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OF THE
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OF THE
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CONTENTS.

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EDITORIAL

We have noticed a curious reluctance on the part of our members to indicate publicly their professional relationships as Fellows or Associates of this Institute. Permission is given under Article 10 of our Rules for Fellows and Associates to use the letters F.N.Z.I.C. or A.N.Z.I.C. after their names—a privilege conferred in public recognition of the attainment of prescribed qualifications—and these letters are indicative of a definite professional status in our community. In this connection it is appropriate to quote from our Rules some of the objects for which the N.Z.I.C. was established: 3 (b) "To raise the status and to advance the interests of the profession of chemistry and of those engaged therein. . . (d) To promote honourable practice . . . (e) To admit . . . a member . . . and to confer on him such rights and privileges as may be determined . . . (j) To award certificates . . . and to provide for the registration of holders of certificates of the Institute and to obtain power to grant legally recognised certificates of proficiency . . . (l) To promote the progress of chemistry and the welfare of those engaged in its study and practice."

The conferment of a degree upon a person by a University certifies to the attainment of a recognised level of training or culture: the use of certain letters by members of the learned societies and professional bodies serves a similar purpose. It is a useful custom—the hall-mark of an individual's worth or standing, whether it be M.A., K.C., F.R.S., or A.N.Z.I.C. Nearly all people entitled to use such descriptive devices do so to greater or lesser extent: greater in matters directly related to their profession.

Recently, on perusing a public document containing the names of the members of the Council of the chief scientific organisation in the Dominion, we were frankly surprised to note that, although four out of ten were members of our Institute, no indication thereof was given among the assortment of letters following their names. Probably the omission was a mere oversight, but would a Ph.D. be overlooked? The same omission will be frequently observed elsewhere.

Our burden, therefore is this. The value of the letters which designate our members as Fellows or Associates of the Institute is either great or small. If they are worthless, the N.Z.I.C. should be wound up, or, if they have as yet insufficient meaning, their value should be enlarged by loyal and diligent service to chemistry in New Zealand. If this designation, however, has a real value, members should surely feel some degree of obligation (apart from privilege) to use it in their professional activities. Thus can a further contribution be made in consolidating the standing of the Institute to which we belong. It is a personal matter.

* * *

In connection with the recent proposals to increase the rate of subscription to the Institute, notice of motion has been given for the subject to be discussed at the January Conference. It has been suggested that this must be done in order to meet the increased cost of Council's decision to publish the *Journal* in quarterly numbers, but there are other considerations which are probably more important than this. Our policy is to make the *Journal* nearly self-supporting by the increased acceptance of advertisements from approved firms; at all events, it can, by these means, become a relatively smaller item in the total annual expenditure of the Institute. This can only be achieved, however, to the extent that members co-operate by patronising our advertisers and mentioning the *Journal* when ordering.

Apart from this, there occur to us other reasons why the Institute should have more funds at its disposal. Our Council meetings have in the past been conducted chiefly by proxy—a procedure that can never be entirely satisfactory. It is reasonable that a larger number of Council meetings should be attended by the delegates who are actually chosen by the branch members and who can therefore accurately interpret and discuss the feelings of their Branches in determining the affairs of the Institute. Obviously this involves a considerably increased allocation for travelling expenses. Further, as the functions of the Institute expand, secretarial and similar costs must rise in the interests of efficient service; probably paid assistance to the President and General Secretary will be found necessary in the not distant future.

Again, funds are needed for the general purpose of safeguarding the status of the profession. This need is illustrated by the necessity for obtaining competent legal advice in matters such as the Registration Bill for Chemical Practitioners. We understand that lack of funds was a deciding factor in the delay and subsequent shelving of this issue.

We are not here concerned with surveying all the reasons in favour of increasing the annual fee, but without being prodigal, the Institute must needs have sufficient funds if it is to achieve the purposes for which it was established, namely, to advance the science and practice of chemistry and the welfare of its practitioners. The present annual subscription is scarcely greater than an evening at the theatre.

A MESSAGE FROM THE PRESIDENT.

