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JOURNAL

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NEW ZEALAND INSTITUTE OF CHEMISTRY

VOLUME XI. MAY, 1947 NO. 2

CONFERENCE, 1947.

The 1947 Conference of

THE NEW ZEALAND INSTITUTE OF CHEMISTRY

and of The New Zealand Section of

THE ROYAL INSTITUTE OF CHEMISTRY

will be held in Wellington from May 20th to 23rd, 1947 and will constitute the Chemical Sciences Section of the Sixth Science Congress of The Royal Society of New Zealand.

PROGRAMME.

(Watch Conference Notice Board for Lecture Room Numbers.)

TUESDAY, 20th MAY, Lecture Hall, Dominion Museum.

Morning:

9.00 - 9.45 Informal gathering, registration, etc.
9.45 - 10.15 Morning Tea.
10.30 Official Welcome.
11.30 Royal Society Address - Dr. R. S. Allan.

Afternoon: (Museum).

2.00 - 3.30 General Meeting N.Z.I.C.
4.00 - 5.00 General Meeting R.I.C.

Evening:

8.00 Presidential Address to the N.Z.I.C.
"THE CHEMISTRY OF WOOL"
By F. G. Soper, University of Otago.

WEDNESDAY, 21st MAY, Victoria University College.

Morning: FIRST INDUSTRIAL SESSION (V.U.C.)

1. 9.00 - 9.45 "General Principles of Drying"
   By S. R. Siemon, Canterbury University College.
2. 9.45 - 10.05 "Drying of Tobacco."
   By S. K. Newall, Dominion Industries, Christchurch.
3. 10.05 - 10.30 "Drying of Clayware."
   By J. T. Linzey, McSkimming & Son Ltd., Benhar.
4. 11.00 - 11.30 "Bulk Drying of Wheat."
   By E. W. Hullett, Wheat Research Institute Christchurch.
5. 11.30 - 12.00 "Drying of Leather and Skins."
   By F. G. Caughley, Leather Research Laboratory, Wellington.

12.00 - 12.30 FREE.

Morning: FIRST BIOCHEMICAL SESSION (V.U.C.).

SYMPOSIUM ON PROTEINS.

Introduction by DR. J. MELVILLE.

Morning:

9.00 - 9.35 "The Structure of Proteins."
By S. N. Slater, University of Otago.

9.35 - 10.20 "Analytical Methods, Part I."
By J. Melville, Plant Chemistry Laboratory, Palmerston North.

10.20 - 10.30 Discussion.

10.30 - 11.00 Morning Tea.

11.00 - 11.30 "Analytical Methods, Part II."
By N. T. Clare, Animal Research Station, Wallaceville.

11.35 - 11.50 Discussion.

11.50 - 12.30 "Proteins in Medical and Surgical Cases."
By Muriel Bell, Nutritionist Health Dept., Dunedin.

(In conjunction with the Medical Section.)

Afternoon:

2.00 Meeting of the Council of the New Zealand Institute of Chemistry, Council Room, Department of Scientific and Industrial Research.

Meetings of Sub-Committees on Methods of Analysis.

Meetings of Chemical Engineers or other Groups.

Evening:

8.00 Royal Society, Presidential Address.
By Professor W. N. Benson.

THURSDAY, 22nd MAY, (Victoria University College).

Morning: SECOND INDUSTRIAL SESSION (V.U.C.).

10. 9.00 - 9.45 "Statistical Method in Chemical Research."
By I. D. Dick, D.S.I.R., Wellington.

11. 9.45 - 10.05 "Sampling and Statistical Methods in the Leather Industry."
By R. O. Page, Woolston Tanneries, Christchurch.

12. 10.05 - 10.30 "Statistical Method Applied in the Woollen Industry."
By R. V. Peryman, University of Otago.

13. 11.00 - 11.30 "The Significance of Alloy Compositions."
By G. S. Lambert, Hayes' Metal Refineries Newmarket.

14. 11.30 - 12.00 "Corrosion in Industry."
By I. S. Hunt, Dominion Laboratory, Wellington.

SECOND BIOCHEMICAL SESSION (V.U.C.).

15. 9.00 - 9.45 "Some Aspects of the Chemistry of Bacteriological Media."
By G. J. Hunter and H. R. Whitehead, Dairy Research Institute, Palmerston Nth.

16. 9.45 - 10.30 "The Use of Radioactive Tracer Elements in Biochemistry."
By H. O. Askew, Cawthron Institute, Nelson.

17. 11.00 - 11.20 "The Pharmacology of Poison in Karaka Berries."
By Muriel Bell, Nutrition Research Department, Medical School, Dunedin.

18. 11.20 - 12.00 "Observations on the Oil Content of N.Z. Fresh Water Eels."
By F. B. Shorland, Fats Laboratory, Wellington.

12.00 FREE

Afternoon: AGRICULTURAL SESSION (V.U.C.).

19. 2.00 - 2.45 "Modern Views on Root Actions of Plants." By H. O. Askew, Cawthron Institute, Nelson.

20. 2.45 - 3.30 "Comparison of Methods of Determining Manurial Requirements of Soils." By E. B. Davies, Soil Fertility Research Station, Hamilton.

21. 4.00 - 4.30 "Tissue Testing as a Means of Determining Mineral Deficiencies." By K. J. McNaught, Soil Fertility Research Station, Hamilton.

22. 4.30 - 5.00 "Application of Kjeldahl and Dumas Micro Methods to Pasture Nitrogen Determination." By F. B. Thompson, Soil Fertility Research Station, and E. P. White, Ruakura Animal Research Station, Hamilton.

5.00 - 5.30 FREE

Afternoon: PURE CHEMISTRY SESSION (V.U.C.).

23. 2.00 - 2.45 "The Chemistry of the Coprosoma Series." By L. H. Briggs, Auckland University College.

24. 2.45 - 3.30 "The Mechanism of Reaction of Halogens with Organic Compounds." By P. W. Robertson, Victoria University College, Wellington.

25. 4.00 - 4.30 "The 2:2 Dimethyl Chromene Derivatives in Volatile Oils." By S. E. Wright, Director Pharmacy College, Wellington.

