MISS B. M. HARRISON
Dominion X-Ray and Radium Laboratory, Department of Health, Christchurch

Radioactive fallout is distributed over the surface of the earth predominantly in the mid latitudes of the hemisphere in which it is produced. New Zealand is in the zone of maximum fallout for the southern hemisphere. Of approximately 400 radioactive isotopes produced in nuclear fission, ^{90}Sr, ^{137}Cs and ^{131}I are the most hazardous. ^{90}Sr is measured because it follows calcium into the food chain and is deposited in the bone. Routine measurements are made on rain and milk, and on bone samples when available. The major problem in analysis of ^{90}Sr is the separation of stable strontium carrier from calcium. Ion exchange techniques, originally developed for rain samples, have been extended to handle the massive amounts of calcium in milk and bone.

Radioactivity measurements are made on ^{90}Y, daughter product of ^{90}Sr in an anti-coincidence low background beta counter.

Results show a continual increase in ^{90}Sr fallout since 1959, with highest values in the areas of greatest rainfall.

SOME CYCLIC TETRAMINES AND THEIR METAL ION COMPLEXES

D. A. HOUSE, G. J. GORDON and N. F. CURTIS
Chemistry Department, Victoria University of Wellington

A new route to the synthesis of C-substituted cyclic tetramines with 9, 10 or 11 carbon atoms and four nitrogen atoms in a ring, is described. The synthesis involves the reaction of nickel coordinated polyamine ligands with acetone to form cyclic ketimine-amine complexes which are then reduced to the cyclic amine complexes. The free amines can be isolated from the nickel complexes and used to form complexes with other ions.

THE SURFACE CHEMISTRY OF WATER

A. T. WILSON
Chemistry Department, Victoria University of Wellington

During the last three years a group at Victoria University of Wellington has been developing a technique which might be called "Simultaneous Isotope Exchange Kinetics" and which is a new way of studying surface chemistry. One of the problems studied is how water molecules interact with the surface of a solid. The work carried out to date will be described and discussed.

THE BIOCHEMISTRY OF THE EARLY STAGES OF SEED GERMINATION

D. J. SPEDDING and A. T. WILSON
Victoria University of Wellington

Tritiated water has been used to detect some of the biochemical reactions occurring in the very early stages of the germination of *Sinapis alba* (mustard) seeds.

Many metabolic pathways include reactions in which the hydrogens of intercellular water become attached to non-exchangeable positions. In the presence of tritiated water this leads to the formation of tritiated metabolites which can be separated by paper chromatography. Detection is by a special form of radio-autography, made necessary by the weak *beta*-radiation of tritium.

Results show that the first detectable metabolism involves the amino acids *gamma*-amino-butyric acid, aspartic acid, glutamic acid, and alanine. The next compounds labelled were some of the Krebs Cycle acids, followed much later by labelled lipids.

These results lead to the postulate that the germinating seed initially establishes keto-acid pools for the Krebs Cycle from amino acids via enzymatic deamination and transamination reactions.

SPONTANEOUS COMBUSTION OF HAY

H. P. ROTHBAUM
Dominion Laboratory, D.S.I.R., Gracefield

About 500 cases of "spontaneous combustion" of haystacks are reported every year, mostly in Northern Europe, where hay is sometimes stacked too wet. No convincing theory had ever been advanced to explain these fires and recent work at Dominion Laboratory has shown that they are most likely to occur when the hay is in equilibrium with a fairly narrow range of relative humidities between 95% and 97%. Experimental results on the adiabatic heating of hay up to ignition temperature confirm this theory. At lower relative humidity no appreciable bacterial action can take place, and at higher values, the thermal conductivity increases so rapidly, owing to water vapour transfer, that the microbiological maximum temperature of about 76° is not exceeded. Chemical reactions that can heat hay to higher temperatures only occur in the presence of moisture; they are not dependent on previous microbial activity and probably involve direct oxidation of the cellulose. At about 170° the hay has dried out and oxidation of dry hay leads to ignition temperatures. The application of this mechanism to the spontaneous combustion of other biological materials will be discussed.

THE NEW ZEALAND INSTITUTE OF CHEMISTRY (INC.)

