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EDITORIAL

EARLY DAYS IN CHEMISTRY IN AUCKLAND.

(Guest Editorial Contributed by S. G. Brooker on behalf of the Conference Committee.)

The history of chemistry in Auckland is not so well documented as that of some other centres; nevertheless some rays of light can be found to illumine the gloom and in view of the site of this year's Conference, are worth setting down.

Chemical industry may be said to begin with the production of hydraulic lime by Nathaniel Wilson at Warkworth in the late sixties. These works were later extended to manufacture cement and the first rotary cement kiln was installed in 1903, and still later developed into the large cement industry now established at Portland, near Whangarei, and still bearing the name of Wilsons.

An attempt to establish industry based on iron sands at Onehunga in 1876 was less successful. After preliminary experiments justifying the floating of a company and the erection of some plant, an American named Jones was to start the works going but before he could do so he was executed on a capital charge. Without his leadership the project failed. We have been unable to gleam any further information to supplement this fascinating glimpse of Jones' career, but we are glad to say that the gallows has not yet claimed any other members of our profession.

An Act of 1865 provided for the appointment of a Colonial Analyst (a post filled by the famous William Skey for many years) and of Provincial Analysts also. The first holder of the latter position of which we have record is J. M. Tunny, who was on the job in 1876 supplying an analysis of clay from the property of Captain Symonds at Big Muddy Creek on the Manukau Harbour. In two pamphlets distributed at the time, Captain Symonds claimed that the property had deposits of excellent coal, clay for brickmaking, iron ore and building stone, this last being particularly recommended by one Peppercorn, C. E. (for Civil Engineer). Tunny must have been pleased to see himself referred to as "Mr. Tummy" in one place by Captain Symonds, who attributed the fact that no one was willing to work these ores to the vile scheming of Auckland importers of iron and building materials.

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Road building was apparently somewhat cheaper in those days. It was reported in 1862 that the planned "great central trunk road" to Wellington had only proceeded for forty miles, but "as the Auckland Government alone votes some £8000 a year for the prosecution of this great work, a few years' time may see it finally completed".

Tunny was succeeded in 1882 by J. A. Pond, who had started as errand boy in a large London chemical firm, and became successively petroleum research chemist, soldier in the Maori wars, miner in the Thames gold fields, pharmacist and analyst. After he retired from his post as Provincial Analyst he continued to work on analysis and research, mainly on agricultural problems, almost to the time of his death at the age of 95.

Auckland University College was opened in 1883 with F. D. Brown as the first Professor of Chemistry and Physics. As the first Professor of Mathematics was drowned on the day of his arrival, Brown took over some of the lectures in this discipline too. In addition he gave many public lectures and became consultant to the Auckland Gas Company, thus being in a sense the first industrial chemist in Auckland, and set an enviable example to subsequent industrial chemists in becoming Chairman of Directors of the same company. He also gave advice on gold extraction and published his only New Zealand paper on insulation in the new refrigerated ships. Brown was succeeded in 1914 by one of his own students, F. P. Worley, who has become very well known and who played a leading part in the early activities of our Institute. C. P. Worley, who followed his brother to A.U.C. in 1902, relates that when he first met Brown in the lab., the Professor asked if he was a brother of F.P. and then his Christian name. "Clarence, sir" was the reply. "Clarence", said the Professor in his great booming voice, "surely to God they don't call you Clarence!"

Perhaps the most remarkable character of early days was Arthur Bowell, who was brought out from Oxford by Brown as his personal assistant at the age of 17. The chemistry department was in very poor temporary premises (it is still in temporary premises today but not the same ones) and the only apparatus purchasable in Auckland was second-hand olive oil flasks which did duty as retorts. Nevertheless Bowell contrived demonstrations for lectures both at the College and in public halls, devised apparatus for research, and acquired considerable skill as an analyst. He achieved no academic distinctions and for his first thirty years was not even considered worthy of mention in the college calendar. However with the support of F. P. Worley, after the latter became Professor in 1914, Bowell became first demonstrator, later lecturer, and after fifty years at the college, acting-Professor for a period. Lab. boy to Professor—or log cabin to White House in New Zealand Chemistry!

NEW ZEALAND INSTITUTE OF CHEMISTRY AND ROYAL INSTITUTE OF CHEMISTRY JOINT CONFERENCE, 1956.

AUCKLAND UNIVERSITY COLLEGE,

20th August to 23rd August.

Monday, 20th August:

9.30 a.m. Registrations.

10.30 a.m. Morning Tea.

11.00 a.m. Official opening of Conference by His Worship the Mayor of Auckland, Mr. J. H. Luxford, C.M.G., in the College Hall, followed immediately by the Presidential Address: Dr. M. M. Burns, President, N.Z.I.C., "The Chemist and the Community".

2.00 p.m. Symposium on Medical Chemistry: Chairman, Mr. D. Whillans.

2.00: L. H. Briggs: Pharmacology of New Zealand Plant Products.

2.30: J. F. Burton: Experimental Cancer Chemotherapy.

3.00: G. A. Nicholls: Antituberculous effect on certain active polyoxyethylene ethers.

3.30 p.m. Afternoon Tea.

4.00 p.m. R.I.C. Annual General Meeting, concurrently with Scientific Films.

8.00 p.m. Film Evening and "Mixer" — Auckland Branch Hosts.

Tuesday, 21st August:

9.30 a.m. Simultaneous symposia on

(a) Medical Chemistry (cont.); and (b) The Chemistry of Wood and its Products.

(a) Medical Chemistry (cont.): Chairman, Mr. D. Whillans. M. Irwin and A. G. Leaver: Protection of Wet Tooth Surface.

9.30: M. Irwin: Part I.

10.00: A. G. Leaver: Part II.

(b) The Chemistry of Wood and its Products. Chairman: Mr. A. W. Mackney.

9.30: C. J. Matheson: Chemistry of Kraft Pulping.

10.00: R. Carlyon and L. G. Neubauer: Manufacture of Chlorine and its use for Semi-bleached Wood Pulp.

10.30 a.m. Morning Tea.

11.00 p.m. Simultaneous symposia on

(a) Medical Chemistry (cont.); and (b) The Chemistry of Wood and its Products (cont.).

(a) Medical Chemistry: Chairman, Dr. F. A. Denz.

11.00: F. B. Shorland: The Significance of Animal Fats in the Light of Recent Investigation.

11.30: F. N. Fastier: Analogues of Serotonin.

12.00: F. H. Sims: Recent Advances in Hormone Research.

(b) The Chemistry of Wood and its Products. Chairman: Mr. A. W. Mackney.

11.00: J. S. Reid: Variation in Specific Gravity and Fibre Length in Timbers as affected by Age, growth and Other Factors.

11.30: W. E. Harvey: Heartwood Extractives.

12.00: I. R. C. McDonald: The Foaming Characteristics of Hot Water Extracts of Green P. Radiata Sawdust.

1.30 p.m. Local excursions to industries and institutes of interest covering Agricultural Fertiliser Industries, Paint and Timber Preservation, Sugar Refining, etc.

Evening: Free.

Wednesday, 22nd August:

9.30 a.m. Lecture by invited lecturer—Professor W. L. Dunkley: (University of California at Davis): The Chemistry of Milk Flavours. Chairman: Dr. M. M. Burns.

10.30 a.m. Morning Tea.

11.00 a.m. Symposium on Instrumentation: Chairman, Mr. O. H. Keys.

11.00: W. G. Whittlestone: Instrumentation in the Laboratory.

11.45: H. G. Lambert: Commercial Instrumentation.

2.00 p.m. Easterfield Lecture: Details will be announced at Conference.

3.30 p.m. Afternoon Tea.

4.00 p.m. N.Z.I.C. Annual General Meeting.

8.00 p.m. Conference Social Function at the Berkley Lounge, Mission Bay.

Thursday, 23rd August:

9.30 a.m. Simultaneous symposia on

(a) Rumen Metabolism.

(b) General Topics.

(a) Rumen Metabolism: Chairman, Mr. N. T. Clare.

9.30: A. T. Johns: Some Recent Advances in Rumen Digestion.

10.00: J. L. Mangan: Protein Metabolism in the Rumen.

(b) General Topics: Chairman, Professor H. N. Parton.

9.30: B. E. Jackson: Conductance Bridge for Titrations.

10.00: A. L. Odell: An Isotopic Study of the Lability of Ligands in Potassium Chromi-oxalate.