26. 4.30 - 5.00 "The Presence of Paraffins in Essential Oils." By W. V. Heazlewood, University of Otago Dunedin.

Evening: Public Address.

FRIDAY, 23rd MAY, (Victoria University College).

Morning: GENERAL ANALYTICAL METHODS SESSION. (V.U.C.).

27. 9.00 - 9.45 "General Physico-Chemical Methods." By S. H. Wilson, Dominion Laboratory, Wellington.

28. 9.45 - 10.05 "Effects of the Waring Blendor on Some Biochemical Systems."
By Rosa Stern, Wheat Research Institute, Christchurch.

29. 10.05 - 10.30 "Absorption Errors in Quinine Fluorimetric Standards."
By L. H. Bird, Wheat Reseach Institute, Christchurch.

30. 11.00 - 11.30 "The Application of Differential Thermal Analysis in Clay Mineral Research."
By I. C. McDowall, N.Z. Pottery & Ceramic Research Association, Dominion Laboratory Wellington.

31. 11.30 - 12.00 "Application of Microchemical Methods to Some Industrial Problems."
By N. H. Law, Dominion Laboratory, Wellington.

12.00 - 12.30 Closing of Institutes of Chemistry Conference.

Afternoon:

2.00 - 3.30 Royal Society Session on "Co-ordination of Research."

ROOMS ALLOCATED TO THE VARIOUS SESSIONS.

All Rooms at Victoria University College.

FIRST INDUSTRIAL SESSION.	Room C.3.
FIRST BIOCHEMICAL SESSION.	Chemistry Lecture Room.
SECOND INDUSTRIAL SESSION.	Room C.3.
SECOND BIOCHEMICAL SESSION.	Chemistry Lecture Room
AGRICULTURAL SESSION.	Room C.3.
PURE CHEMISTRY SESSION.	Chemistry Lecture Room.
GENERAL ANALYTICAL METHODS SESSION.	Room C.3.

Registration to Date. 5th May, 1947.
For Institutes of Chemistry Conference.

Non-Members of N.Z.I.C.	48
Members of N.Z.I.C.	124
	172

SUMMARIES OF PAPERS TO BE READ AT THE 1947 CONFERENCE OF THE INSTITUTES OF CHEMISTRY.

PAPER No. 1

GENERAL PRINCIPLES OF DRYING.

By S. R. Siemon, Canterbury University College.

The rate of removal of water from a solid by unsaturated gas depends on whether the moisture concerned is free or adsorbed (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 vaporisation moves into the body of the solid as the diffusion rate diminishes. Where bound water is present, its zone of vaporisation 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.

PAPER No. 2

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.

PAPER No. 3

DRYING OF CLAYWARE.

By J. T. Linzey, McSkimming and Son Ltd. Benhar.

The degree of control in the drying of clay ware varies from practically nil in the heavy products such as pipes and bricks through

simple waste heat dryers, to complex continous humidity-controlled infra-red dryers used for fine pottery and electrical porcelain. The importance of compounding a clay body that will yield up its water readily is 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.

PAPER No. 4

BULK DRYING OF WHEAT.

By E. W. Hullett.

It is believed that the severity and frequency of the damp wheat problem in New Zealand does not justify the expenditure of the large capital needed for conventional driers of adequate capacity.

The paper describes pilot-scale trials of mass drying by means of forced cross-ventilation in bins (1938), and upward ventilation through a deep layer on a floor. Ventilation is applied when air conditions are suitable. A sharply defined drying zone advances from the air inlet towards the exit surface. Temperature rise in the wheat is readily avoided.

Operational costs are high and capital costs low.

PAPER No. 5

DRYING OF LEATHER AND SKINS.

By F. G. Caughley, Leather Research Laboratory, 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 are discussed to show the principles underlying industrial methods of drying hides and leathers.

PAPERS 6, 7, 8 and 9

SYMPOSIUM ON PROTEINS.

By J. Melville, Plant Chemistry Laboratory, Palmerston North.
S. N. Slater, University of Otago, Dunedin.
N. T. Clare, Wallaceville Animal Research Station.
Muriel Bell, Nutritionist Health Dept., Dunedin.

Following the brilliant work of Emil Fischer during the early years of this century, interest lapsed in proteins as chemical compounds and

in only one or two Laboratories throughout the world was any continuous research into protein structure attempted. The situation however changed radically during the 1930's, due both to knowledge that had slowly accumulated in unrelated fields and to the application of new techniques and methods. The work of Astbury on the X Ray analysis of fibrous proteins, of Bergmann on synthetic peptides and their behaviour with enzymes of far greater specificity than had been envisaged, of Svedberg and Tiselius on the behaviour of large molecules in gravitational and electrical fields, the demonstration by Stanley that plant viruses have the characteristics of nucleo-proteins and by Northrop, Sumner and others that enzymes are proteins many of which can be crystallised, these are only a few examples of the newer investigations which have completely revivified interest in protein chemistry. The War has also had a stimulatory effect, notably in the separation and preservation of blood components, and in the use of injected amino acid mixture for the relief of inanition.

It is obviously impossible in the space of three hours to review more than one or two aspects of the subject. It is the more fortunate therefore that the Presidential address to the Institute deals with an important phase of protein chemistry and links up physical properties with chemical composition and amino acid arrangement. The periodicity of structure established for the keratins has been extended to the soluble globular proteins, and one section of the symposium will be devoted to the structure of the protein molecule.

Considerable advances have also been made in the analysis of proteins into their constituent amino acids and two of these methods, which will be discussed in some detail, are products of the last decade. The microbiological method is based on the essential nature of a large proportion of the naturally occurring amino acids for the growth of certain strains of bacteria. The partition chromatographic method involves the separation of the amino acid or acetylated amino acids between two solvents on an inert adsorption medium.

PAPER No. 10

STATISTICAL METHOD IN CHEMICAL RESEARCH.

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

This paper is 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 are discussed, and an example from a present day research on the estimation of ammonia and glutamine in plant tissue is discussed.

PAPER No. 11

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) is discussed.

PAPER No. 12

STATISTICAL METHOD APPLIED IN THE WOOLLEN INDUSTRY.