BALANCE SHEET AS AT APRIL 30, 1963

1962 £					1962 £				
	Current Liabilities:					*Current Assets*:			
90	Sundry Creditors	90 0 0			12	Petty Cash Funds	17 18 4		
17	Provision for Taxation	15 6 2			31	Bank of New Zealand	442 17 0		
74	Subscriptions Received in Advance	76 13 0			729	National Savings Account	497 14 5		
(181)				181 19 2	25	Sundry Debtors			
	Special Funds:					Subscriptions in Arrears	106 12 1		
106	Overseas Visitors' Travelling Fund	144 6 8				*Less* Provision for Overdue Subscriptions	50 0 0		
75	Education Fund	75 0 0						56 12 1	
33	Compounded Subscriptions	27 12 4			20	Advance, Conference		20 0 0	
(214)				246 19 0	44	Monographs on Hand		2 10 0	
	Trust Fund:				(987)				1037 11 10
1275	As per Statement Attached			1326 15 0		*Trust Fund Investments, at Cost*:			
	Accumulated Funds:				231	Post Office Savings Bank	282 15 0		
	Balance as at 30/4/62	660 18 3			500	Hutt County Council Debentures	500 0 0		
	Add Excess of Income over Expenditure for Year	8 15 5			500	Lyttelton Harbour Board Debentures	500 0 0		
661				669 13 8	44	Cash in General Account	44 0 0		
					(1275)				1326 15 0
						Fixed Assets, at Cost:			
						Office Equipment	99 19 0		
						Less Depreciation	39 19 0		
					68			60 0 0	
						Addressograph Plates	31 3 6		
						Less Depreciation	30 3 6		
					1			1 0 0	
					(69)				61 0 0
£2331				£2425 6 10	2331				£2425 6 10

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED APRIL 30, 1963

1962 £						
	Administration Expenses:					
165	Printing, Stationery, Postages and Tolls	338	18	6		
200	Salary, Registrar	200	0	0		
279	Travelling Expenses	163	9	11		
128	Branch Expense Allowances	150	0	0		
50	Honorarium to Secretary	50	0	0		
21	Audit Fee	21	0	0		
39	General Expenses	19	13	0		
8	Depreciation	14	2	6		
(890)					957	3 11
362	Cost of Journal	307	15	6		
35	Honorarium to Editor	35	0	0		
(397)					342	15 6
25	Chemistry in Action — Net Cost				27	8 5
25	Chemistry Essay Prize				25	0 0
	Examination Expenses	16	16	0		
	Less Examinees' Fees Received	8	17	6		
7					7	18 6
17	Provision for Taxation				15	6 2
	Excess of Income over Expenditure Transferred to Accumulated Funds				8	15 5
£1361					£1384	7 11

1962 £						
1197	Subscriptions—Annual	1350	1	8		
5	Proportion Compounded Subscriptions	5	1	7		
(1202)					1355	3 3
	Interest Received:					
	National Savings Account	18	4	4		
	Bank of New Zealand	5	17	1		
33					24	1 5
17	Commission on Journal Subscriptions				5	3 3
109	Excess of Expenditure over Income				—	— —
£1361					£1384	7 11

TRUST FUND ACCOUNT

1962			1962			
£			£			
1275	Balance, 30/4/63	1326 15 0	1224	Balance, 30/4/62		1274 16 10
				Interest: Debentures	44 0 0	
				Post Office Savings Bank	7 18 2	
			51			51 18 2
£1275		£1326 15 0	£1275			£1326 15 0

OVERSEAS VISITORS' TRAVELLING FUND

200	Travelling Expenses Paid During Year	46 19 0	302	Balance, 30/4/62	106 9 6
106	Balance of Fund, 30/4/63	144 6 8	4	Conference Surplus Credited to Fund	74 16 2
			—	Donation Received	10 0 0
£306		£191 5 8	£306		£191 5 8

AUDITOR'S REPORT

I have audited the books of the New Zealand Institute of Chemistry (Inc.) for the year ended April 30, 1963, and have received all the information and explanations I have required. In my opinion, according to the best of my information and the explanations given to me and shown by the books of account, the Balance Sheet, Income and Expenditure Account, and Trust Fund Account are properly drawn up so as to give a true and fair view of the state of the Institute's affairs as at April 30, 1963.

Christchurch,
July 1, 1963.

J. W. SHANAHAN, A.P.A.N.Z.,
Auditor.

BRANCH NEWS AND NOTES

AUCKLAND BRANCH

The local branch committee was privileged to have the President, Mr W. G. M. Hughson, attend a committee meeting in March. Later in the evening, Mr Hughson, who recently attended the sixth World Power Conference in Melbourne, addressed mmbers on "The Energy Resources of the World", a subject of importance when considering a future fuel and power programme.