10.30 a.m. Morning Tea.

11.00 a.m. Simultaneous symposia on
(a) Rumen Metabolism.
(b) General Topics.

(a) Rumen Metabolism: Chairman, Mr. N. T. Clare.
11.00: L. I. Hart: Synthesis and Metabolism of B Vitamins in the Rumen with Particular Reference to Vitamin B12.
11.30: N. D. Jamieson: The Miniature Rumen and its Application to Studies on Rumen Metabolism.
12.00: K. R. Christian: Measurement of Rumen Volume.

(b) General Topics: Chairman, Professor L. H. Briggs.
11.00: R. B. Johns, S. N. Slater and R. J. Woods: Picrotoxinin.
11.30: R. H. Locker: The Structure of Myosin.
12.00: W. L. Dunkley: The T.B.A. Test for Oxidative Rancidity.

1.30 p.m. Further local excursions to places of interest covering Food Technology, Wood Products, Metallurgical, etc.

Friday, 24th August:

6.15 a.m. Post-Conference excursions depart for Kawerau.

PHARMACOLOGY OF NEW ZEALAND PLANT PRODUCTS

BY L. H. BRIGGS,
Auckland University College.

Although a considerable amount of research has been carried out on the isolation and chemistry of many compounds derived from New Zealand's unique flora the pharmacology of these compounds has been relatively little studied. Recently, from funds from the British Empire Cancer Campaign Society, a chemical unit has been established at Auckland University College to investigate the effect of plant extracts on various cancer tumours and the possible carcinogenic effect of pure compounds derived therefrom. At the same time opportunity will be taken to investigate the general pharmacology of pure compounds including their antibiotic activity and effect on viruses.

The general plan and scope of the work will be discussed.

EXPERIMENTAL CANCER CHEMOTHERAPY

BY J. F. BURTON,

British Empire Cancer Campaign, Auckland.

Of the heterogeneous group of drugs now known to be capable of influencing favourably (though not curative of) certain forms of human cancer, the majority were initially subjected to clinical trial on the basis of laboratory findings of growth inhibition of animal tumors.

The ultimate test of a candidate anticancer drug is its effectiveness in human clinical trial, an unattainable basis for large-scale screening operations.

Failure to damage a single experimental tumor does not indicate a compound to be ineffective against human cancer or even against other animal tumors. It is likely however that testing against a "spectrum" of experimental tumors should minimise the risk of agents worthy of clinical trial remaining undisclosed.

For the most effective trial of new chemicals, particularly when, as usual, these are available in small quantities only, close liaison between chemistry and testing laboratories is highly desirable.

ANTITUBERCULOUS EFFECT OF CERTAIN SURFACE-ACTIVE POLYOXYETHYLENE ETHERS

BY G. A. NICHOLLS,

N.Z. Forest Products Ltd., Auckland.

Following from the observation that a commercial detergent, the non-ionic "Triton A 20", has a suppressive effect on experimental tuberculosis in mice, other similarly active products have been prepared. It has been shown that *p-tert.*-butylphenol and *p-tert.*-octylphenol each can react with formaldehyde to give a pair of crystalline macrocyclic condensation products. The members of each pair are almost certainly stereoisomeric. These compounds react with ethylene oxide and the most active products have an order of effectiveness against a standard tuberculous infection in mice comparable to that of streptomycin. Maximum therapeutic activity is critically dependent on the average polyoxyethylene chain length. As this is increased the antituberculous effect is lost. By increasing the chain length still further, so that there is an average of 45 or more oxyethylenes per phenolic group, it is possible to obtain products capable of enhancing the effect of a tuberculous infection in mice. No member of this series of chemotherapeutically active compounds inhibits the *in vitro* growth of tubercle bacilli, nor has any tuberculostatic substance been detected in treated animals. There is evidence that these surface-active agents are associated with monocytes in such a way that the growth of ingested tubercle bacilli is inhibited. It has also been shown that these antituberculous compounds greatly lessen the sensitivity of red blood cells to thermal shock.

PROTECTION OF WET TOOTH SURFACE — PART I

BY M. IRWIN AND A. G. LEAVER,
Dental School, Dunedin.

The problem of protecting the teeth from attack by the cariogenic agents with an oil film is very complicated since very little is known about the physico-chemical nature of the system tooth-surface/saliva/oil, and great experimental difficulties are involved in its study in the laboratory.

The conditions necessary for oil to displace saliva from the tooth surface can, however, be deduced from first principles, and applied empirically in the laboratory *in vitro.* The final assessment, however, of the correctness of these deductions, *in vivo,* can at present, be only achieved by a prolonged clinical trial.

The equilibrium of the system can be altered by modifying the interfacial properties of the oil phase only since at present tooth-surface and saliva must be regarded as constant within certain natural limits. The use of surface active additives in oil is the simplest and most convenient of modifying the surface properties of the oil phase, but the choice of surface active additive for use in dentifrice is limited not only by the nature of the tooth-surface but also by its toxicity. The experiments of Green and Walsh (1) showed that of the number of surface active compounds investigated, cationic surface active compounds, long chain aliphatic primary amines, yielded the most promising results, but possible modifications to the amines themselves and a change in the type of oil phase may further improve their efficiency.

REFERENCES: (1) Green, R. W. and Walsh, J. P. (1951). J. Dent. Res. 30, 218.

PROTECTION OF WET TOOTH SURFACE — PART II

BY M. IRWIN AND A. G. LEAVER,
Dental School, Dunedin.

Throughout the world dental research workers are investigating the problem of dental caries, the most prevalent of all diseases to which mankind is subject. The multiplicity of interrelated factors, involved in the aetiology of caries, is such that it is rarely possible for one team of workers to attack more than one facet of the problem. In New Zealand, fundamental research is proceeding into the organic constituents of saliva but of possibly greater immediate interest, is the work on the protection of the tooth-surface by adsorbed oil films. This, of course, is a stop-gap prophylactic measure to reduce the incidence of caries and is not directly concerned with the aetiology of the condition.

It has long been observed that races living on a diet rich in oil and fatty materials exhibit low incidence of caries and, with this observation in mind, the effects of applying various oils, fats and surface active agents to teeth, subsequently exposed to acid buffers, were examined. The methods will be fully described. It was found that, whereas numerous fats and oils together with various surface active agents were ineffective, the long chain aliphatic amines conferred a marked degree of protection whether applied in oil solution or in aqueous solutions of their acetate salts. The most effective agent was tetradecylamine and, though numerous other compounds have been tested only one has proved of comparable value.

The problems involved in formulating a suitable dentrifice were considerable and it was not until a preparation, consisting of an oil in water emulsion suitably thickened, was produced, that an effective clinical trial could be carried out. This trial has just been concluded and further laboratory work involving the use of an "artificial mouth" is being carried on. This and other aspects of the work will be described.

CHEMISTRY OF KRAFT PULPING

BY C. J. MATHIESON,

N.Z. Forest Products Ltd., Auckland.

The active cooking agents in the kraft pulping process are caustic soda and sodium sulphide. The main purpose of these reactants is to remove the non-cellulosic portions of the wood not desired in the final pulp, these being mainly lignin and hemicelluloses. Although all components of the wood are simultaneously attacked to different degrees in the digestion process the reaction conditions favour the removal of intercellular material which consists of carbohydrate components and most of the lignin in the wood substance. The presence of sodium sulphide (formed from the make-up chemical, saltcake) is very beneficial to the strength characteristics of the resulting pulp due to its modifying effect on the rather drastic action of sodium hydroxide on the cellulose of the fibres. It is claimed that the hydrolysis of the sodium sulphide to sodium hydroxide and sodium hydrosulphide gives rise to increased solubility of the lignin in the cooking liquor due to the formation of thiolignin by the hydrosulphide component.

MANUFACTURE OF CHLORINE AND ITS USE FOR SEMI-BLEACHED WOOD PULP

BY R. CARLYON AND L. G. NEUBAUER,
Tasman Pulp and Paper Company, Kawerau.

THE SIGNIFICANCE OF ANIMAL FATS IN THE LIGHT OF RECENT INVESTIGATIONS

BY F. B. SHORLAND,✓
Fats Research Laboratory, Wellington.

Fats and oils occupy an important role in everyday life particularly as foodstuffs, as soap and as drying oils for paints and varnishes. In this paper it is proposed to discuss the role of animal fats in nutrition and to cover certain aspects of their metabolism with a view to indicating gaps in our knowledge.