By R. V. Peryman, University of Otago.

Results of tests on wool or wool products frequently require statistical analysis if proper conclusions are to be drawn. Examples of the use of statistics are 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.

PAPER No. 13

THE SIGNIFICANCE OF ALLOY COMPOSITIONS.

By G. S. Lambert, Hayes' Metal Refineries, Newmarket.

The physical and mechanical properties of metals are due to their crystalline structure. The limited range of properties available with the common pure metals can be greatly extended by the formation of alloys. The addition to a metal of another metal or non-metal may result in the formation of mechanical mixtures, solid solutions or intermetallic compounds, each of which gives characteristic properties to the product.

From a knowledge of the crystalline structure and atomic properties of the constituents of alloys it is possible to predict to some extent the nature of their distribution and their effect on the physical and mechanical properties of the alloys.

PAPER No. 14

CORROSION IN INDUSTRY.

By I. S. Hunt, Dominion Laboratory, Wellington.

1. A brief survey of modern theories of the mechanism of corrosion.
2. A classification of types of corrosion according to the factors involved
   e.g. corrosive materials,
   forms of corrosion.
   corrosion properties of metal,
   type and composition of metal.
3. Examples encountered at Dominion Laboratory in recent years will be used to illustrate the influence of these factors on the failure of metals in industry.

4. The results of a survey of corrosion problems effecting a cross section of New Zealand industry will be discussed and typical examples will be considered in detail.

PAPER No. 15

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 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 adsorptioin of the phosphate-agar growth factor on the pulp.

PAPER No. 16

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, Fa, 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 radio active 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.

PAPER No. 17

PHARMACOLOGY OF THE POISON IN KARAKA BERRIES.

By Muriel Bell, Nutrition Research Department, 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.

PAPER No. 18

OBSERVATIONS ON THE OIL CONTENT OF N.Z. FRESH WATER EELS.

By F. B. Shorland, Fats Laboratory, 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 inches 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% to 23%, approximately 70% of the total oil reserves being concentrated in the tail, which comprised but 40% 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.

PAPER No. 19

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.

PAPER No. 20

COMPARISON OF METHODS OF DETERMINING THE MANURIAL REQUIREMENTS OF SOILS.

By E. B. Davies, Soil Fertility Research Station, Hamilton.

Methods of estimating available phosphate and potash in soils are described and their value assessed by comparing their indications on a

variety of soil types with those of the Mitscherlich pot culture method. Attention is paid to quick tests as in the hands of Field Officers of the Department of Agriculture—these would permit an advisory service of wide coverage.

The optimum levels of the two nutrients according to any selected method can be found through cumulative experience for the various crop and pasture species and this knowledge used when estimating the manurial requirements of soils.

PAPER No. 21

TISSUE TESTING AS A MEANS OF DETERMINING MINERAL DEFICIENCIES.

By K. J. McNaught, Soil Fertility Research Station, Hamilton.

Correlation of results of tissue tests on pasture and crop plants with fertiliser responses and with results of soil tests are in some cases good, but many conflicting results have been obtained. In such a dynamic system as the living plant many variable and often uncontrollable factors enter to complicate the interpretation of the results, such as differences in the mineral requirements of different plant species, and at different stages of growth, effects of drought, temperature and other climatic factors, differences of soil type, etc.

PAPER No. 22

APPLICATION OF KJELDAHL AND DUMAS MICRO METHODS TO PASTURE NITROGEN DETERMINATIONS.

By F. B. Thompson, Soil Fertility Research Station, and E. P. White, Ruakura Animal Research Station, Hamilton.

A semi-micro Kjeldahl method for total nitrogen determinations in pasture is described. On some samples the method gave extremely high figures (5.5—6.5% 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.

PAPER No. 23

CHEMISTRY OF THE COPROSOMA SERIES.

By L. H. Briggs, Auckland University College.

Coprosma australis has been shown to contain in phenomenally high yield the known anthraquinone colouring matters morindin, morindone

and rubiadin methyl ether. Coprosma arcolata contains rubiadin methyl ether and a new tetrahydroxy methylanthraquinone whose structure has been confirmed by degradation and synthesis. Coprosma lucida contains at least 8 colouring matters, the ones identified so far being derivatives of anthragallol. Some of the latter derivatives have been isolated from Coprosma acerosa while Coprosma rubra contains rubiadin methyl ether and other compounds. All species contain the glucoside asperuloside.

PAPER No. 24

THE MECHANISM OF THE REACTION OF HALOGENS WITH ORGANIC COMPOUNDS.

By P. W. Robertson, Victoria University College.

This communication contains an account 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) Electrophilic, 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, COPh, or NO_2, the reactions are strongly acid-catalysed. Electrophilic Cl_2 addition and substitution are bimolecular, but the corresponding reactions with Br_2 an I_2 show orders increasing to fourth in concentrated solutions.

PAPER No. 25

DERIVATIVES OF 2:2 DIMETHYL-Δ^3-CHROMENE IN VOLATILE OILS.

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

The 2:2-dimethyl-Δ^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 evodional, 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-Δ^3-chromene. In this paper the chemical and spectrographical evidences which have lead to the acceptance of this structure for evodione, and its close relationship to evodionol will be discussed.

PAPER No. 26

THE PRESENCE OF PARAFFINS IN ESSENTIAL OILS.

By W. V. Heazlewood, University of Otago.

Essential oils are generally considered to contain terpenes, sesquiterpenes and diterpenes. When the essential oil of Pittosporum eugenioides was fractionated in the modified Lecky and Ewell column, 60% of a saturated paraffin was obtained. From a study of the physical and chemical properties, this 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% paraffins m.p. 44.5°, 56°, 62-63°. 135 examples of solid paraffins existing in essential oils have been recorded in the literature.

PAPER No. 27

MODERN PHYSICO-CHEMICAL METHODS IN ANALYSIS.

By S. H. Wilson, Dominion Laboratory, Wellington.