A grant of £800 has been made by the trustees of the Nuffield Foundation to Professor Briggs for the purchase of a fermentation unit which will enable micro-organisms to be grown under carefully controlled conditions.

Several branch members are taking part in a co-operative effort to improve the packaging of export meat, especially frozen boneless beef, which requires thousands of tons of fibreboard derived from industries based on exotic forest utilization.

The £700,000 contract to build the first stage of the University of Auckland's new science block has now been let. This stage will include a three-storey chemistry block plus basement and it is hoped that it will be possible for this portion, which will include 90,000 sq. ft of laboratory space, to be occupied in December, 1964. The second stage of the science block will incorporate a ten-storey chemistry research building, chemistry lecture theatre and special library.

At the chemistry department of the University of Auckland something looked forward to for a long, long time recently went into use. This is a fully transistorized I.B.M. 1620 computer and an automatic punched card processing unit similar to that seen at the University of Canterbury by delegates to the 1962 conference.

Mr M. J. Elliott, a graduate of the University of Canterbury, and who is now Head Chemist at B.A.L.M. Paints (N.Z.) Ltd., in Auckland, addressed members in April on "Some Aspects of Paint Technology".

Mr G. Maskill-Smith, a former senior national scholar, who is now General Manager of N.Z. Wallboards Ltd., addressed the May meeting of the branch on "The Manufacture of Gibraltar Board". This industry is now based mainly on the use of materials supplied from within New Zealand.

To attend the first joint talks between New Zealand and Australian nuclear scientists, Dr J. E. Packer of Auckland University chemistry department recently visited Lucas Heights.

The Ngawha Springs area, known both as a place where mercury has been mined, and for its waters which contain greater amounts of boric acid than other New Zealand springs, was recently the focus of attention because Mr J. Healy pointed out at the Whangarei Geological Survey conference that this hot springs area, near Kaikohe, is well worth investigating as a possible source of geothermal power.

Professor A. L. Odell returned in June after a visit to the U.S.A. while on leave.

Several branch members attended the annual conference of the Australian and New Zealand Pulp and Paper Industries Technical Association (APPITA) which was held early in May at Rotorua. A contingent of Australian members visited New Zealand for the meeting.

The £10,000,000 Marsden Point, Whangarei, oil refinery which is to provide heavy fuel oils, diesel oil, petrol and bitumen is now under construction. It is expected that about one eighth to one quarter of the crude oil needed for the refinery will come from the Kapuni field in Taranaki.

Dr J. D. K. North, a former Rhodes Scholar, who is now Physician-in-Charge of the Auckland Hospital's Medical Unit (Dunedin members please note), addressed the June meeting of the branch on "Kidney Disease and the Artificial Kidney", with illustrated reference to renal diseases and the type of failure that can be treated with the artificial kidney.

WAIKATO BRANCH

The March meeting was held in association with the Waikato Branch of the Royal Society, the speaker being the Institute President, Mr W. G. Hughson, and his subject "World Fuel Resources". Mr Hughson visited members at the research institutions during his stay in Hamilton.

Through the inclusion of an unscheduled meeting in last year's programme the Chairman's Address for 1962 was delayed until April, 1963. Mr Lancaster spoke on "Silage". The May meeting was held in the Ruakura Animal Research Station laboratory, where Miss A. E. Stevenson demonstrated the use of the autoanalyser, especially for the estimation of ammonia in Kjeldahl digests.

MANAWATU BRANCH

Dr C. V. Fife is to be congratulated on the award of his doctorate, and Dr G. Butler and Mr I. Andrew for being the recipients of the Morcom Green, Edwards prize for 1962 and the Sir Walter Mulholland Scholarship respectively.

Mr G. B. Russell, formerly at the University of Canterbury, has joined the Plant Chemistry Division, D.S.I.R.

Mr P. J. Peterson will attend the 5th International Amino Acid and Protein Symposium at the Max Planck Institute, Gottingen, in September.

Professor J. K. Scott is attending in July and August a Conference in Stockholm organized by the International Association of Microbiological Societies and the Royal Swedish Academy of Engineering Sciences. While overseas he will visit Institutions interested in Food Technology and Biotechnology.

WELLINGTON BRANCH

Mr J. E. Cornish has arrived in New Zealand from Australia to take up the position of Technical Manager for I.C.I. (N.Z.) Ltd. in place of Dr W. J. Whitton who recently was transferred to Australia where he has become the Research Department Manager of I.C.I. (ANZ) Ltd.