In countries where there is a high caloric intake there is invariably a high consumption of fats, mainly of animal origin. Some investigators have linked with the high fat intake incidence of atherosclerosis, and this subject is now being investigated by the World Health Organisation which has hitherto been concerned with undernourished populations.

It has been customary to view the composition of animal fats as more or less specific to the species. The recent trend is to look upon the composition of animal fats as originating from a series of metabolic changes involving both the dietary and the endogenous fats.

Of particular interest in this regard is the effect of the rumen micro-organisms on the composition of the depot fats of ruminants. These micro-organisms hydrogenate the unsaturated acids of the diet giving rise to saturated acids, together with trans and positional isomers. With pasture-fed animals linolenic acid is the main unsaturated acid, and the number of possible mono, di and tri unsaturated isomers formed in the rumen is very considerable. In addition, the breakdown of the amino acids in the rumen gives rise to branched-chain and n-uneven numbered acids, such as isobutyric, isovaleric, 2-methylbutyric and propionic acids, which, apparently, by the successive addition of acetate give rise to the higher molecular weight branched-chain and n-uneven-numbered acids found in ruminant fats. Though the rumen gives to a considerable variety of isomers of the naturally occurring unsaturated acids and to branched-chain acids, little is known of the nutritive value and metabolism of these constituents.

ANALOGUES OF SEROTONIN

BY F. N. FASTIER.
Medical School, Dunedin.

Since the characterization of serotonin as 5-hydroxy-tryptamine ('5-HT'), the pharmacological properties of this metabolite have been studied in many laboratories, and there has been considerable speculation concerning its function in the body—if indeed 5-HT is of physiological importance, as its strong pharmacological activity strongly suggests. Some authorities believe 5-HT to be of importance because of its action on the kidney, others believe that 5-HT plays an essential part in cerebral metabolism and that madness can result when this is disturbed. Nor are these the only views that have been expressed.

Partly in the hope of obtaining information which might throw some light on the physiological role (if any) of 5-HT, various experiments have been carried out with chemical analogues of 5-HT. Certain of the latter have been found to resemble 5-HT pharmacologically to a limited extent. Thus a number have been shown to produce characteristic chemo-reflexes such as the coronary chemoreflex. The results of such experiments will be discussed.

RECENT ADVANCES IN HORMONE RESEARCH

BY F. H. SIMS,
Auckland Public Hospital, Auckland.

The application of recent advances in hormone research to medical problems will be briefly described.

VARIATION IN SPECIFIC GRAVITY AND FIBRE LENGTH IN TIMBER AS AFFECTED BY AGE, GROWTH AND OTHER FACTORS

BY J. S. REID,
N.Z. Forest Service, Wellington.

Variation in specific gravity is of current interest especially in some planted coniferous timbers as it in turn is reflected in variation in most strength properties within any species. At any point in the height of a merchantable bole there is an initial increase in S.G. from the pith outwards. Also there is a decrease in S.G. from the butt towards the top. The fibre length varies directly in a somewhat similar fashion in the fast-grown conifers. In other words the early-formed wood at any particular height in the tree has "youthful" characters of relatively low S.G. and short fibre length. The feature is of particular importance in rapidly-grown timbers as the broad growth rings consisting of such wood form a significant proportion of the volume of logs now considered of adequate size for conversion.

The width of growth rings in radiata pine grown under forest conditions has not been shown to depress S.G. except in the undernourished "suppressed" trees or in trees putting on excessively broad rings following abnormal conditions such as recovery from attack by the *Sirex* wasp and associated fungus, which had killed a large percentage of the associated trees. Douglas fir under optimum conditions forms growth rings with dense latewood bands almost as wide as the relatively low density earlywood bands. Sites with favourable growth conditions in spring and early summer followed by sustained dry conditions in late summer and autumn are liable to produce Douglas fir timber with broad earlywood and narrow latewood which is consequently poor in strength.

There are many instances of strength variation in a single species which are not attributable to variation in S.G.; one line of study suggested is the cellulose-lignin ratio.

HEARTWOOD EXTRACTIVES

BY W. E. HARVEY, ✓
Victoria University College, Wellington.

The substances which can be extracted from wood with solvents such as acetone, although only minor constituents on a weight basis, are of considerable importance in determining the properties of the wood. Thus, the well known resistance to sulphite pulping exhibited by some woods is due to the presence of small amounts of phenolic compounds, and, in general, durable woods owe their resistance to insect and fungus attack at least partly to the presence of compounds toxic to these organisms.

The extractives include a very wide range of chemical types and no hard and fast classification is possible. However, the following rough grouping forms a convenient basis for discussion.

The *terpenes* appear commercially as turpentine which may be manufactured directly from stump wood or recovered as a by-product from pulping operations. The related resin acids and the fatty acids, available as by-products of the sulphate industry, are also of commercial significance.

Tannins are present mainly in the bark rather than the wood and have long been in demand for the leather industry. Their chemistry is complex and relatively little investigated.

Colouring matters vary widely in type. They are no longer of commercial value but may be of interest to the producer of mechanical pulp.

Phenolic compounds are of interest because they are the substances which are responsible for the inhibition of sulphite pulping and appear to be of major importance in determining the durability of the wood. The very detailed investigations of the phenols in pine heartwood make this genus by far the most thoroughly studied to date.

Miscellaneous compounds such as the lignans, tropolones, etc., are of considerable interest to the academic chemist and together with the phenols offer the most scope for inter-relating the botanical classification of a plant and its chemical constituents.

THE FOAMING CHARACTERISTICS OF HOT WATER EXTRACTS OF GREEN P. RADIATA SAWDUST

BY I. R. C. McDONALD,
Dominion Laboratory, Wellington.

The abnormal foaming of hot water extracts of jack pine has been previously investigated but the results were somewhat inconclusive, and no attempt was made to isolate the trees responsible. This problem has been encountered during the grinding of some New Zealand grown P. radiata and the present investigation is an attempt to isolate the particular trees that give the trouble and to define the particular period of tree growth, when abnormal foams can be expected. Over the period August, 1955 to August, 1956, fortnightly sawdust samples have been taken from the top and bottom of merchantable logs from trees representative of the three crown classes. The green sawdust samples were placed in tightly closed bottles and within a few days of cutting were analysed. It has been demonstrated that while a small proportion (less than 5 per cent.) of normal trees give high foaming solutions, over the spring sap flow period a very high proportion of samples from sirex infested trees yield abnormal foams. Experiments describing the isolation of the foaming constituents are presented together with details of the constitution of this fraction.

INSTRUMENTATION IN THE LABORATORY

BY W. G. WHITTLESTONE,
Ruakura Animal Research Station, Hamilton.

In recent years there has been a bewildering increase in the number of instruments available for use in the laboratory. In some cases recent developments are merely a revamping of well-known principles. In other cases radically new changes have occurred. The object of this paper is to run briefly through some of the recent developments indicating the merits and demerits of some of the newer instruments available commercially. An attempt will be made to summarise developments in the field of pH measurement, conductivity determination, the measurement and control of temperature, and problems of voltage regulation. Examples given include recent developments in portable pH meters, the application of new techniques to conductivity determination, and the construction of some of the newer proportional temperature controls which are now freely available. Electromagnetic flow measurement will be described.

Because of our remoteness from overseas instrument makers, it is useful at times to have a few recipes for home-home instruments. A few examples of how the application of a little ingenuity in the laboratory can save much money will be given. Cheap vacuum tube relays suitable for use with contact thermometers, a simple direct reading conductometer, a thermistor bridge for freezing point determination, and high frequency titration equipment are described as illustrations of the way in which very useful equipment can be made from readily available and cheap electronic components.

A few examples will be given of how servo type equipment which has been designed for both laboratory and factory application can be used in a wide range of laboratory problems. Examples are given of the use of a potentiometer type of recording instrument for the measurement of temperature, electrical conductivity, light intensity, and pressure. The general value of instruments of this type for application to different kinds of laboratory problem will be outlined.

COMMERCIAL INSTRUMENTATION

BY H. G. LAMBERT,
Paykel Bros., Auckland.

Commercial instrumentation differs from laboratory instrumentation in that accuracy is usually subordinate to sturdiness, readability, and minimum maintenance.

Pressure and temperature are the most common measured variables. Others (in N.Z.) are count, speed, density, vacuum, liquid level, rate of flow, integrated quantity of flow, relative humidity, % CO_2, % CO plus H_2, % O_2, pH and conductivity.