One main reason for the modern development of physical methods of analysis is that the realisation in industry and research of the importance of low concentrations of certain constituents, for example, trace impurities in alloys, and vitamins in foods, has been followed by the demand for suitable methods of estimation. Another reason is that new possibilities in technique are afforded by the revolutionary advances in physics. These are meeting the needs of industry for more rapid methods of control analysis, and even making possible direct instrumental methods of analysis. However the main consideration will be given to methods based on exposure to, or emission of radiation. Actual examples will be discussed of the application of spectrographic, absorptiometric, and X-ray crystallographic methods. Finally reference is made the wider implications of the new developments, their bearing for instance on the training of the analyst, the division of laboratory work, and the rational application of the new techniques, particularly in this country.

PAPER No. 28

EFFECTS OF THE WARING BLENDOR ON SOME BIOCHEMICAL SYSTEMS.

By Rosa Stern, Wheat Research Institute, Christchurch.

The Waring Blendor has recently come into use as a convenient means of converting plant tissues into uniform suspensions. When the Waring Blendor was used in experiments on the oxidising systems of wheat, its intensive stirring action was found to cause significant changes in the protein, enzyme and reducing matter of the extracts.

PAPER No. 29

ABSORPTION ERRORS IN QUININE FLUORIMETRIC STANDARDS.

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

Certain batches of test tubes have been found to have a strongly adsorptive surface which causes progressive adsorption of quinine ions from the matching solution. The drift in the intensity of the fluorescence upsets calibration of test tubes. The difficulty has been overcome by (a) presaturation of the glass with quinine or (b) treatment of the glass with strong hot alkali.

PAPER No. 30

THE APPLICATION OF DIFFERENTIAL THERMAL ANALYSIS IN CLAY MINERAL RESEARCH.

By I. C. McDowall, N.Z. Pottery and Ceramic Research Association, Dominion Laboratory Wellington.

The nature of thermal reactions in clay are outlined and the apparatus described.

Factors affecting thermal curves are—mass of reactants, specific heat of reaction, specific heat of sample, thermal conductivity, heating rate, lattice structure.

Thermal curves are given for typical clay minerals and quantitative applications discussed, with particular reference to free quartz determination.

The relations of thermal, X-ray, chemical and petrographic data on clays are discussed.

PAPER No. 31

APPLICATION OF MICRO-CHEMICAL METHODS TO SOME INDUSTRIAL PROBLEMS.

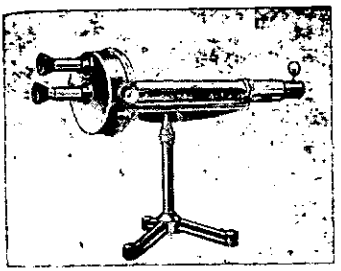
By N. H. Law, Dominion Laboratory, Wellington.

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

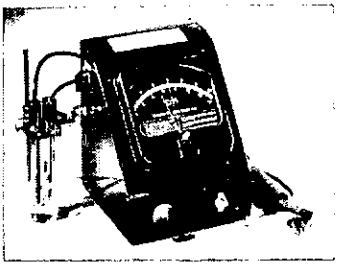
Certain refinements in the handling and treatment of samples coupled with the use of a specially constructed electrical furnace, appreciably reduces the time of assay of halogens and sulphur by the Carius micro-combustion technique.

Finally a modification of the Blacet & 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.

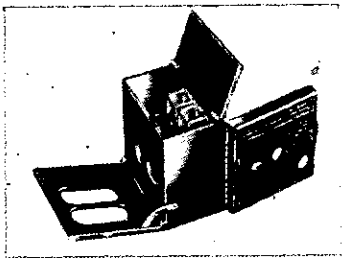
SCIENTIFIC EQUIPMENT



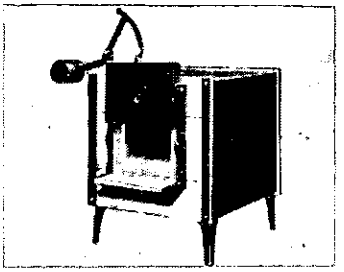
B & S Polarimeter



Macbeth pH Meter



Lovibond Comparator



Hoskins Muffle Furnace

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KELVIN CHAMBERS, 16 THE TERRACE,
WELLINGTON,
with Branches at Auckland, Christchurch, Dunedin
and throughout Australia.

GENERAL MEETING.

A General Meeting of the New Zealand Institute of Chemistry (Inc.) will be held in the Dominion Museum Lecture Hall, Buckle Street, Wellington, on Tuesday, 20th May, 1947, from 2 p.m.—3.30 p.m.

Business:—

Confirmation of the Minutes of the last General Meeting held in Wellington, 29th August, 1946.

Business arising from the Minutes.

Presidential Statement on the activities of the Institute, including the financial position.

General.

COUNCIL MEETING — 19th February, 1947.

This was the first meeting of the Council elected for 1947. The President was in the chair, and on this occasion Mr. N. P. Alcorn was proxy for Auckland and Mr. E. S. Borthwick proxy for Canterbury.

Dr. J. Dixon surveyed his activities in connection with salaries in the Public Service. The latest of his many approaches to the question has been an interview, in company with Dr. Marsden, Mr. Joiner and Mr. O'Connor, with the Public Service Commissioner.

Dr. J. C. Andrews was appointed as the Institute's representative to a committee being formed by the Association of Scientific Workers to investigate the setting up of a Parliamentary Scientific Committee.

The Registrar reported that the Registrar of Industrial Unions had advised that the Institute will be afforded an opportunity of making representations on any application being received in the near future for registration of an industrial union covering chemists or scientific workers. The Secretary of the New Zealand Employers' Federation had advised that his Federation's policy is to object to the chemists being included in any award or industrial agreement which includes other factory workers. Council stressed, however, that, if any member of the Institute hears of a case where a union is seeking to include chemists in the scope of its award, he should immediately communicate with the Registrar of the Institute, so that the Institute may be afforded an opportunity of making representations in the matter.

The Standard Scale of Salaries for Laboratory Assistants,

prepared by Wellington Branch, was adopted by Council. This scale is published elsewhere in this issue.

CHEMISTS' EMPLOYMENT COMMITTEE.

