

that with untinned cylinders the copper content of the water decreased with time to a low figure. With tinned cylinders, however, the copper continued to build up to a relatively high value. He considered that Mr. Hunt's work on the metalography of tin coatings offered an explanation of this phenomenon; that a tin coating of poor quality could be responsible for pitting of the underlying copper and thus cause a continuous build up of copper in the water.

Dr. G. Moir referred to trouble which he had experienced some time ago with pitting along each side of welds in stainless-steel vessels used in brine solutions.

Mr. G. S. Lambert explained how an unstabilised stainless steel would undergo this type of "weld decay" under corrosive conditions. This difficulty has been overcome by using alloy steels stabilised by the addition of small amounts of titanium and columbium. This prevents precipitation of chromium carbide at the grain boundaries.

Mr. I. S. Hunt, in replying to Mr. Wilkinson's remarks, confirmed that a poor-quality tin coating in which the protective eutectic layer was missing or discontinuous could cause excessive solution of the underlying copper such as was described.

In reply to Dr. Moir's remarks Mr. Hunt referred to tests being carried out at the Dominion Laboratory which were showing that even welded stabilised stainless steels were not completely resistant to chloride solutions. In the tests carried out so far, pitting developed in the welds in both acid and alkaline oxygen-saturated brines. This pitting did not develop when the brines were saturated with nitrogen. The work had not yet been carried far enough to determine what were the conditions favouring the development of pits in the weld regions.

ABSTRACTS AND TITLES

General Principles of Drying.

By S. R. SIEMON, Canterbury College.

The rate of removal of water from a solid by unsaturated gas depends on whether the moisture concerned is free or absorbed (bound or equilibrium). Two cases of removal of free water arise, viz.: (a) where the rate of diffusion through the solid to the surface is equal to that of evaporation, and (b) where rate of diffusion is the controlling rate. In the second case the plane of vapourisation moves into the body of the solid as the diffusion rate diminishes. Where bound water is present, its zone of vapourisation lags behind that of the free water, because of the lower equilibrium vapour pressure.

Reduction of gas humidity increases the driving force, hence the rate of drying: so does velocity increase by reduction in film thickness. On the other hand, such phenomena as shrinkage and distortion can be controlled by rate reduction using the reverse changes. In the case of heat-sensitive material, the necessary protection may be obtained, and the rate maintained, by keeping inlet gas temperature high and using parallel flow. High absolute humidities may be used if relative humidity is kept down by reheating; and recirculation affords a ready means of control of humidity driving force.

Drying of Tobacco.

By S. K. NEWALL, Dominion Industries, Christchurch.

The drying of tobacco is one operation in the leaf-curing process. The grower cures his tobacco by methods developed largely by trial and error and without an understanding of the basic principles involved. An appreciation of these principles should lead to better kiln design and more efficient operation with the production of a more uniform product. Measurements of air velocity and of temperature and humidity gradients have thrown some light on the matter and point the way to further work.

Drying of Clayware.

By J. T. LINZEY, Benhar Potteries.

The degree of control in the drying of clayware varies from practically nil in the heavy products such as pipes and bricks through simple waste heat dryers, to complex continuous humidity-controlled infra-red dryers used for fine pottery and electrical porcelain. The importance of compounding a clay body that would yield up its water readily was stressed. Discussion of uses and limitations of usual forms of commercial dryers: Natural drying, steam floors, hot-air and waste-heat batch dryers, humidity-controlled dryers, infra-red dryers.

Bulk Drying of Wheat.

By E. W. HULLERT, Wheat Research Institute, Christchurch.

Drying of Leather and Skins.

By F. G. CAUGHLEY, Leather Research Association, Wellington.

Raw hides and tanned leather have a structure of woven fibres. The problem of satisfactorily drying them to produce a usable material consists in preserving this structure so that the fibres retain their property of discreteness and do not form or become cemented in a hard continuous mass. For untanned hides this means the retention of the ability to soak back after drying, i.e., return from a hard horny state to a fibrous state. For tanned leather this means drying under conditions that will produce such properties as light colour, flexibility, and good feel. Illustrations were discussed to show the principles underlying industrial methods of drying hides and leathers.