Industry differs from the laboratory in using a higher proportion of *recording* instruments (especially in New Zealand; recorders are more common in American laboratories). And industry differs even more markedly in the number of instruments for automatic *control*, or "automation."

In automatic control the essential concept is the closed loop of cause and effect whereby any departure of measured variable from set point brings about a corrective action. So-called proportional, integral and derivative control actions are simply explained.

There are a few traps for the unwary in applying automatic control, and a few fundamental principles of approach which get over difficulties. These are explained.

A great wartime achievement is the electronic self-balancing potentiometer, developed for industry but used also in laboratories because of high accuracy. Over 100 are in New Zealand, about equally divided between industrial and laboratory use. Transducers translate almost any measurable variable into an electrical input.

Pneumatic instruments now use an analogous "force-balance principle" with such success that pneumatic transmission is used not merely for operating valves but also for remote transmission of measured variable and remote setting of control point. Pneumatic transducers translate almost any measurable variable into a pneumatic input.

Respective advantages of electric and pneumatic transmission and control are contrasted.

RECENT ADVANCES IN RUMINANT DIGESTION

BY A. T. JOHNS,

Plant Chemistry Laboratory, Palmerston North.

There has been a marked increase in interest in the field of ruminant physiology over the last decade. I propose to review some of the highlights of research in this field as seen on a recent trip to the U.S.A., the United Kingdom and Australia.

In the United States a good deal of effort is being put into the culturing and classifying of members of the complex association of micro-organisms in the rumen, together with a search for unknown growth factors necessary for their nutrition. Research into the use of artificial rumen techniques is also popular. Considerable advances in the study of the eructation mechanism have been made by the use of a cinefluorographic technique.

In England very interesting results have been obtained in studies of the mechanisms of absorption of rumen constituents both organic and inorganic, while protein synthesis in the ruminant is the major interest in Australia.

PROTEIN METABOLISM IN THE RUMEN

BY J. L. MANGAN,

Plant Chemistry Laboratory, Palmerston North.

The ruminant differs from the monogastric animal in that the protein of its food is largely converted to microbial protein in the rumen before being digested in the abomasum or true stomach. This conversion involves proteolysis of the food protein and deamination of a considerable proportion of the resulting amino acids to give a high concentration of free ammonia in the rumen. In the presence of suitable carbohydrate this ammonia, together with free amino acids, is converted to microbial protein. Non-protein nitrogen in the feed is treated in like manner without the necessity for proteolysis.

Although strong proteolytic and deamination activity of rumen micro-organisms has been demonstrated with a number of proteins such as casein, gelatine and zein, little information has been published relating to pasture fed animals. In addition to nitrogen from the feed the rumen of the cow receives nitrogen contained in about 50 litres of saliva per day. The mixed saliva has been found to contain on the average 36 mg. N/100 mls., contributing approximately 20 grams of nitrogen per day. About two-thirds of this nitrogen is in the form of a mucoprotein and the remainder as urea. In vitro experiments have shown that cytoplasmic protein isolated from red clover is rapidly broken down by rumen micro-organisms. If adequate carbohydrate is present, almost 90% of the protein is hydrolysed in two hours, while in the absence of added carbohydrate the reaction is slowed to about 12% under the same conditions. In the absence of carbohydrate about twice as much free ammonia is produced although a much smaller amount of protein has been utilised.

Using fistulated cows a number of feeding experiments were carried out with freshly cut red clover, and the nitrogenous compounds in solution in the rumen liquor estimated. It was found that after a delay of 30 minutes the soluble protein increased during the two-hour feeding period from about 5 mg. N/100 mls. to 25 mg. N/100 mls. Feeding was then discontinued and soluble protein fell in a further two hours to about its pre-feeding level. Free amino acids behaved similarly reaching a peak value on occasions of 15 mg. N/100 mls., a value much higher than expected from the literature. Free ammonia-N increased to as high as 45 mg. N/100 mls. and unlike the other components did not decrease when the feeding was discontinued for two hours. The significance of these results will be discussed, together with preliminary figures on the role of the salivary mucoprotein.

CONDUCTANCE BRIDGE FOR TITRATIONS

BY B. E. JACKSON,

Dominion Laboratory, Wellington.

The conductance bridge was designed and built for the conductometric titration of sulphate with barium hydroxide by the method of Elphick and Gerson (1). It provides a number of features that are not available in commercial radio servicemen's resistance-capacity bridges that are sometimes used for this purpose.

The special features incorporated are:—

1. Direct reading scale of conductance with an expanded linear scale.
2. Provision for balancing the unavoidable quadrature component of the cell and leads.
3. The use of a cathode ray tube indicator with Lissajou figure presentation in which
    3.1 the sense of unbalance is indicated by a left or right-hand slope of the ellipse,
    3.2 the magnitude of unbalance is indicated by the slope of the ellipse.
    3.3 the quadrature unbalance is indicated by the width of the ellipse, and
    3.4 a highly distorted ellipse indicates an unsatisfactory condition of the electrodes which should be remedied before proceeding.

In addition, the C.R.T. as an indicator is free from inertia and damage by overloads, and is often useful for self-servicing the instrument.

One of the main advantages of the method of presentation used is that there is a clear distinction between the resistive and reactive components in the bridge output signal. No such distinction can be shown by the usual indicators used, e.g. telephones, magic eye, or vacuum tube volt meter. It is thus a very simple matter to balance the bridge for the quadrature component, and once this is done, even approximately, the conductance balance is also easily found. The procedure is sufficiently straightforward for laboratory technicians to grasp without difficulty.

The main parts of the instrument are (1) bridge network, (2) amplifiers, (3) C.R.T. indicator, (4) 1,000 cps oscillator, and (5) mains operated power supply.

REFERENCES: (1) Elphick, J. O. and Gerson, T. (1952). Fuel 31, 438.

AN ISOTOPIC STUDY OF THE LABILITY OF LIGANDS IN POTASSIUM CHROMI-OXALATE

BY A. L. ODELL,

Auckland University College.

Following Werner's (1) announcement in 1912 of the resolution of optically active tris-oxalates of trivalent metals, several theories of the mode of racemisation appeared. Werner suggested that there was a "momentary vacation of one co-ordination position, thus permitting an interchange of position when it joins up again." Thomas, (2) on the other hand, assumes that an entire oxalate group ionises and that the remaining complex assumes a 4 co-ordinated square configuration.

Exchange studies using O-18 labelled water and C-13 labelled oxalate ions have been carried out, the former of these showing exchange at a measurable rate and the latter very slow exchange. Comparison of these rates with the rate of racemisation and the rate of aquotisation of the complex lends support to the Werner hypothesis and suggests that "one-ended" dissociation of the oxalate ion in the chromi-oxalate complex is fast.

This result is surprising in view of the known inertness of the chromi-oxalate complex.

References:—(1) Werner, A. (1912). Ber. 45, 3061.
(2) Thomas, W. (1921). J. Chem. Soc. 119, 1140.

SYNTHESIS AND METABOLISM OF B-VITAMINS IN THE RUMEN, WITH PARTICULAR REFERENCE TO VITAMIN B_{12}

BY L. I. HART,

Wallaceville Animal Research Station, Wellington.

The B-complex vitamins generally considered essential for mammalian nutrition are thiamine (vitamin B_1), riboflavin (vitamin B_2), nicotinic acid, pantothenic acid, biotin, folic acid, "vitamin B_6" (pyridoxine, pyridoxal and pyridoxamine) and vitamin B_{12} (cyanocobalamin).

A dietary source of these vitamins is essential for ruminant sucklings before the development of rumen function, but older grazing animals do not require them in the diet, due to bacterial synthesis of the vitamins by rumen symbionts appearing with the development of rumen function.

Ruminants are unique in that they require relatively large amounts of dietary cobalt in order to promote the ruminal synthesis of an adequate supply of vitamin B_{12}. It is suggested that cobalt has a dual function in ruminants—firstly to supply certain of the rumen bacteria with essential growth factors of the B_{12} group, and secondly to ensure a supply of bacterially synthesised cyanocobalamin to the host. It is also suggested that in addition to its other functions, cyanocobalamin may have a detoxicative role in the metabolism of herbivorous animals.

THE MINIATURE RUMEN AND ITS APPLICATION TO TO STUDIES ON RUMEN METABOLISM

BY N. D. JAMIESON,
Wallaceville Animal Research Station, Wellington.