All members and local members of the Institute who wish to obtain employment or a change of position, or who are seeking to engage chemists, are reminded of the services offered by the Employment Register, which is maintained jointly by the N.Z.I.C. and the R.I.C. (N.Z. Section). For an annual registration fee of 10/- to cover expenses, members are advised frequently by circular of all vacancies of which the Hon Secretary receives notification, and prospective employers are placed in touch with members who possess qualifications in particular fields. Membership of the Register with remission of subscription until employment is obtained, may be had by unemployed chemists.

The Employment Register operates as a service to Institute members, and to ensure its continued success, the cooperation of employers is particularly desired; notification of vacancies may be made directly to the Hon. Sec. or to the following Branch representatives of the Committee:—

Dr. J. C. Andrews, 63 Onslow Avenue, Epsom, Auckland.
Mr. F. Morgan, 27 Derwent Street, Island Bay, Wellington.
Mr. F. H. G. Johnston, P.O. Box 325, Christchurch.
Mr. H. G. Woolman, C/o. Reckitts and Coleman Ltd., Forth Street, Dunedin.

SALARY SCALE FOR LABORATORY ASSISTANTS.

The following is the standard scale recommended by the New Zealand Institute of Chemistry for the payment of Laboratory Assistants.

This scale is subject to modification in the event of a general increase in Industrial Award rates.

Technical Trainees under 21 years of age.

Year	Unqualified	With School Certificate	With University Entrance
	£	£	£
1st year	125	150	180
2nd year	150	180	210
3rd year	180	210	240
4th year	210	240	270
5th year	240	270	300
6th year	270	300	

Persons over 21 years of age.

Designation	Minimum	Maximum	Increment
	£	£	£
Laboratory Attendant	320	350	15
Technical Assistant	335	365	15
Assistant Technician	350	400	25
Technician, 2nd Grade	435	460	25
Technician, 1st Grade	485	520	35

SCOPE OF DUTIES:

Laboratory Attendant: Responsible for cleaning laboratory; washing glassware; preparing analysis material from crude form to simple form; messages; general handyman; care of stores, etc.

Technical Assistant: Engaged exclusively in routine technical duties which are defined for him and who needs supervision to obtain best results. Some attain high accuracy, but only within a narrow range of routine jobs.

Technicians: It is suggested that the criterion of entrance for any person to this classification be (1) the passing of the Institute of Chemistry's Laboratory Assistant's Certificate Examination, or (2) where some special skill required in his laboratory duties has been previously obtained, e.g. (a) experience or training in a trade or calling which makes that person of special use in the laboratory, and where such a person has general ability to justify his being graded higher than a Technical Assistant, or (b) where some University Degree Examinations including a Science subject to Stage I have been passed but the Degree has not been completed.

In this class, a **Technician, 1st Grade**, would be capable of carrying out laboratory duties which require the exercise of skill, experience, and ingenuity, without the detailed supervision of a chemist, but with such definite objectives as may be laid down.

Note:—In the Technician Class it is not suggested that a man on the lowest salary of £350 proceed automatically to £520, but that £400 and £460 be regarded as efficiency barriers.

PERSONAL.

Mr. R. H. Stokes, Associate 1942-46, has been awarded the Meldola Medal of the Royal Institute of Chemistry. The medal is given to a British subject under 30 years of age whose published chemical work shows the most promise, and is brought to the notice of the administrators during the year

prior to the award. Mr. Stokes has also won the Rennie Memorial Medal of the Australian Chemical Institute for 1946, an award of similar type to the Meldola Medal, and has recently been awarded a C.S.I.R. Studentship to undertake research in Britain.

For a number of years in association with Dr. R. A. Robinson, and more recently in Perth, Mr. Stokes has made substantial contributions to progress in the physical chemistry of electrolyte solutions, and the announcement of the above awards will be received with great satisfaction by his friends in New Zealand.

To mark the retirement of Mr. Philip White, who for some twenty years has been the Director of the Leather and Shoe Research Association, a farewell function was arranged by the Branch in conjunction with the N.Z. Section of the R.I.C., and was held in the English Speaking Union Rooms on Friday, 28th March. Mr. White, who is shortly to return to England, was accompanied by Mrs. White and Miss White, and after their introduction to the gathering by Mr. G. A. Lawrence, Mrs. White was presented with a bouquet by Mrs. Joiner. In making a presentation of a set of silver tea-spoons, eulogistic addresses were given by Mr. Joiner on behalf of the R.I.C. and by Dr. Dixon, who represented the N.Z.I.C., reference being made to Mr White's record of service to both Institutes. He has served the R.I.C. as Chairman of the N.Z. Section, and for many years was its Secretary; for the N.Z.I.C. he acted as Auckland Branch proxy on the Council over a long period. In his reply, Mr. White outlined the work his Association had undertaken during his term as Director, and screened a technicolour film entitled "From Hide to Sole." The serving of supper brought a pleasant evening to a close.

Mr. M. L. Stewart is at present in England on a business visit.

Mr. S. R. M. Ellis, F.R.I.C., A.M.I.Chem.E., who has been engaged in work on fuels in England for seven years is at present attached to the Fuel Section of the D.S.I.R. for some two months, pending his return to England.

Mr. B. E. Jackson, until recently with the Shell Co., at Auckland, has joined the Dom. Lab. staff and is attached to the Oil Testing Section.

Mr. G. A. Lawrence has been appointed representative of

the Institute to the newly re-constituted Standards Council.

On the recommendation of the Examinations Committee, the Laboratory Assistant's Certificate was awarded to:—

W. T. Eggleston, C/o United Dairies, Barbadoes Street, Christchurch.

L. C. Blakemore, Soil Bureau, Molesworth Street, Wellington.

Mr. J. Rogers has resigned from the Soil Bureau to take up a position as Research Lecturer in Ores at the Otago School of Mines.

CORRECTION.

In the list of Associates recently elected, published in the March Issue, P.7., line 12 should read:—

D. G. Howard, M.Sc., has been on the Chemical Staff of S. W. Peterson and Co. Ltd., Wellington, since 1940.

AUCKLAND BRANCH.