OTAGO BRANCH

Mr R. G. Stewart of the Wool Research Institute has left to spend a year at the Lowell Technological Institute, Lowell, Massachussetts, on a grant from the International Wool Secretariat. He will then travel to the United Kingdom and Europe to visit wool research institutes there before returning to New Zealand.

Dr R. F. Smith is spending a year at Queen's University, Kingston, Ontario, on a Post Doctoral Fellowship.

Mr F. Occleshaw, formerly of British Phosphate Commission, has retired and is now living at Mosgiel.

Miss N. E. Sirett of the Endocrinology Department of the Medical School will be attending the 2nd Asia and Oceania Congress of Endocrinology in Sydney at the end of May.

The President of the Institute was entertained at a luncheon held in the Senior Common room at the University of Otago on June 6. After the luncheon, the President spoke about his visit to Australia where he attended the World Power Conference.

The Otago Branch is sponsoring a series of three lectures to be given in July, August and September by the staff of the Department of Chemistry for senior secondary school pupils. It is hoped that these lectures will become an annual event similar to the lectures presented in some other centres.

AMENDMENT OF RULES

At the meeting of the Council held on May 29 a resolution containing extensive alterations of the Institute's Rules was passed. As the booklet of Rules will be reprinted in the near future, the details of these changes have not been included in the abridged Minutes in this issue, but a few of the more important changes, especially those affecting admission to membership, are indicated below.

8.2.1 *Reword to read*: "Holds a Bachelor's Degree of a New Zealand university, such degree having included a Chemistry III unit or its equivalent or Biochemistry III or its equivalent, provided that the courses taken have included the pursuance of not less than three years' study of Chemistry and/or Biochemistry together with suitable practical work, and who proves to the satisfaction of the Council that he has been engaged in the study of Chemistry or Biochemistry or in the practice of the profession in a manner approved by the Council for a period of at least two years after qualifying for such degree."

8.2.2 "Holds such qualification as Council may approve as being equivalent to the requirements set out in 8.2.1."

9.1 *Omit*: "has attained the age of twenty-five years".

9.2 *Change to read*: "An Associate who is a candidate for Fellowship must, subsequent to his election to the Associateship, have had at least five years' experience in the practice, application or teaching of chemistry, or in the direction of other qualified chemists, and must have shown therein a substantial measure of ability or achievement. Notwithstanding the above, Council may in exceptional circumstances and on the unanimous recommendation of the membership committee elect to Fellowship a person who, although otherwise qualified, has been an Associate for less than five years".

13.8 *Change to read*: "The President, the Vice-President and the General Secretary-Treasurer shall hold office until the first day of September in the year following their election to Council. Branch Delegates shall hold office until replaced by resolution of their branch."

This amendment of the Rules completes the work of a Revision Committee from the Auckland Branch in addition to consideration by other branches over the last eighteen months. The amendments are now in force.

COUNCIL MINUTES

ABRIDGED MINUTES OF A MEETING OF THE STANDING COMMITTEE OF THE COUNCIL, APRIL 18, 1963.

Present

W. G. Hughson (President), S. G. Brooker (Vice-President), Miss J. M. Mattingley and Dr W. E. Harvey (Hon. General Secretary).

Professional Status

A letter from the State Services Commission in reply to the Institute's letter re Station Chemist at Meremere Power Station evaded the issue raised and it was agreed to follow this matter up.

Overseas Visitors

Arrangements are in hand for Professors P. V. Danckwerts (Cambridge) and A. E. Alexander (Sydney) to visit the main centres later this year. The universities have agreed to assist in financing these visits.

Rules and Regulations

The suggested amendments to the Rules and Regulations were approved and will be circulated to Branches for final comment before the next Council meeting.

Associateship by Examination

The Secretary reported that following the I.U.P.A.C. meeting in London in July there will be a meeting of secretaries of many of the chemical institutes. On the agenda for this meeting is consideration of examination requirements for professional membership, and it was agreed that the N.Z.I.C. should not finalize its examination requirements until the outcome of this discussion becomes known.

National Research Council Bill

It is believed that the R.S.N.Z. is going to take this matter up with the Government and it was agreed to write to the R.S.N.Z. offering to co-operate with them in this matter. It was considered that a united approach, if possible, would be the most satisfactory course of action and if the R.S.N.Z.'s proposed course of action is acceptable to the N.Z.I.C. we should support the R.S.N.Z. rather than make an approach to the Government ourselves.