The Structure of Proteins.

By S. N. SLATER, Otago University.

Analytical Methods, Part I.

By J. MELVILLE, Plant Chemistry Laboratory, Palmerston North.

Analytical Methods, Part II.

By N. T. CLARE, Ruakura Animal Research Station, Hamilton.

Statistical Method in Chemical Research.

By I. D. DICK, D.S.I.R., Wellington.

This paper was an historical summary of the application of statistical methods to problems of industrial research as found in Guinness's brewery forty years ago, and how "Student," one of the brewers, was led to make his famous researches into the statistical theory of small samples. Errors of routine analysis were discussed, and an example from a present-day research on the estimation of ammonia and glutamine in plant tissue was discussed.

Sampling and Statistical Methods in the Leather Industry.

By R. O. PAGE, Woolston Tanneries, Christchurch.

Leather is a material that varies very greatly in different hides and also in different positions of the same hide.

Leather sampling, therefore, generally aims to be representative of the most uniform and valuable parts rather than a mere average. In applying statistical methods to the experimental results, the most practical number of samples is six. The use of standard deviation in a typical case of chemical composition (chrome-oxide content) and of physical properties (yield) was discussed.

Statistical Method Applied in the Woollen Industry.

By R. V. PERYMAN, Otago University.

Results of tests on wool or wool products frequently require statistical analysis if proper conclusions were to be drawn. Examples of the use of statistics were found in reporting on measurements of the fineness of wool tops by fibre diameter, the identification of blends of tops, and in measurements of the strength and count of yarns leading to the use of quality control charts.

Some Aspects of the Chemistry of Bacteriological Media.

By G. J. HUNTER and H. R. WHITEHEAD, Dairy Research Institute, Palmerston North.

In the course of attempts to improve a medium used for the isolation of lactic streptococci the following observations were made:—

(a) Various peptones which were tried varied significantly in their growth-promoting power. None of them contained all the requisite vitamin-like growth factors, and it was still necessary to include meat extract in the medium.

(b) The original medium was poorly buffered and addition of phosphate gave a big improvement.

(c) The effect of phosphate was not due solely to its buffer effect. The heating of phosphate and agar mixtures appeared to result in the production of a growth stimulant for the bacteria.

(d) The usual procedure of filtration through paper pulp before final sterilisation reduced markedly the growth-promoting power of the medium by reason of absorption of the phosphate-agar growth factor on the pulp.

The Use of Radioactive Tracer Elements in Biochemistry.

By H. O. ASKEW, Cawthron Institute, Nelson.

By use of radioactive isotopes many reactions can be followed which it would otherwise be impossible or very difficult to determine. Isotopes of suitable life periods are available for Ca, Mg, K, Na, Sr, Rb, Cl, Br, I, P, S, Fe, Cu, Mn, and Co.

In plants intake of nutrients is apparently a two-way process, and nutrients may pass into actively growing points as well as into older parts.

In animals under deficiency conditions the lacking element may concentrate in certain organs on being supplied.

The most striking information obtained from the use of radioactive tracer elements is that in plants and animals no element appears to be in a static condition; all the atoms of a given kind are constantly interchanging with one another.

The Pharmacology of Poison in Karaka Berries.

By DR. MURIEL BELL, Medical School, Dunedin.

The legend that the Karaka kernel is poisonous has not hitherto been tested. It has been found to contain a poison which is eliminated with difficulty and is long-lasting in its effects, thus confirming the fears and certain of the Maori traditions concerning it, and justifying their method of preparing it for use as a food.

Observations on the Oil Content of N.Z. Fresh Water Eels.

By F. B. SHORLAND, D.S.I.R., Wellington.

The oil content of the tissues of the two species of New Zealand Fresh Water Eels has been studied, using specimens from various localities, commencing with eels of approximately 20 in. in length, proceeding to the fully mature migrant stage. In both species the oil content of the immature eel was found to increase markedly with length from 7 per cent. to 23 per cent., approximately 70 per cent. of the total oil reserves being concentrated in the tail, which comprised but 40 per cent. of the total weight of the fish. In both species the oil content of the migrant eel, irrespective of size, was approximately the same as that of the largest size of immature eel, but the oil in the former was found to be much more uniformly distributed as between the tail and trunk portions.