At the February Meeting of the Auckland Branch, first of the 1947 Session, the subject was "Paint Technology." Mr. L. Wilkinson, of the D.S.I.R., gave the first talk of the evening, on the composition of paints. Owing to shortness of time, he confined his attention to the constituents of white house paints, which comprise by far the greatest part of paint manufacture. He gave a brief review of the oils, pigments and extenders used and the necessary relations of refractive index, particle size, reflecting powers and chemical nature required to give the most satisfactory paint mixture.

In the second talk, Mr. G. Chamberlain also of the D.S.I.R., dealt with problems of the use of paint. In replying to questions raised by the Chairman, Mr. Stansfield, concerning his unfortunate adventures while painting an outhouse, Mr. Chamberlain pointed out that although paint quality was necessarily lowered by war conditions affecting the supply of materials, paints made from the present substitute materials could in the hands of expert painters give results equal to those of prewar days, though they left little margin for the unskilled; and the skill with which paint was applied had a great deal to do with its lasting powers. In a series of interesting photographs, he proceeded to cover the various types of paint failure, and the methods in use for investigating their nature and cure. He pointed out the difficulties of the investigation where obscure physical properties arising in methods of manufacture may have important effects. But since the

painting programme for State Houses involves £400,000 a year in paint, and well over £1,000,000 a year for painters, increased efficiency is well worth while.

The second meeting of the year, on March 11th, was given to a lecture on "Microchemical Methods" by Mr. R. N. Seelye, of A.U.C. Mr Stansfield was again particularly interested, as the application of micro methods of testing would appreciably increase the Auckland gas supply, a matter of some public concern.

Mr. Seelye outlined the limits of accuracy of various types of microchemical method, and then went on to discuss some of the techniques involved, and the application of the pieces of apparatus which he displayed.

WELLINGTON BRANCH.

Arrangements for the first meeting of the 1947 season, early in March were cancelled in favour of a combined meeting with the Royal Society, the N.Z. Institute of Engineers, and the Association of Scientific Workers, which was addressed by Captain G. F. Kosco of the U.S. Navy. As organiser of the scientific activities of the latest Byrd Antarctic Expedition, some of the ships of which were making a short call in Wellington on their homeward journey, Captain Kosco was able to deliver a most interesting account of the scope and achievement of the expedition, his lecture being illustrated with lantern slides and attended by a very large audience.

Mr. I. G. McIntosh of the Animal Research Station, Wallaceville, addressed the April Meeting on, "Animal Toxicology in New Zealand."

In all countries where intensive farming is carried out it is necessary to combat a large range of pests. The use of a number of poisonous substances both against these and for other purposes leads, through carelessness, ignorance, and sometimes bad luck, to the loss of a great many animals.

The speaker outlined the scope and range of toxicological work at Wallaceville where a service is provided for the veterinary services of the whole country. Since it has been found that the classic post-mortem lesions are often partly or completely absent in lead and arsenic poisoning it is now almost a matter of routine to make examinations for these elements in cases of unexplained death. As a result, in the past few years, an increasing number of cases of lead poisoning have been detected. The common sources, i.e. old paint tins, painted woodwork, old battery plates, etc., were indicated.

Work at Wallaceville following mortalities in pigs feeding

on skim milk distributed through galvanised pipe lines has led to a revision of the idea that zinc does not cause systemic poisoning. The lesions caused by chronic zinc poisoning in pigs, namely, eroded cartilages on the heads of bones and ruptured aortas, were demonstrated by lantern slides. Reference was made to work done at Reporoa on arsenic contamination of farm lands by the thermal area at Waiotapu.

Following the loss of 200 out of 600 pigs by nitrite poisoning caused by the eating of cooked mangolds it was shown that the temperature of cooking governed the amount of nitrite formed. The in vitro conversion of nitrate to nitrite was shown to be due to enzyme action during the cooling process.

Last year, for the first time in New Zealand, poisoning in cattle eating large quantities of winged or variegated thistle was recognised. Here again nitrite was responsible but in these cases the conversion from the harmless nitrate took place in vivo.

The speaker referred to a number of points of analytical technique including the incomplete precipitation of micro amounts of lead sulphide using copper sulphide as a carrier, in the presence of large amounts of calcium phosphate. An improved technique for the determination of total HCN in fresh plant tissue was mentioned.

Preparations are well in hand for a Refresher Course in Chemistry to be held during the winter months in collaboration with the V.U.C. Chemistry Department staff. A course of twelve lectures has been arranged, Mr. A. D. Munro taking "The Solid State and Valency" Mr. B. E. Swedlund "The Mechanism of Chemical Reactions" and Mr. W. S. Metcalf "The Theory of Aqueous Solutions."

The acceptance of a position in Christchurch by Mr. J. N. Sutherland left a vacancy on the Branch Committee and it was filled by the appointment of Mr. A. J. Metson of the Soil Bureau.

CANTERBURY BRANCH.

"Some Aspects of Propellant Manufacture and Testing Methods," was the title of the Chairman's address by Mr. A. F. Adams.

The speaker opened with an historical introduction which dealt with the discovery of nitrocellulose in 1833 and the subsequent investigations into its properties and purification, particularly with regard to its stability. Early attempts to use it as a propellant were briefly described.

The discovery of nitroglycerin in 1846 and the establishment of the first manufacturing plants was also dealt with.

The essential difference between high explosives, primary explosives, and propellants were listed; the main characteristics of a propellant being defined as: 1. its property of burning only on the surface, and 2. the fact that the burning rate increases with the pressure. The control of burning rate by means of varying the sizes and shapes of the propellant was described and the modern progressive powders were contrasted with the older degressive burning types.

A classification of nitrocelluloses according to their nitrogen content and the raw material from which they were made, either cotton, paper from wood or wood pulp, was given. The effect of varying the N content on the properties of the resulting nitrocellulose, and the bearing which these properties had on the methods of incorporating into powder were shown.