Technicians Certification Authority

It was agreed to refer to the Wellington Branch a request from the T.C.A. that we name a deputy for W. E. Dasent on the Executive Committee for Science.

Instrument Survey

It was agreed to accede to the request by Mr A. H. Horn that the Institute prepare a form for distribution to members asking for information for the above survey. The distribution will be handled by branches. It was not considered that reply-paid envelopes were justified.

Visitors

A letter from the Secretary, Wellington Branch, raised the question of granting temporary status and privileges to chemists who may be working in New Zealand for limited periods. It was con-

sidered that this matter should be left in the hands of branches, with the suggestion that the branch pay to the Institute the normal local member's subscription.

National Certificate in Science (Chemistry)

A letter from the Waikato Branch requested support for a local member of that Branch who has a difference of opinion with the T.C.A. over the credit given for English qualifications. It was agreed that no action should be taken, but the letter was referred to Mr Dasent who would be free to bring up the matter informally with the T.C.A. if he chose to do so.

Campaign for Nuclear Disarmament

A letter from the C.N.D. sought support for a petition in support of a nuclear-weapon-free Southern Hemisphere. It was agreed to place this matter on the agenda for the General Meeting. The President expressed his willingness to attend in his personal capacity a C.N.D. meeting to discuss this matter.

Royal Society

The Vice-President agreed to prepare for circulation a memorandum on the relationship between the N.Z.I.C. and the R.S.N.Z. outlining so far as possible the views of both sides. The memorandum would be given the normal Council agenda distribution.

W. E. HARVEY,
Hon. General Secretary.

ABRIDGED MINUTES OF A MEETING OF THE COUNCIL, MAY 29, 1963.

Present

W. G. Hughson (President, in the chair), P. J. Gallaher (Auckland), N. T. Clare (Waikato, Editor), Dr R. W. Bailey (Manawatu), Miss J. M. Mattingley (Wellington), T. A. Mitchell (Canterbury), Dr W. G. Hanger (Otago), D. J. Hogan (Registrar) and Dr W. E. Harvey (Gen. Secretary). An apology was received from S. G. Brooker (Vice-President).

Minutes

The Minutes of the last Council Meeting held on November 27, 1962, and of the two meetings of the Standing Committee held on February 18, 1963, and April 18, 1963, were taken as read and confirmed.

Journal

The Editor reported that the June issue would contain the "Chemistry in Action" lectures, but would not appear until near the end of the month.

Conference 1963

Dr Bailey outlined arrangements for the Conference and presented a tentative programme. More papers have been offered than could be included in the time available but few papers were offered by chemists employed in industry. It is hoped that most attending the Conference will stay in the Massey hostels.

Royal Society of New Zealand

After considerable discussion about the relationship between the N.Z.I.C. and the R.S.N.Z. it was generally agreed that the R.S.N.Z. is, and, by virtue of the fact that N.Z.I.C. members are on the R.S.N.Z. Council, will continue to be kept informed of the general attitude of the N.Z.I.C. towards closer ties between the two bodies and that the N.Z.I.C. should take no further action until the nature of possible changes to the R.S. Act become more definite.

Associateship by Examination

The decision taken by the Standing Committee on April 18, 1963, was confirmed.

Meeting of Secretaries of Chemical Societies in London

Resolved that the Institute ask Dr V. Armstrong if he would be prepared to attend the above meeting as the N.Z.I.C. representative.

Campaign for Nuclear Disarmament

It was agreed that discussion on this topic should be deferred to the Annual General Meeting.

Public Statements

It was agreed to ask branches to consider what should be the policy of the Institute and of branches as regards the issuing of public statements. It was considered that the difference between statements dealing with chemical facts (*e.g.*, the distinction between fluorine and the fluoride ion) and those dealing with matters of opinion should be kept in mind when arriving at a decision as to policy.

The remit from the Wellington Branch was referred back to the Branch with the suggestion that the propositions detailed in the remit be re-worded and/or reconsidered.

Applications for Associateship and Fellowship

Resolved that the Standing Committee be empowered to admit Fellows and Associates to membership when the Membership Committee recommendation has been unanimous.

National Research Council Bill

The President reported briefly on a meeting of interested parties convened by the N.Z. Association of Scientists to discuss the proposed Bill. Individual members of Council said they believed that the Minister of Scientific and Industrial Research was proposing to call a meeting to discuss the Bill and the Secretary was instructed to write to the Minister requesting that the Institute be invited to send representatives to any such meeting. It was agreed that if the meeting eventuated the Institute should be represented by the President and the General Secretary.