Modern Views on Root Actions of Plants.

By H. O. ASKEW, Cawthron Institute, Nelson.

Recent views on root action of plants have been away from the previous idea that roots absorbed nutrients from the solution surrounding soil particles. Present ideas on the constitution of the soil postulate clay particles carrying a swarm of ions (H, Ca, Mg, K, etc.) which are "exchangeable." Root hairs of plants are colloidal systems which may also be surrounded by ionic swarms. Inter-penetration of these swarms of ions may lead to interchange of ions between roots and clay particles. Moreover, movement of nutrients may be both into and out of the roots.

While not at present a complete explanation of the feeding of plants, the "contact exchange" hypothesis forms a good starting point for further work in this branch of plant nutrition.

Comparison of Methods of Determining Manurial Requirements of Soils.

By E. B. DAVIES, Department of Agriculture.

This paper will be published in the *N.Z. Journal of Science and Technology*.

Tissue Testing as a Means of Determining Mineral Deficiencies.

By K. J. McNAUGHT, Soil Research Station, Hamilton.

The tissue-test technique permits of relatively rapid determinations of levels of the major inorganic sap constituents, but the desire for speed tends to prejudice accuracy. The limitations of the method noted are probably due to a combination of the following sources of error.

- (a) Failure in practice to use morphologically homologous samples.
- (b) Failure to take a truly representative sample probably accounts for a large proportion of the apparently anomalous cases noted in the pasture investigations. Even careful sampling in the field tends to favour patches of higher fertility, especially when growth is short or stunted.
- (c) In trying to offset this difficulty of different species in interpretation of results of analysis of a mixed herbage, by sampling one species only, an equally great hazard may be introduced in unintentional fertility selection.
- (d) Effect of drought.

Additional factors, other than availability of major mineral elements, may complicate the interpretations and require investigation.

- (a) Effect of trace-element deficiencies.
- (b) Different requirements for minerals at different soil pH levels.
- (c) Effect of temperature, light, humidity, rainfall.
- (d) Effect of inadequate aeration of the soil.
- (e) Effect of soil micro-organisms.
- (f) Effect of soil type.

Interpretation of results must take into consideration not merely the absolute amounts of any one mineral element, but relative levels of all the major nutrients. The concepts of limiting factors and interactions or antagonisms between elements aid in this interpretation.

The tissue-test technique cannot, in our present state of knowledge, be regarded as superceding soil tests or observational top-dressing trials, but if properly handled should be a valuable aid in the diagnosis of mineral deficiencies both in the field and in the laboratory.

Application of Kjeldahl and Dumas Micro Methods to Pasture Nitrogen Determination.

By F. B. THOMPSON and E. P. WHITE, Research Station, Hamilton.

A semi-micro Kjeldahl method for total nitrogen determinations in pasture was described. On some samples the method gave extremely high figures (5.5—6.5 per cent. N.). Check determinations by the standard Dumas micro-method and a "tapping" modification both gave lower but erratic results. Another modification repeating the combustion in oxygen gave consistent figures in agreement with those from the Kjeldahl method. The modified Dumas method is unsuitable for routine analysis.

The Chemistry of the Coprosma Series.

By L. H. BRIGGS, University College, Auckland.

This paper will be published in the *Journal of the Chemical Society*.

The Mechanism of Reaction of Halogens with Organic Compounds.

By PROF. P. W. ROBERTSON, Victoria College.

An account was given of the work on halogen addition and substitution carried out at Victoria University College during the last twelve years. Two modes of halogen addition have been established: (a) Electronic, when there is electron-accession to the ethylene system. (b) Nucleophilic, when there is electron-regression, e.g., in such compounds as vinyl bromide. When the electron-attracting group is CHO, C₆H₅ or NO₂, the reactions are strongly acid-catalysed. Electrophilic Cl₂ addition and substitution are bimolecular, but the corresponding reactions with Br₂ and I₂ show orders increasing to fourth in concentrated solutions.

The 2 : 2 Dimethyl Chromene Derivatives in Volatile Oils.

By S. E. WRIGHT, Pharmacy College, Wellington.