The investigation of certain aspects of rumen metabolism, where the use of the intact animal would be cumbersome and incapable of satisfactory replication, can be facilitated by using a miniature artificial rumen.

The conditions and criteria necessary for a satisfactory miniature rumen are enumerated, and various forms briefly reviewed. Attention has been focused on the one developed by Huhtahnen and Gall for the measurement of fibre digestion, because it closely models the conditions prevailing in the animal, and is capable of being handled in large groups.

The main features are, provision for the removal of fermentation products from the sac during the course of incubation, and adequate control of the pH and Eh levels over a maximal period of 48 hours. Standardised amounts of substrate can be used to compare the activities of rumen fluids from sheep in various nutritional and pathological states; or conversely, rumen fluid from a healthy animal may be used as a standard inoculum to measure the fermentation products derived from a variety of substrates of nutritional importance.

A study has been made of some of the properties of the cellophane membrane employed, and of the rates of diffusion of ammonia-nitrogen and volatile fatty acids from the sac into the surrounding medium. Experiments illustrating the use of the technique include: a rapid qualitative estimation of the ability of a rumen sample to digest cellulose; the correlation of volatile fatty acid production with cellulose digestion; and the ammonia-nitrogen and individual volatile fatty acid production resulting from the digestion of proteins in the miniature rumen.

MEASUREMENT OF RUMEN VOLUME

BY K. R. CHRISTIAN,
Ruakura Animal Research Station, Hamilton.

Investigations are in progress on the applicability of a series of inert reference substances for measuring changes in volume of the rumen fluid contents.

Theory:

Let a quantity α of marker A be introduced at time T_1, and the same quantity of marker B at T_2, etc., and let the concentration of A at T_1 be a_1 and at T_2 be a_2; of B at T_2, b_2; etc.

If the rumen volume is V_t at any t, assuming that over the interval T_1 to T_2 fluid enters as saliva and through the epithelium at a constant rate k_e and leaves via the reticulo-omasal orifice at a constant rate k_1, then

$$V_t = V_{T_1} + k_e(t - T_1) - k_1(t - T_1) = V_{T_1} + K(t - T_1)$$

At this time, a volume V_0 of the original fluid and a volume V_e of fluid which entered the rumen since T_1, has passed to the any time as its ratio to the total rumen volume at that time.

The rate of disappearance of marker A is proportional to the rate of disappearance of the original fluid, which varies directly at any time as its ratio to the total rumen volume at that time.

$$\text{i.e. } \frac{d}{dt}\left(\frac{a}{V}\right)_t \propto \frac{dV_0}{dt} = k_1 \cdot \frac{V_{T_1} - V_0}{V_t}$$

Integrating between T_1 and T_2, and rearranging,

$$k_1 = K \cdot \frac{\log \dfrac{V_{T_1} - V_0}{V_{T_1}}}{\log \dfrac{V_{T_1}}{V_t}}$$

and since these volumes are proportional to marker concentrations,

$$k_1 = K \cdot \frac{\log a_2/b_2}{\log b_2/a_1} = \frac{V_{T_2} - V_{T_1}}{T_2 - T_1} \cdot \frac{\log a_2/b_2}{\log b_2/a_1}$$

from whence k_e is derived.

In the case where $b_2 = \alpha_1$,

$$k_1 = \frac{\alpha}{T_2 - T_1} \cdot \log a_2/b_2$$

PICROTOXININ

BY R. B. JOHNS, S. N. SLATER AND R. J. WOODS,
Victoria University College, Wellington.

Picrotoxinin ($C_{15}H_{16}O_6$) is considered to be a dilactone; the remaining two oxygen atoms are assigned to hydroxyl and ether functions. Conroy (1) proposed a structure for picrotoxinin based on published degradative results and his own spectroscopic examinations. Its major weakness lies in the proposed epoxide function of the sixth oxygen atom for which there is as yet no chemical or spectroscopic evidence. The carbon skeleton of picrotoxinin has been established by synthesis and the presence of an *iso*propylidene side chain confirmed by degradation. Infra-red determinations indicate with certainty one and possibly two γ-lactones together with a tertiary hydroxyl grouping. If the two lactones are assigned their most probable positions in the molecule, the location of the remaining two oxygen atoms may be deduced.

Lithium aluminium hydride reductions of pictrotoxinin derivatives have been carried out viz., on β-bromopicrotoxinin ($C_{15}H_{15}O_6Br$) and its alkaline rearrangement product, β-bromopicrotoxinic acid ($C_{15}H_{17}O_7Br$). Parallel oxidation of the two reduction products with periodic acid has provided evidence having a direct bearing on the positions of attachment of the "ether" oxygen in the parent molecule.

Reduced β-bromopicrotoxinic acid ($C_{15}H_{21}O_6Br$) reacts with one mole of periodic acid giving a 5-membered *cyclic*-ketone and formaldehyde. This result indicates the presence of an oxygen atom in an α-position to the carboxyl group either as an hydroxyl or an ether linkage. Reduced bromopicrotoxinin ($C_{15}H_{23}O_6Br$), however, reacts readily with one mole of periodate then more slowly with a further two moles liberating bromine. The end product of reaction corresponds to (a) single glycol splitting; (b) replacement of halogen by -OH. The halogen-free compound possesses no free carboxyl group but does contain a back-titratable centre of acidity which, on the basis of infra-red determinations, is a γ-lactone. The generation of a lactone by the action of periodic acid is interpreted by the assumption that an hemi-acetal linkage is present in reduced bromopicrotoxinin and by inference in picrotoxinin also. The importance of this observation on the function of the "sixth" oxygen atom in picrotoxinin and the modified formulation for the compound arising from it will be discussed in greater detail in the paper.

REFERENCES: (1) Conroy (1951). J. A. C. S. 73, 1889.

THE STRUCTURE OF MYOSIN

BY R. H. LOCKER, ✓
Dominion Laboratory, Wellington.

Myosin, the major structural protein of muscle tissue has a molecular weight of 500,000. This large molecule contains only very small amounts of N- and C-terminal groups. The C-terminal isoleucine is concentrated in a fraction split from the myosin by a mild heat coagulation at 53°, pH 6.2. This fraction was shown by Russian workers to have a higher adenylic acid deaminase activity than the original myosin. It has been found that this heat resistant fraction contains a myosin-like protein of high enzymic activity and three other lower molecular weight proteins of low activity but accounting for most of the C-terminal isoleucine of the myosin. The effects of variables such as pH, ionic strength, time and temperature have been studied.

The presence of pyrophosphate or tripolyphosphate during coagulation has a stabilising effect on the deaminase activity and causes a displacement of the activity from the high to the low molecular weight fragments. This suggests a stepwise dissociation of the myosin. By carrying out a second heat coagulation on the myosin-like protein remaining from the first, further fractions of very high activity can be obtained, the most active showing a purely nucleotide absorption. The identification of this nucleotide cofactor is in progress.

THE T.B.A. TEST FOR OXIDATIVE RANCIDITY

BY W. L. DUNKLEY, ✓
University of California.

In recent years several objective tests for the determination of oxidative rancidity in fats and fatty foods have been devised. One of these, the thiobarbuturic acid (T.B.A.) test, is discussed in this paper.

The correlation of the T.B.A. test with oxidised flavours in dairy and pork products and certain cereal and baked foods has generally been satisfactory. In some cases the T.B.A. test was found to be more sensitive for detecting incipient rancidity than other tests studied.

The test involves heating the sample with an acidified solution of thiobarbituric acid and measuring the red colour at 530-535 mμ. However, as the test is empirical, individual procedures have been developed for each product investigated.

Although the test is simple, its chemistry is not well understood. Several compounds found in oxidised fats, such as malonic dialdehyde and oxidised 2-heptenal give the characteristic red colour when heated with thiobarbituric acid. In addition to an aldehyde group, potential or actual conjugation from a second carbonyl or other unsaturated group appears to be necessary for a positive T.B.A. test. The basic reaction may entail an equimolecular combination of thiobarbituric acid and a 3-carbon component from oxidised fatty acid. Evidence indicates that thiobarbituric acid promotes the decomposition of intermediate compounds formed during fat oxidation, perhaps by combining with the intermediates and removing the reactive group necessary for colour formation. The test does not measure oxidation of oleic acid, is relatively insensitive to linoleic acid, but is extremely sensitive to linolenic acid. Attempts to determine the structure of the coloured compound have been unsuccessful.