Following this a description of nitrocellulose manufacture by the Thomson displacement process, as used in British plants, was presented. A weighed amount of teased cotton or papered wood cellulose is nitrated in a mixture of nitric and sulphuric acids contained in a shallow pan, and after the specified nitration time the acid is slowly displaced by ice-cold water, with as little mixing as possible. The water is then drained off and the crude nitrocellulose transported and packed by hand into boiling vats, where adsorbed acid is largely boiled out, and any cellulose sulphates hydrolysed. Following this the boiled product is trucked to beaters where break down into small fibres releases further entrapped acid, which is removed at the next stage in the poachers where the pulp is boiled in a dilute alkaline solution. This completes the stabilization programme. The pulp is then passed over a grit run to remove impurities such as particles of metal, grit, etc. Blending followed by centrifugal wringing completes the process.

This method was then contrasted with the mechanical dipper process, a typical American method. The cellulose is shredded and automatically discharged by air lift to the nitration house where it is weighed into barrels and charged by hand into the nitrators, which are equipped with mechanical stirrers. After nitration, the charge is dropped through the floor into centrifuges where the bulk of the acid is removed; and the crude nitrocellulose is forked through to the floor beneath, where it is subject to numerous jets of water from all sides, thus effectively diluting the remaining acid without developing heat. The resulting pulp is then pumped to the boiling vats where it undergoes a long boiling programme, and then to high speed beaters to break down the fibres still further.

A boil in dilute alkali is followed by several fresh water boils in the poacher tubs; the pulp is then screened, washed on a vacuum filter and pumped to the blending tanks. Finally it is wrung in a centrifuge.

The advantages of this process over the previous one were pointed out. The labour required is only a fraction of that needed for the displacement process; the working conditions throughout the plant are very much better, and finally the material is pulped before nitration and from that point on is pumped throughout the plant. Much handling is thereby avoided.

In a similar manner the manufacture of British cordite was contrasted with that of American nitrocellulose powders, some of the advantages of the latter being; the fact that after the ingredients have been incorporated into the colloid and through the dies, the powder is cut to its final size and thereafter handled in bulk. This contrasts most forcibly with the English method, which involves a great deal of manual handling of small quantities of material. Most American powders contain no nitroglycerin, hence the hazards of its manufacture are avoided. There is no trucking or storage of dangerous explosives. Much less machinery is needed for the pressing stage and fewer dies are needed for the same number of presses. Again, working conditions are much more pleasant and heavy work is reduced to a minimum. Finally, the staff required for an equal output is roughly one quarter that of the British method.

The properties of an ideal propellant were then listed, and the extent of conformity of cordites and nitrocellulose powders to the ideal shown.

Finally, the tests conducted on the various materials and the methods of conducting these tests were described.

OTAGO BRANCH.

THE CHEMISTRY OF THYROXINE.

At the April meeting of the Otago Branch, Mr. T. H. Kennedy spoke on the Chemistry of Thyroxine.

It had been known for some time that if the thyroid gland is removed, normal growth could be maintained by feeding thyroid extract, even after hydrolysis by NaOH, and that the activity of the extract varied with its iodine content. In 1919 the essential amino acid was isolated by Kendall who obtained 30 gms. of acid from 3000 kilos of thyroid. He announced an empirical formula $C_{11}H_{10}O_3NI_3$, and said thyroxine was a triiodo tryptophane.

Harington prepared a synthetic tri-iodo tryptophane which however had no activity. Since analysis of thyroxine, which contains 65%I_2 would be difficult Harington obtained an iodine-free substance thyronine by catalytic reduction. By brilliant and unorthodox degredations and syntheses he confirmed that the skeleton of thyroxine was $HO—C_6H_4—O—C_6H_4—CH_2CHNH_2COOH$.

Further degradation work—this time on thyroxine itself suggested there were two iodine atoms on each benzene ring. Finally Harington was able to announce the true formula of thyroxine and the preparation of a synthetic sample indistinguishable from the natural substance.

Next Mr. Kennedy discussed the iodination of proteins. 20 to 25 years ago German workers showed that at pH7-8 proteins reacted with iodine to give iodinated proteins. Of the known amino acids, tyrosine and histidine were the only ones found to give iodinated compounds. The iodine uptake by proteins could be accounted for by their tyrosine and histidine content. Unfortunately little importance was attached to this work.

In 1939 however independent German work confirmed that certain iodinated proteins do have biological properties consistent with their containing thyroxine. It was also shown that thyroxine itself could be obtained by the alkaline hydrolysis of certain iodinated proteins. Finally thyroxine was prepared by the incubation of di-iodo tyrosine in dilute alkali.

American workers whose theory has been much elaborated by Harington, have attempted to explain the mechanism of the above oxidative reaction. This theory not only satisfactorily explains the production of thyroxine from di-iodo tyrosine but also accounts for the great variety of products obtained by Pummerer in his classical work on the oxidation of phenols.

The Otago Branch Chairman for 1947 is Mr. O. H. Keys, M.Sc., Government Analyst for Otago and Southland. Mr. Keys who is an Associate of the New Zealand Institute, and of the Royal Institute of Chemistry of Great Britain and Ireland, was educated at Wellington College and at Victoria University College, where he completed his M.Sc., in 1930. Mr. Keys held a research scholarship at Massey Agricultural College where he investigated the biochemistry of wool production. He was then in private industrial employment until he joined the D.S.I.R. in 1936. Prior to his appointment as Government Analyst for Otago and Southland in 1945, Mr. Keys worked on many topics in the Dominion Laboratory in Wellington. He was engaged on, among other things, fruit storage, nutrition, vitamins and various defence projects.

Until he came to Dunedin, Mr. Keys was President of the

New Zealand Association of Scientific Workers. He was also secretary of the original committee appointed by N.Z.I.C. to place before the Government remedies in enactment of the Medical Advertisements Act, 1942. Mr. Key's special interests are in foods and drugs and in forensic science and toxicology.

PLASTIC OPTICAL MATERIALS.

In an address to the Institute of Physics, Dr. D. Starkie of the Optical Development Department of Imperial Chemical Industries Ltd., discussed the properties of plastic materials for optical purposes, a development of great interest to chemists.