Next Meeting

The next meeting of the Council will be held at Massey University College on the afternoon of Monday, August 19, 1963.

W. E. HARVEY,
Hon. General Secretary.

THE REGISTRY

Fellows

(Elected April 18, 1963)

FIFE, Clifford Valmont, M.Sc., Ph.D., Massey University College (Head of Soil Science Department).

HALL, David, M.Sc., Ph.D., Chemistry Department, University of Auckland (Associate Professor).

(Elected May 29, 1963)

CAIN, Bruce Frank, M.Sc., Ph.D., D.Phil., British Empire Cancer Campaign Society (Senior Research Fellow).

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

MACKNEY, Alan William, B.Sc. (Hons.) (Sydney), F.R.A.C.I., N.Z. Forest Products Ltd. (Technical Director).

MATTHEWS, Richard Ellis Ford, M.Sc., Ph.D., F.R.S.N.Z., University of Auckland (Professor of Microbiology).

ROBINSON, James Roper, B.A., Ph.D. (Cantab.), M.D., Professor of Physiology, Medical School, Dunedin.

RUSSELL, William Ernest, M.Sc., A.R.I.C., M.I.Chem.E., N.Z. Farmers' Fertilizer Co. Ltd (Works Superintendent)

SEAL, Kenneth Edmund, M.Sc., Amalgamated Brick & Tile Co. Ltd., Auckland (Chief Technical Officer).

SWINDALE, Leslie Denis, M.Sc., Ph.D., N.Z. Pottery and Ceramics Research Assn. (Director).

WHILLANS, Douglas, B.Sc., Central Laboratory, Auckland Hospital (Principal Technologist).

Associates

(Elected May 29, 1963)

BAIRD, Walter Norman, B.Sc., Dip.Ind.Chem., Shirley Boys' High School, Christchurch (Teacher).

CAMPBELL, David Franklin, B.Sc., Rangiora High School, Rangiora (Head of Science Dept.).

CLARKE, John Graham, M.Sc., Dairy Research Institute, Palmerston North (Research Chemist).

CRAIG, John Thorburn, B.Sc., Ph.D.(Edin.), Victoria University of Wellington (Lecturer in Chemistry).

CRUMP, Fay Hilton, B.Sc., Dominion Laboratory, Private Bag, Petone (Scientific Officer).

CURTIS, Yvonne Margaret, M.Sc., Wellington Girls' College (Teacher).

ESCHER, Wallace Lee, B.Sc., Dominion Laboratory, Private Bag, Petone (Scientific Officer).

FITZGERALD, Paul, M.Sc., Burnside High School, Christchurch (Teacher).

FURKERT, Roderick John, M.Sc., Soil Bureau, Private Bag, Lower Hutt (Scientific Officer).

GRIGOR, John Andrew, M.Sc., Aranui High School, Christchurch (Teacher).

LONG, Mervyn Allan, M.Sc., Chemistry Dept., University of Auckland (Temporary Junior Lecturer).

MARKHAM, Kenneth Ronald, M.Sc., Ph.D.(Melb.), Dominion Laboratory, Private Bag, Petone (Scientific Officer).

MILLAR, Keith Raymond, M.Sc., Wallaceville Animal Research Station, Private Bag, Wellington (Scientific Officer).
RALPH, Raymond Keith, M.Sc., Ph.D.(Melb.), Dept. of Microbiology, University of Auckland (Senior Lecturer).
RHODES, Desmond Cecil, M.Sc., Edgecumbe College, Edgecumbe (Head of Science and Maths. Dept.).
SCOTT, James Kelvin, B.E.(Hons.), A.M.I.Chem.E., Massey University College (Professor of Food Technology).
STRANG, William Ritchie, M.Sc., Shell Oil N.Z. Ltd., Wellington (Chemist).
SUTCLIFFE, Eric Raymond, B.Sc., Dominion Laboratory, Dunedin (Scientific Officer).
SWAN, William Gourlie, M.Sc., Cashmere High School, Christchurch (Head of Chemistry Dept.).
WEENINK, Ronald Owen, B.Sc., Fats Research Laboratory, Wellington (Scientific Officer).
WICKEN, Anthony John, B.Sc.(Hons.) (Capetown), B.A.(Hons.) (Cantab.), Ph.D.(Cantab.), A.R.I.C., Lincoln College, Christchurch (Lecturer in Biochemistry).