OFFICIAL NOTICE.

A GENERAL MEETING OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY (INC.) WILL BE HELD IN THE CHEMISTRY LECTURE THEATRE, AUCKLAND UNIVERSITY COLLEGE AT 4 P.M. ON WEDNESDAY, 22nd AUGUST, 1956.

AGENDA.

1. Confirmation of Minutes of previous General Meeting held at Massey College, Palmerston North, on 24th August, 1955.
2. Business arising out of the Minutes will be dealt with under the appropriate heading below.
3. Presidential Remarks.
4. Institute Prizes.
5. Sub-Committees:
    1. Membership.
    2. Journal.
    3. Professional Status.
    4. Salaries.
    5. Examinations.
    6. Standards Institute.
    7. Employment.
    8. Conferences.
6. Finance. Statement of Receipts and Payments.
7. Rules and Regulations.
8. General.

W. E. HARVEY,
Acting General Secretary.

MAKING THE MOST OF REFRESHER LEAVE

BY H. R. WHITEHEAD,

Chief Bacteriologist and Assistant Director, The Dairy Research Institute (N.Z), Palmerston North.

[*With the increased provision in Universities, Government Departments and Industry for refresher leave and visits overseas, more and more chemists are able to avail themselves of these opportunities. Dr. Whitehead has recently returned from such a period of leave. Interested in a wide range of both pure and applied research and development problems, he visited briefly Universities and Institutes in the United States, Canada, Great Britain and the Continent. He also spent a longer period working in one laboratory. From his experience on this and a previous trip, Dr. Whitehead offers some advice which will be of value particularly to the younger chemist who is planning his first visit overseas.*]

There is perhaps no more stimulating experience for the scientific worker than a trip overseas to meet people working along similar lines. The visitor has of course read published work and has corresponded with some of his confreres but these forms of contact are a poor substitute for a meeting in person and verbal discussion. The opportunity for travel may occur only once or twice in a working life so it is essential to get the utmost value out of a trip. How should one go about it?

It is relatively simple to decide upon the people to be visited but it is not so easy to lay out an itinerary for the trip since in these days of heavily booked transport and hotel accommodation it is not wise to leave too much to chance. This necessity for sticking to a fairly tight schedule means that the duration of each visit has to be decided in advance—a very real difficulty. How long can the visitor spend with a person he has not met before without exhausting the subject matter for discussion or outstaying his welcome. A mis-estimate puts him in an embarrassing position on the one hand or in a frustrating position with too little time to cover the subject for discussion on the other. The degree of embarrassment is of course inversely proportional to the thickness of the skin. We have all at some time or another been in the position of the visitee and have on occasion heartily cursed (mentally) the visitor for making a nuisance of himself. On this (let us presume) first trip abroad let the visitor remember his feelings as visitee and act accordingly.

Experience indicates a few general principles on which visitors should base their arrangements:

(1) The visitor should write some months beforehand to all the people he wishes to visit. Are they willing to receive him and will the time he proposes to visit them be suitable. In small countries like New Zealand it is permitted to be more

informal and to call on people without warning but in more densely populated centres (and especially in the United Kingdom) people work more to a timetable of appointments. Even after the tentative arrangement is made some time ahead it is necessary to write or phone for a definite appointment a day or two before the actual visit.

(2) The visitor should prepare himself (and to some extent the visitee in his early correspondence) for the discussion by bringing himself up to date in the subject and making himself familiar with the published work of the visitee. In this way he makes sure, as far as possible, of getting the utmost benefit from the visit. He should also be prepared to give as well as to receive and should pass on any information which he thinks, on the basis of the discussion, may be of interest to his host. Some New Zealanders are over-modest as a result of the feeling that New Zealand is a small backwater which must necessarily always lag behind the main centres of population in scientific progress. This is by no means true. In some fields, due to special facilities and material available New Zealand may actually be ahead. The visitor should learn to appraise the situation in his particular subject in a realistic manner.

(3) It is often unwise to take notes during a discussion. Some people get the feeling that anything they may say is "being taken down to be used as evidence against them." Most people speak more freely and easily in casual discussion and "close-up" instinctively if they feel they are to be quoted. An occasional note about figures and specific details is permissible but otherwise notes on a discussion should be written up later from memory in the privacy of a hotel room. This rule is not of course of universal application, but in the absence of clear indications to the contrary it is better to stick to it.

(4) A visit should be confined to a few hours or spread over several weeks. The reasons for this should be (but are not to some people) obvious. A lot of ground can be covered in a three-hour discussion. After that things are apt to fall flat and in any case the visitee has a job to do. A longer stay is tolerable only if the visitor becomes a worker in his host's department and has time to become acclimatised and find his way about. During a stay of (say) three or four weeks it will then be possible to renew discussion at suitable moments. The only exceptions to this choice between 4 hours and 4 weeks occur when the host has agreed to show the visitor around on trips which may last a day or two. In the confines of the laboratory the rule almost always applies.

(5) In his enthusiasm and keenness to do as much as possible in the time available the inexperienced visitor will probably make arrangements for visits which will keep him fully occupied. He will learn by experience that travel and the meeting of a number of strangers each day is physically and mentally tiring. He should be warned by the experience of others and not arrange a full programme. The time which is apparently "spare" will in many instances be filled by unexpected appointments or it will often be welcomed as a "breathing space" or a time for stocktaking. This advice is difficult to follow because the inexperienced traveller finds it impossible to visualise how tired he may become.

(6) The visitor should not throw the full responsibility for entertainment on his host but should make some effort to return the hospitality at his hotel or perhaps while on a trip together in the country. After all the visitor is in many instances a self-invited guest. After having left his host he should not delay long in expressing his appreciation by letter. By these means he helps to build a lasting good feeling which may be the basis for friendly personal contact in the future.

These principles are all subject to modification according to the personalities involved. On some visits visitor and host may immediately take a liking to each other—they find that they "talk the same language." In such a case the 4-hour-4-week rule may not apply because a more social relationship is established. In other instances there is a sense of strain—a lack of contact—which makes even the shortest visit a wearing experience, not necessarily through either person's fault. Much depends on temperament. The extravert tends to find no difficulty—the shy person finds difficulties where there need be none.

However let us assume that the itinerary has been fixed and can be modified only in minor details. The great thing then is not to be unduly depressed when a visit "misses fire." The visitor should accept the failure of a visit philosophically, extract himself from an awkward situation as gracefully as possible, and hope that the next visit will compensate by its success. A visitor on his first journey overseas is liable to be unduly downcast by a "misfire." Experience will soon make him realise that there are visits which prove unexpectedly rewarding and that the gains must be balanced against the losses.

Finally, the value of a trip overseas is not to be measured by the amount of detailed information accumulated, but more by growth in mental stature and broadening of outlook.

NEWS AND NOTES.

AUCKLAND BRANCH.

Dr. H. C. Holland, Managing Director of W. Sutherland & Co. Ltd., Auckland, who was recently elected President of the New Zealand Tanners' Association, and Mrs. Holland, have left on a visit to Australia, United Kingdom and Continental countries.

MANAWATU BRANCH.

Professor C. R. Barnicoat, Biochemistry Department, Massey Agricultural College, and Mrs. Barnicoat, sailed recently for England. They will be away about nine months, most of which will be spent in London where Professor Barnicoat will be working in laboratories associated with the University of London. Interested particularly in nutritional and calcification studies, Professor Barnicoat will be visiting laboratories in Great Britain and on the Continent. While in Rome he will be one of the New Zealand delegates to the Sixth Dairy Congress.

WELLINGTON BRANCH.

Mr. R. A. Kennerley, of the Dominion Laboratory, has sailed for Europe where he will study recent investigations of the hydration of cement. Mr. Kennerley, who is particularly interested in work on pozzolanas, will visit Austria, Italy, the United Kingdom and the U.S.A.

The Wellington Branch were recently given the opportunity to see a film on the establishment of the British atomic power station, Calder Hall. The film was shown to members early in the evening and coffee and sandwiches were served—a departure from the usual procedure which proved most successful.

Mr. W. M. Billinghurst has joined the staff of the Southland Co-operative Phosphate Company. Previously employed in the chemical engineering section of the Dominion Laboratory, Mr. Billinghurst visited Japan last year as a member of a delegation to study the manufacture of fertiliser.