The 2:2-dimethyl 3-chromene nucleus (also designated 2:2-dimethyl-1:2-benzopyran) figures in the molecules of a number of naturally occurring substances which are active as insecticides and fish poisons; e.g., deguelin, toxicarol, tephrosin, all of which are closely related to rotenone.

Two derivatives of this nucleus have also been found in the volatile oils of two plants, viz., *Evodia littoralis* and *Evodia elleryana*, both of which grow in a restricted region in South Eastern Queensland. The structure of one of these substances, a crystalline phenolic ketone named evodionol, was elucidated by Lahey (University of Queensland Papers, Department Chemistry No. 20) and that of the other, a non-phenolic ketone evodione, has now been shown to be 5:7:8-trimethoxy-6-acetyl-2:2-dimethyl 3-chromene. In this paper the chemical and spectrographical evidences which led to the acceptance of this structure for evodione, and its close relationship to evodionol were discussed.

The Presence of Paraffins in Essential Oils.

By W. V. HEAZELWOOD, Otago University.

Essential oils are generally considered to contain terpenes, sesquiterpenes and diterpenes. When the essential oil of *Pittosporum eugenoides* was fractionated in the modified Lecky and Ewell column, 60 per cent. of a saturated paraffin was obtained. From a study of the physical and chemical properties, the fraction was confirmed as n-nonane. This presence of a paraffin is not unprecedented in essential-oil chemistry as n-heptane, n-nonane and n-undecane have been isolated. The solid residue of the oil was shown to consist of 0.5 per cent. paraffins m.p. 44.5°, 56°, 62–63°. One hundred and thirty-five examples of solid paraffins existing in essential oils have been recorded in the literature.

Effects of the Waring Blendor on some Biochemical Systems.

By DR. ROSA STERN, Wheat Research Institute, Christchurch.

This paper will be published in the *Biochemical Journal*.

Absorption Errors in Quinine Fluorimetric Standards.

By L. H. BIRD, Wheat Research Institute, Christchurch.

This paper will be published in the *N.Z. Journal of Science and Technology*.*The Constitution of Solmargine.*

By W. E. HARVEY.

Solmargine, the alkaloid from *Solanum marginatum*, is a glycoside, the aglycone, Solmargidine, being steroidal in nature and closely related to Solasodine and Solanidine. Solmargidine possesses an extra hydroxyl group, and this forms part of an L-glycol. Both Solmargidine and Solasodine are carbinolamines, although Solanidine is not.

The Application of Differential Thermal Analysis in Clay Mineral Research.

By I. C. McDOWALL, N.Z. Pottery and Ceramic Research Association (Inc.), Wellington.

On heating clay minerals changes occur which are reflected in endothermic and exothermic reactions. Records of the temperature difference between the sample and an inert material are characteristic for different clay minerals. The apparatus used consists of an electric tube furnace, voltage control unit, mirror galvanometer and rotating drum carrying photographic paper.

The factors influencing thermal curves, and characteristic curves for the kaolinite, montmorillonite and illite groups of clay minerals were given. The qualitative and quantitative applications of the method and its use in the evaluation of bauxite deposits, extraction of alumina from clays and determination of free quartz were described. The value of the thermal method in relation to chemical, X-ray and petrographic studies on clays was outlined.

Application of Micro-chemical Methods to some Industrial Problems.

By N. H. LAW.

The Conway diffusion-cell technique for the rapid estimation of free ammonia in organic and biological extracts, urca in blood and urine, and carbon monoxide in blood, provides a very simple and accurate method most applicable to routine control and testing.

Certain refinements in the handling and treatment of samples coupled with the use of a specially constructed electrical furnace, appreciably reduces the time of assay of halogens and sulphur by the Carius micro-combustion technique.

Finally, a modification of the Blacet and Leighton gas apparatus normally used for the quantitative gasometric analysis of gaseous mixtures has been applied to the determination of small concentrations of oxygen in nitrogen filled ampoules containing unstable drugs. The new procedure employs saturated brine in place of mercury as the confining medium, but still retains the yellow phosphorus bead as the means for absorbing the oxygen. The brine causes no appreciable interference in the absorption of the oxygen.