NUCLEAR SCIENCE DISCUSSIONS

A group of Institute members working in nuclear chemistry and its applications participated in discussions with scientists of the Australian Atomic Energy Commission during May. These meetings, held at Lucas Heights, Sydney, were attended by Mr T. A. Rafter (Institute of Nuclear Sciences), Professor J. Duncan and Dr H. E. Wilson (Victoria University of Wellington) and Dr J. E. Packer (Auckland University). Accompanying these chemists were Dr R. E. White (Physics Department, Auckland) and Mr G. Whittle (Engineering Department, Canterbury). These discussions on the research programmes in nuclear sciences in the two countries will inaugurate a series of interchanges of ideas and problems during future years.

FORTHCOMING INTERNATIONAL CONFERENCES

July 5–9: 22nd IUPAC Conference, LONDON.
July 10–17: 19th IUPAC Congress, LONDON.
July 18–20: Symposium on the chemistry and biochemistry of fungi and yeasts, DUBLIN.
July 22–27: European meeting on molecular spectroscopy, BUDAPEST.
August 9–15: 6th International Nutrition Congress, EDINBURGH.
August 19–23: 5th International Congress on Clinical Chemistry, DETROIT.
July 20–23: 2nd International Pharmacology Congress, PRAGUE.
August 26–30: 8th International Congress of Leather Chemists, THE HAGUE.
September 9–14: 6th General Assembly, International Union of Crystallography, ROME.
September 22–29: 34th International Congress of Industrial Chemistry, BELGRADE.

BOOK REVIEWS

THEORY AND APPLICATIONS OF ULTRAVIOLET SPECTROSCOPY, by H. H. Jaffe and Milton Orchin. Published by John Wiley and Sons, New York, 1962. $15.

I was disappointed with this work — perhaps because the title led me to expect more than the book gives. Theory there is in plenty, all useful to an understanding of spectra; but some is of little practical value — even the authors admit that the calculated absorption maximum for octatetraene at 471 μ and the observed value at 286 μ are "not in very good agreement". Applications of U.V. spectra are largely confined to simple molecules, with little mention of such interesting topics as π overlap in non-conjugated systems. However, Chapter 10, dealing with conjugated dienes and $\alpha\beta$-unsaturated carbonyl compounds does relate theory to practice in a useful empirical manner, extending Woodward's rules to a variety of strained systems.

The theoretical spectroscopist will certainly find this a most useful work, applying molecular orbital theory to the spectra of a large variety of organic molecules, ions and free radicals as well as discussing the spectra of inorganic complexes and fluorescence spectra. The practical organic chemist will find little not already covered in the admittedly inadequate books already published on this subject.

—R.H.

RUSSIAN-ENGLISH CHEMICAL AND POLYTECHNICAL DICTIONARY, 2nd Ed., by L. I. Callaham. John Wiley, New York, 1962. 892pp., $19.50.

A colleague whose interests are in the physical sciences, and who has taught technical Russian, regards this dictionary as the best technical one he has seen. The reviewer can comment only from the viewpoint of a user (in chemistry) with no more than a smattering of the language. It was checked by looking up most of the words in an alkaloid paper in *Zhur. obshchei Khim, 31*, 2428 (1961). Nearly all ordinary and technical words and abbreviations were found. The double word *tolstoplodnoi* (= thickfruited) was not there but the components were. The abbreviation *razl.* (= decomp.) after a m.p. was not found, but the word it came from was clear.

The dictionary caters for those who are unfamiliar with the alphabet. The system of location involving spots on the edge of the book and a guide on the front page is useful, if your eyesight is good. There is some guide to the meanings of suffixes, and to declensions, and in general each basic word has a list of derived forms, with their meanings.

—E.P.W.

COLLAGEN, edited by N. Ramanathan. J. Wiley & Sons, New York, 1962. 579 pages. Price 20 dollars.

This well-produced book records the proceedings of a symposium sponsored by the Central Leather Research Institute, Council of Scientific and Industrial Research, Madras, India, and held at the Institute in November, 1960.

Twenty-six contributions from 58 research workers representing 10 countries are classified under 3 headings: structural studies, medical and biochemical studies and physical, chemical and technological studies. Discussion is recorded after many papers.