CANTERBURY BRANCH.

Mr. T. A. Mitchell has resigned from H. C. Urlwin Ltd., and accepted a position as chemist at the Wheat Research Institute.

Mr. K. W. Kiddle has resigned from the position of chemist at Commercial Cleaners Ltd., Christchurch, and taken up fruit-farming on his own account at Havelock North. He still retains his interest in the Institute and has transferred to the Wellington Branch.

An item of general interest is that at a meeting of the Royal Society on 15th March this year, two former students of Canterbury University Colege were elected Fellows of the Royal Society. They were:—

"Dr. J. W. Mitchell, Reader in Physics, University of Bristol, distinguished for his work on the action of light on crystals, particularly in photographic emulsions, and on the nature of the photographic latent image"; and

"Professor R. M. Barrer, Professor of Chemistry, Imperial College of Science and Technology, London, distinguished for his work on the mechanism of adsorption and diffusion of gases in solids and the problem of molecular sieves in zeolite minerals."

Both graduated with first-class honours in Chemistry, Dr. Mitchell in 1934 and Professor Barrer in 1931.

OTAGO BRANCH.

Mr. N. P. Lino, local Committee member, has left for Australia, where he has joined the Swiss firm of Ciba & Co., of Basle. Dr. Alexander, the Secretary, is leaving shortly to take up a post at Queensland University—two more losses to Australia. Mr. Broughton, Committee member, who was chosen to represent the N.Z. Institute of Management at the Duke of Edinburgh Conference on Human Relations in Industry, will be overseas until about September or October.

Professor N. L. Edson, Biochemistry Department, University of Otago, has just returned from England and America. He was invited by the University of London and sponsored by the British Council to visit the University to meet teachers and research students and particularly to discuss research problems with the younger research workers. Under these terms he visited most of the biochemical schools in the University Colleges and associated Medical Schools of the University of London and also Reading University. The universities of Oxford, Cambridge, Birmingham, Sheffield and Leeds also associated themselves with the University of London. Professor Edson also visited the biochemistry departments and the chemical micro-biology departments of these universities and lectured by invitation at all of the above universities. To our knowledge he is the first New Zealander from the University of New Zealand to have been invited in this way and be sponsored by the British Council. Professor Edson also took the opportunity of short refresher leave in America where he visited a number of universities and lectured by invitation at the National Institute of Arthritis and Metabolic Diseases, Bethseda, the Public Health Institute of the city of New York and Western Reserve University, Cleveland, Ohio.

COUNCIL MINUTES.

MINUTES OF A MEETING OF COUNCIL-IN-PERSON HELD IN THE CONFERENCE ROOM, D.S.I.R., SYDNEY STREET, WELLINGTON, ON FRIDAY, 11th MAY, 1956, AT 10 A.M.

PRESENT:

Dr. M. M. Burns, President (in the Chair); W. E. Russell (Auckland Delegate); Dr. E. D. Davies (Waikato Proxy); C. B. Radcliffe (Manawatu Delegate); N. H. Law (Wellington Proxy); Dr. R. M. Allison (Canterbury Delegate); Dr. J. K. Dixon (Otago Proxy); V. J. Wilson, Registrar, and Dr. W. E. Harvey, Assistant Hon. General Secretary. Apologies were received from Prof. H. W. Parton, N. T. Clare and J. A. D. Nash.

HON. GENERAL SECRETARY:

W. G. Hughson, the Hon. General Secretary, has gone overseas, and it was *Resolved:* THAT leave be granted to W. G. Hughson and that Council extend to him its best wishes for his trip overseas.

It was further *Resolved:* THAT Dr. W. E. Harvey be appointed Acting Honorary General Secretary.

CONFERENCE, 1956:

Mr. Russell presented a brief report of progress. The programme has now been essentially settled. The second circular will be issued shortly, and more detailed information will be published in the next issue of the Journal.

INSTITUTE OF SCIENCE TECHNOLOGISTS, L.A.C., Etc.

Dr. Campbell's remarks on the Institute of Science Technologists had been circulated to Branch secretaries, and considerable discussion ensued on what would be the Institute's attitude towards chemical technologists who would not have the necessary qualifications to become Associates. It was generally agreed that the formation of a N.Z. Branch of the Institute of Science Technologists or a similar body which may possibly set certain standards for technologists may well be a desirable thing and in any case the Institute could do little to either help or hinder this happening. However, it was also agreed that the Institute should retain or increase its interest in chemical technologists and it was considered that it might be desirable to introduce some form of qualification between the L.A.C. and the Associateship. This raises a number of important questions. A summary of information on the present position of technicians in New Zealand will be prepared and circulated to branches for their information.

SUBJECTS FOR L.A.C.:

Approval was given to the changes in the syllabus for Technical Drawing recommended by the Examinations Committee.

OPTIONAL SUBJECT FOR L.A.C.:

It was agreed to refer to Branches the suggestion that typing be introduced as an optional subject for the L.A.C.

AWARD OF L.A.C.:

Resolved: THAT the Laboratory Assistant's Certificate be awarded to Bryan Charles Rae, I.C.I. (N.Z.) Ltd., Lower Hutt.

PROFESSIONAL STATUS COMMITTEE:

Resolved: THAT P. R. Parr be appointed to the Professional Status Committee in place of the late F. H. V. Fielder.

JOURNAL:

The Editor's report included the following paragraph and it was agreed that these remarks should be drawn to the attention of Branches:

> "I am still very short of suitable material. Several main articles have been promised but I have no material in hand at present and would again ask Branch Chairmen to keep the Journal in mind when preparing their addresses and also to ask other Branch speakers, whose addresses they consider suitable, to send them on to me. Branch News and Notes seem to be falling off in some cases. These personal items seem generally popular and every effort should be made to have something from each Branch."

It was reported that the Education Department had undertaken to distribute copies of the Jubilee issue to schools and would meet those costs only.

MEMBERSHIP COMMITTEE:

Resolved: THAT Dr. J. K. Dixon be appointed to the Membership Committee for the period of W. A. Joiner's absence overseas.

STANDARDS INSTITUTE TIMBER PRESERVATION COMMITTEE:

Resolved: THAT the resignation of C. G. W. Mason from the Standards Institute Timber Preservation Committee be accepted with regret, and that he be thanked for his services as the Institute's representative.

Further *Resolved:* THAT L. F. Addis-Smith be appointed the Institute's representative on the Standards Institute Timber Preservation Committee.

TRAVELLING EXPENSES:

Resolved: THAT travelling expenses be paid, if necessary, for the following persons to attend meetings of Council-in-Person:

(a) All members of Council.

(b) Such other persons as may be invited by Council to attend the meeting.

(c) Such other persons whose presence, in the opinion of the President and Hon. General Secretary, is desirable for the conduct of the meeting.

COMBINED PROFESSIONAL BODY:

Resolved: THAT other professional organisations be consulted with a view to the formation of a combined professional association. The primary object of this association would be to improve the economic status of professional people in New Zealand.

CHEMICAL ABSTRACTS:

Resolved: THAT in view of the prohibitive cost of *Chemical Abstracts* to non-teaching libraries and to non-members of the American Chemical Society, the New Zealand Institute of Chemistry suggests that the American Society offers the *Abstracts* section-wise and that the Institute seek the support of overseas Institutes in this respect.

NATIONAL INSTITUTE OF WOOD PRESERVERS (INC.):

In the past the Institute has refrained from joining bodies of this sort and it was *Resolved:* THAT Council adheres to its previous decision and thus does not join the National Institute of Wood Preservers.

MEMBERSHIP:

Elections: The following were elected Associates on the recommendation of the Membership Committee:

WATKINS, Wanda Lois, M.H.Sc., Griffin & Sons Ltd., Box 827, Lower Hutt (Chief Chemist).

WILSON, Ashley Francis, M.Sc., 83 Queen Street, Islington, Christchurch (Ph.D. student, C.U.C.).

WONG, Edmon, M.Sc., Chemistry Dept., Canterbury University College, Christchurch (Ph.D. student).

WRATISLAV, Arnost, Dip. Ing., Ivon Watkins Ltd., Box 124, New Plymouth (Chief Chemist).

Resignations: Resignations were accepted with regret from O. T. Dalley (Waikato) and N. P. Lino (Otago).

Honorary Fellow: Sir Theodore Rigg was elected an Honorary Fellow of the Institute.