"By the time this issue of the *Journal* is received by members we will be at the commencement of the hundredth year since the official settlement of New Zealand by British people and the year will be one of active preparation for the celebrations to mark the Centenary. It is expected that nearly all the businesses and professional organisations will make some contribution towards making the celebrations a success. During the early part of 1940 many conferences have been arranged to take place in Wellington and it is expected that there will be a large influx of people from overseas to take part in these conferences. Our Institute should not be lacking in making some preparation and it is my wish that we should issue a special publication dealing with the part that Chemistry has played in the development of this country. Members will, I am sure, realise what an important part Chemistry has played in the basic industries of this country and we should take this opportunity of bringing this before the general public and by doing so we will also help to put our Institute "on the map." The type of publication I have in mind would consist of short articles dealing with the development of the mining, agricultural, freezing and dairying industries, as well as articles on such subjects as our food laws, etc.

"At our last conference there was some considerable discussion on the question of the *Journal*. There was a suggestion that the publication should be abolished and another that a news letter type of publication be instituted to replace the *Journal*. At a subsequent meeting of the Council the matter was very thoroughly discussed from all angles and it was decided to publish the *Journal* in four parts per annum. The present issue is the fourth of the series and I think members will agree that they are very creditable publications for a body so small as ours. In view of our scattered membership I am sure the majority of members will agree that some sort of *Journal* is most desirable if we are to keep touch with the activities of the Institute. They afford a means of letting branches know what other branches are doing and, more important still, they afford the only means of keeping country members in touch with the activities of the Institute. Members will be interested to know that considerable interest has been taken in some of the articles appearing in our *Journal* by overseas chemists and requests for a regular supply of issues have been received from many foreign countries.

"The activities of the Institute are severely handicapped by reason of limited finance and members should be prepared for an increase in the subscription. Everyone will, I think, realise that the present subscription is very small and in no way compares with the subscription paid by members of other professional societies.

"Another matter which will require serious consideration is the question of providing facilities for an examination for the Associateship, more especially for trainees in country laboratories. At the present time we have many large well equipped laboratories away from the main educational centres and it should be one of the functions of the Institute to provide facilities for workers in such institutions to qualify for the Associateship. A further step will be to approach employing authorities in order to have the Institute's qaulifications recognised.

"If the Institute is to play its part in the life of the community it must have the wholehearted support of its members. To many of us there is no individual gain in being a member of the Institute but we must take the broad view and remember that it is for the profession as a whole that we are working. Members will have noted from the Annual Report that cases have been investigated where it is considered that inadequate salaries have been offered or are being paid to fully qualified chemists. The Council considers this an important matter and are keeping a close watch on the question of salaries being offered for responsible positions. Just recently a University teaching position in another profession has been advertised at a salary of £2000 per annum. If such a salary is considered necessary in this case surely the salaries offered to the members of a profession which is at the very foundation of the prosperity of our country are in many instances totally inadequate.

"I cannot conclude without paying a tribute to the valuable work which is being done by our Hon. General Secretary, Mr. T. A. Glendinning, the Publications Committee, our Hon. Editor, Mr. O. H.

Keys, the Branch Chairmen, and Hon. Branch Secretaries. I take this opportunity of wishing members a prosperous and happy New Year."

A MESSAGE FROM MR. NEVILL L. WRIGHT.

The following message has been given, at our request, for publication to our members by Mr. Nevill L. Wright, F.I.C., D.I.C. Mr. Wright, who is the Scientific Liaison Officer attached to the office of the High Commissioner for N.Z. in London, is a New Zealander and arrived here in the middle of December to spend a few months in the Dominion.

"Ten years have passed by since I had the pleasure of attending a function of the Institute of Chemistry in New Zealand. Since then a separate organisation—the New Zealand Institute of Chemistry—has been set up. At the time the development was viewed with concern by the parent body in England, but with the passage of time the usefulness of a separate organisation appears to have been demonstrated and the new infant has developed into a lusty, reliant and progressive manhood. I hope sincerely that close and cordial association is being maintained with the parent body which exerts a powerful and beneficial influence in the world of science and especially in regard to the status and future of chemists.

"Ten years have witnessed important developments in the organisation of science to solve the problems of our wonderful country. Prior to its decease, the Empire Marketing Board, with which I was closely associated, through its grants to research institutions in the Dominion, provided a powerful stimulus to the creation and development of research organisations.

"The major part of the organisations created in this way have become permanent and are playing an important and increasing part in strengthening the culture and economic structure of the country. Indeed such organisations as the Plant Research Bureau, the Dairy Research Institute, the Cawthron Institute, the Wheat Research Institute, the Leather Research Association and the Fruit Research work have already established a world-wide reputation. Now grassland research, soil surveys and dairy research in particular are in the very front rank and are making important contributions to the pool of knowledge. The influence of such work extends far beyond the merely national sphere, because it shows the world at large that our people are not only efficient in production of material wealth, but capable of producing the stock which is assisting in solving the problems of mankind, and in promoting the happiness of all.