Two plastics are in common use in Britain as optical materials, polymethyl methacrylate ("Perspex") and polystyrene. These optical quality plastics are sold as sheet or blocks as "Transpex" 1 and 2 in areas up to 4 ft. by 3 ft. and thicknesses up to 3 inches. Much research has been carried out on the manufacture of the materials, showing that higher purity than is necessary for normal commercial purposes, improves the optical quality. High purity and new manufacturing methods led to an increase in the softening point and in haze resistance, the elimination of strain, and a big improvement in optical homogeneity. The two materials can now be regarded as first class optical materials, Transpex 1 corresponding to normal crown glass, and Transpex 2 to flint glass. Their light transmission values are high in the visible, the limit of transmission in the U.V. is close to 2900 A°, lower than for glass, and they have a high transmission for photographic infra-red rays. Transpex 1 is unaffected by continuous exposure to sunlight, but a minute colour change has been reported for 2 after several years exposure. The refractive index can be maintained accurate to 0.0001 from batch to batch, a factor of some importance for high quality optical components.

The low density compared with glass can result in a considerable saving in weight, especially for instruments containing massive prisms. The tensile strength is adequate, but a lower modulus of elasticity than that of glass requires care in mounting and careful selection of thickness, especially when the components are to be used at elevated temperatures. Scratch resistance is low compared with glass, though higher than that of commercial grades of Perspex and polystyrene. Standard tests show the scratch resistance is close to that of aluminium, and elaborate precautions are not needed in cleaning the surfaces. Scratches on glass surfaces have broken edges and the light scattering area extends well beyond the boundaries of the scratch, whereas a scratch on Transpex is simply a depression in the surface and light scattering is confined to

the actual area of the scratch. Still the scratch resistance is undesirably low, and surface hardening is being investigated with promising results.

There is a general impression that plastic optical components are limited in use to temperatures not much higher than room temperature. The softening point (Vicat Needle test) for Transpex 1 and 2 is 120°C. The important temperature is the maximum at which use for indefinite periods is possible without distortion. Manufacturing methods which obviate any trace of strain have produced components which have been held at 100°C without measurable change of form.

Thermal conductivity is lower and thermal expansion coefficients higher than for glass. Care must be taken in designing certain instruments and in extreme cases it is preferable to incorporate thermal compensating devices. A whole range of constructional plastics is available for use in building such devices.

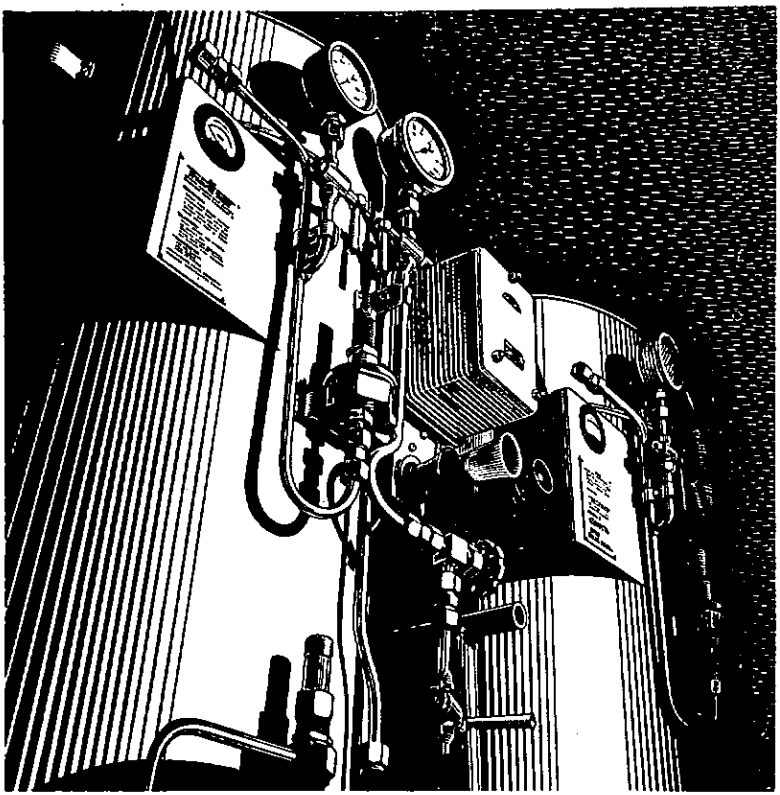
The two materials can be sawn, drilled and turned with normal workshop equipment. The most convenient method of holding a component during machining is by means of a vacuum chuck, the face of which is conveniently made of the same material as the component to avoid scratching if any sliding adjustment is required. Optical components can be made by normal glass working methods, in rather less time than using glass. Low spindle speeds must be used during smoothing and polishing. Two methods of manufacture are in use, compression moulding between optically worked stainless steel moulds, and polymerisation of the plastic in an optically worked mould. If the necessary accuracy can be obtained, reproduction from a mould has many attractions, such as speed and hence cheapness of manufacture, reduction in the large price difference between small and large glass components, and the production of relatively cheap aspheric components. Imperial Chemical Industries have developed a "surface finishing" process which reproduces from a mould optical parts having an accuracy comparable with that of first class glass components. If plastic optical materials are applied intelligently, with due regard for their limitations, they should make a big contribution to advancement in the field of applied optics.

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

Correspondence should be addressed to Dr. H. N. Parton, Canterbury College, Christchurch.

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

Mountain to Mohammet



About 30 years ago, chemical engineers succeeded in making ammonia direct from its constituent gases, nitrogen and hydrogen. The ammonia cracker, illustrated here, reverses that process. In doing so, it has removed the biggest problem facing users of hydrogen—the difficulty and cost of its transport. Previously, hydrogen had to be conveyed in heavy steel cylinders which held only a very small quantity, even though the gas was highly compressed. Today, hydrogen is transported as liquid ammonia, which the cracker easily breaks down into its original elements when required. Not only is ammonia easier to liquefy than hydrogen, but it takes up so much less space that a cylinder of liquid ammonia contains more hydrogen than a similar cylinder of the gas itself! The hydrogen obtained by cracking ammonia is the purest commercially available. This, and the ease with which it can be transported as ammonia, has led to cheaper and better ways of producing radio and television valves, nylon, gold and stainless steel wires, and parts of scientific instruments, aircraft, and petrol engines. The ammonia cracker shows not only how one chemical development leads to another, but also how achievements of the British chemical industry lead to advances in the wide range of other industries it serves.

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