Fellowship: Resolved: THAT Council considers it in the best interests of the Institute that members suitably qualified should make application for election to the Fellowship.

PRESENTATION OF GAVEL:

In association with the Institute's Jubilee, S. G. Brooker offered to present a gavel for use by the chairman on official occasions together with a donation to cover the cost of a suitably inscribed plate. It was *Resolved:* THAT Mr. Brooker's offer of a gavel be accepted and that he be thanked for his very kind gesture.

PRESIDENTIAL INSIGNIA:

It was generally agreed that the Institute has now reached the stage of development at which it should give serious thought to the provision of a chain of office for the President. The design of a suitable chain demands considerable thought to ensure that it is appropriate and it was agreed that Branches should be asked to consider this matter and send their ideas to the Wellington Branch Committee. (The R.I.C. chain was mentioned as an example of appropriate design.)

LETTER TO THE EDITOR.

Sir,—Dr. Bottomley's article "Volumetric Calculations on the Molar Basis" in the June issue of the Journal is interesting and outspoken. But we cannot agree that the use of the "normality" system is "pernicious." Such a description is difficult to reconcile with the statement that "the only real difference between the two methods is the point at which the corrective factors are introduced." If this is so, why all the fuss?

We have always found that the real difficulty in teaching volumetric calculations is the reluctance or inability of students to write down the relevant equations. Once they are written, normalities follow in a perfectly straightforward way, particularly if the ion-electron system for oxidation-reduction equations is adopted. Thus the azide-hypochlorite reaction which the "reader is invited to consider" appears to be a particularly simple example of this. From the partial equations

$$2HN_3 - 2e = 3N_2 + 2H^+$$

$$\text{and}\quad HClO + H^+ + 2e = H_2O + Cl^- ,$$

the equivalent weights of HN_3 and HClO are respectively one formula weight and one-half formula weight. This follows from the definition of the equivalent weight of an oxidising or reducing agent as the formula weight divided by the number of electrons which one "molecule" of the substance gains or loses in the reaction. We find this method neither "a dangerous device" nor a "confusing exercise" in the hands of students, though in some cases the resulting partial equations involve a measure of artificiality.

Much of Dr. Bottomley's discussion is devoted to proving that the equivalent weight of a given substance may vary. Of course it may vary —surely this is one of the first points to be made in teaching the normality system. It merely emphasises the necessity for always writing the equations for the reactions under consideration before making a decision as to the equivalents of the reactants. But writing equations is no *new* difficulty—it is a requirement of whatever method is used, being in fact step 2 of Dr. Bottomley's "Method of calculation on a molar basis."

Several points made by Dr. Bottomley are good ones, and we would certainly not reject molar calculations out of hand. Nevertheless we believe the idea of "normality" to be both useful and elegant, and not to be dismissed through the inability of some students to (1) appreciate the variable nature of an equivalent, and (2) write the correct equations for the reactions concerned.

W. E. DASENT.
W. R. B. MARTIN.

LABORATORY EQUIPMENT.

(Contributed by Dr. R. M. Dolby, The Dairy Research Institute (N.Z), Palmerston North.)

Dry batteries in portable pH meters, potentiometers, etc., are often a source of annoyance when they become erratic and have to be replaced. This trouble can be avoided by using some of the small Edison-type accumulators now available. These accumulators are completely sealed and can be used in any position. They are not harmed by being left discharged. They are made in a range of sizes from tiny button-type cells of 60 milli-ampere-hour capacity to larger rectangular cells of 8 ampere-hours and upwards. Though their initial cost is several times that of a corresponding dry battery, their long life and steady voltage make them worth considering.

A useful gadget where small quantities of liquid or gas are to be circulated is the Becton-Dickinson Double Valve. This assembly is a part of the automatic pipette described in the last issue, but is available locally from the agents of BD hypodermic syringes. A neat micro-pump for circulation in a closed system has been made from a syringe fitted with one of these two-way valves. The plunger of the syringe is moved by a motor-driven crank so that the assembly forms a small piston pump.

For the measurement of small and medium rates of flow of gases or liquids "Predictability" flowmeter tubes are useful. This flow-meter differs from the better-known "Rotameter" in having a tri-flat tapered tube which is circular at the bottom and triangular at the top. The floats are spherical balls of sapphire or stainless steel. Since the balls differ in density each tube has two ranges, one with each ball. Standard calibration tables for air and water are furnished for each tube. Calibrations for other gases and liquids can easily be calculated if the density and viscocity are known. Five tubes cover flow rates from 1 ml. to 68 litres of air or 0.02 ml. to 2 litres of water per minute. An example of their use: It was desired to bubble a mixture of nitrogen (99%) and carbon dioxide (1%) through a bacterial culture. By connecting a metering tube in the lead from each gas cylinder, the proportion of CO_2 in the mixture was easily kept correct.

A new type of stirrer, the "Vibromix", is useful for some appplications where the popular magnetic stirrer is unsuitable, e.g. for viscous solutions or where a vigorous agitation is required. This stirrer consists of a perforated disc of glass and metal attached by a rod to a vibrator unit which causes it to oscillate at mains frequency. The amplitude is adjustable. The holes in the disc are tapered so that the liquid tends to flow through them in one direction. By inverting the disc the direction of pumping can be reversed. The "Vibromix" will keep solid particles continually in suspension. It can, if desired, be made to aerate the solution. It can also be used for agitation in a vacuum, the shaft being passed through a small rubber diaphragm mounted in a rubber bung.

"Labelon" tape, a recent development of cellulose adhesive tape, is a useful item in the laboratory for rapidly ticketing flasks, bottles or boxes. This tape has a lower layer of black or coloured cellophane separated from an upper clear film by a white pasty material. It can be written on with a pencil or anything with a point. It has the advantage over paper labels that it is more quickly applied, is not affected by spilt liquid and is easily removed. We do not recommend it for labelling sample bottles which are to be stood in hot water. Above 50°C the film rapidly turns black all over.

For other marking jobs a felt-nib pen is useful. "Cado Fountain-brush" can be recommended. It will mark glass, metal, cardboard, etc. The ink is not soluble in water or detergents (though it may come off glassware after a few washings) but is easily removed with solvent. This pen is excellent for addressing cases, marking cans or drawing poster-size lecture diagrams.

BOOK REVIEWS.

THE SYSTEMATIC IDENTIFICATION OF ORGANIC COMPOUNDS (4th Edition) by Ralph L. Shriner, Reynold C. Fuson and David Y. Curtin. Published by John Wiley & Sons, Inc., New York, 1956. 426 pages.

Shriner and Fuson's book has enjoyed considerable popularity since it first appeared in 1935 and this new edition, to which Dr. Curtin contributes for the first time, can be warmly recommended to all who are faced with the problem of identifying an organic compound.

The authors have (in the reviewer's opinion, wisely) refrained from presenting a detailed, hard and fast scheme of analysis (which is usually unsatisfactory) and have concentrated on methods for the identification of individual functional groups by simple solubility tests followed by more or less specific confirmatory reactions. The chapter dealing with the preparation of derivatives is well presented and gives detailed instructions for the preparation of most common derivatives on the semi-micro scale, together with an unusually complete list of references to the original literature.

The new edition differs little from the earlier ones in general presentation, but a new chapter has been included outlining the use of ultraviolet and infra-red spectroscopic methods for the identification of functional groups, and increased space has been devoted to discussion of the theory underlying the functional group tests. The 60 pages of tables of melting points and boiling points include almost all relatively well-known compounds and their derivatives.

—W.E.H.

HOUBEN-WEYL: METHODEN DER ORGANISCHEN CHEMIE, 4th Edition, edited by Eugen Muller. Vol. 3, Physical Methods, Part 1. 954 pages. 1955. Leipzig: Georg Theime Verlag. DM 162. (£14/3/6).

This part completes Vol. 3 and deals with thermodynamic methods, kinetic studies, determination of density, solubility, vapour pressure, molecular weight, surface tension, calorimetric methods, determination of molecular configuration with the aid of models, calculation of standard error of physical methods, microscopy and crystallographic methods, study of liquid crystals, mass spectometry, estimation and use of radioactive elements, and estimation and use of non-radioactive isotopes. This is a volume difficult to review because of the wide range of information contained, but the fullness of the articles and bibliographies, the numerous illustrations, tables and graphs make it a very useful volume to possess for workers in physical organic chemistry while its splendid printing and binding make it very pleasant to handle.

—S.G.B.