The section on structural studies consists of 11 papers. The work of the Department of Physics of the University of Madras is highlighted and includes 2 papers on the structure of feather keratin which unlike α keratin is based on the collagen-type triple helical configuration. Contributions from America, Germany and Austria are included in this section. All the papers are most interesting and they illustrate that the structure of the collagen molecule, which contains 19 different amino acids, is extremely complex. The exact configuration has yet to be agreed upon.

The 14 papers in the section on Medical and Biochemical Studies are contributed by research centres in 9 countries. Authoritative work is presented on a wide variety of topics including the influence of enzymes, certain diseases, specific agents and ageing on collagen structure. Results of research work on materials associated with collagen which include mucopolysaccharides, elastin, procollagen (the precursor of collagen) and gelatin (a heat degraded collagen) are also presented in this section.

The section on physical, chemical and technological studies, consisting of 11 papers, contains no studies on the mechanisms of various types of tannage. An appraisal of accepted theories would be expected considering that the Central Leather Research Institute sponsored the symposium. This is no criticism as some limit had to be placed on the various aspects of collagen research to be presented. However, the work of the Institute on the changes which hide and leather undergo owing to hydrothermal shrinkage is an important contribution.

This book contains the latest work in many fields of collagen research. Not all fields are covered nor could it be claimed that all research schools are represented. Indeed, many renowned names are missing. However, all papers are accompanied by references, often extensive, so it is obvious that this volume will be a valuable addition to libraries of research workers directly or indirectly concerned with collagen.

— G.W.V.

GAS CHROMATOGRAPHY, by H. Purnell. John Wiley and Sons, Inc., N.Y., London. 1962. 441 pages.

GAS CHROMATOGRAPHY. Third International Symposium on Gas Chromatography, June, 1961. Editors: N. Brenner, J. E. Callen and M. D. Weiss. Academic Press, New York, 1962. 719 pages.

Gas chromatography was first applied to analytical problems about twelve years ago and following a lag phase of about three years, during which time there was little literature on the subject, it has become one of the most written-about techniques of chemical analysis. Two further texts, very different in nature, one a comprehensive treatise and the other a collection of original and review papers, might appear, at first, to be unnecessary. However, gas chromatography is being developed, and its applications diversified at a tremendous rate and this compels industrial and research chemists of any field of interest to be aware of the advances being made. Authoritative texts such as these provide a convenient way of doing this.

Each book has its special audience. Dr Purnell is a physical chemist and was one of the early contributors to the development of the theory of gas chromatography. It is natural, therefore, that his book should commence with a full discussion of the underlying physico-chemical principles which govern chromatographic separa-

tions. Later sections are critical accounts of the theory and practice of chromatography. The book provides valuable information to anyone who is contemplating the purchase or construction of gas chromatographic equipment when almost bewildering decisions on type of detector, column design, etc., have to be made.

The collection of papers given at the Third International Symposium gives a very comprehensive cover of the techniques and applications of gas chromatography and the library of institutions in which gas chromatography is being used should possess this volume. Of particular value to practising chromatographers are the accounts of the informal discussions on the performance of capillary columns and the factors which possibly affect the performance of preparative columns. Among the large number of interesting papers is one on a gas chromatograph designed to analyse volatile components on the moon's surface.

—J.C.H.

ADVANCES IN ORGANIC CHEMISTRY: Methods and Results. Vol. 3. Edited by R. A. Raphael, E. C. Taylor, H. Wynberg. Interscience Publishers, New York, 1963. 333 pages, 13.75 dollars.

Contents: Mass Spectrometry as a Structural Tool (R. I. Reed); Phosphorylation (D. M. Brown); Selectively Removable Amino Protective Groups used in the Synthesis of Peptides (R. A. Boissonnas); Protective Groups (J. F. W. McOmie).

Reeds article of 72 pages appears to have been written about 1960, with a few more recent examples of structural applications appended, and thus misses recent exciting papers on the use of the technique for structural work. The various aspects of the technique are covered in a readable way — the apparatus; molecular weight determination with the interesting point that an exact mass can render the microanalyst obsolete; the "cracking pattern" of simple types of organic molecules; and examples from more complex structures. The simplicity of the article is in marked contrast to the standard work of Beynon. Biemann's book has not yet been seen by the reviewer. Other small, more modern reviews of the subject are available.

To the bench organic chemist the 140 pages on protective groups are particularly welcome. The coverage of the articles seems very thorough, and reviews of a comparable nature do not appear to be available.

The article on phosphorylation is of a more restricted interest, with particular reference to synthesis of substances of biochemical interest.

—E.P.W.

Registered at the G.P.O., Wellington, as a magazine.

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