"This is a time of international unrest and national difficulties, but the problems confronting us all provide a grand opportunity for initiative, resoluteness and general co-operation. The limitation of markets for our primary products means at present that the potential resources of this wonderful country cannot be fully exploited.

"Personally I believe that the time is long overdue for a systematic, careful and efficient development of sound new primary and secondary industries. In addition, there is a strong case in favour of the rationalisation and development of already existing secondary industries. The present time provides an opportunity which may not soon recur for such a development. Much can be done in direct co-operation with Great Britain and our sister dominions.

"One of the most important requirements in such an extension of industry is the provision of sound technological guidance. Without it success would be impossible. I am convinced that in the years just ahead of us the chemists and their associated scientific colleagues in the Dominion have a great opportunity to make a major contribution to the sound development of our joint heritage. We can depend upon the co-operation of scientific bodies overseas in providing guidance and assistance. In thus facilitating such co-operation I hope to play my small part, but the main burden will fall on you and your colleagues in other branches of science in the application of science and technology to our own needs.

"I hope that the New Year will bring some lessening of the tension and fear of war and the development of the spirit of co-operation and friendship for which all are so earnestly longing."

OBITUARY.—As we go to press, we regret to record the death of Dr. J. S. Maclaurin on January 19th, at the age of 74 years. Dr. Maclaurin retired from the office of Dominion Analyst in 1931.

NOTES AND NOTICES.

Chemical Symbols and Abbreviations.

There has just arrived in New Zealand a British Standard entitled *Chemical Symbols and Abbreviations* (No. 813—1938) issued in October. This standard list is based upon the Report of the Joint Committee to which attention was drawn in our September issue, but is far more comprehensive and contains everything the chemist is likely to require. The specification, which occupies 35 pages with an excellent double index (of Terms and Signs) costs 3/6 in England. No doubt it will shortly be adopted as a New Zealand Standard and copies will be available from the N.Z. Standards Institute. The chapter headings are as follows: Greek Alphabet; Mathematics; Physical Constants; Subscripts and Modifying Signs; General Physics and Chemistry; Heat and Thermodynamics; Electricity and Magnetism; Optics; Units; Elements; Organic Radicals; General. As a broad indication of the contents, a few examples are given here—Grain (gr.) is distinguished from gram (g.); the symbols Ac, Me, Et, Pr, Bu, Ph and Bz are recognised for the radicals acetyl, methyl, ethyl, propyl, butyl, phenyl and benzoyl respectively; the element-names glucinum, celtium, columbium and niton are declared to be obsolete; fractional normalities are written as, for example 0.1N. and *not as vulgar fractions;* pH is written in that way only. There are official abbreviations of common expressions such as p.p.m. (parts per million); mol (gram molecule); A.V., I.V., S.V. (acid, iodine-, or saponification-values); sp. gr. (specific gravity—*not* s.g.); and many others are now uniformly recognised.

Authors and others are requested to note that these abbreviations will be used as standard practice in this *Journal* in future.

*   *   *

We have received from the Central Agricultural and Scientific Bibliography ("C.A.S.B."), lists of the bibliographies issued up to September, 1938, in Section 1 (*Agriculture and Allied Industries*) and Section 5 (*Industrial Chemistry and Physics*). Among the many subjects covered may be mentioned: Acid-proof cements; Preservation of fresh pork and bacon; Metallisation of surfaces; Plaster boards; Composition and properties of casein; Reclaiming used lubricating oil; Artificial wool from casein; Asbestos; Synthetic plastics for binding abrasives; Lacquering of tins for canning; lime kilns; Derris and rotenone; Winter washes for fruit trees (tar distillates); Dry disinfection of seed; Pasteurisation; Insecticides, etc. The examples we have seen are excellent compilations. Existing bibliographies will be brought up-to-date from time to time and care is taken to select matters of general interest to those engaged in industrial work in all branches. A few particulars are available from the Editor or full details may be obtained from the Secretary, C.A.S.B., Science Museum Library, South Kensington, London, S.W.7.

* * *

Members are reminded of the offer made in the September issue to obtain binding cases for their copies of the *Journal*. Orders to hand so far are well behind the minimum number necessary to obtain the concessions offered and, unless the proposal is to be abandoned, early application to the Editor is now necessary.

It has been suggested that, during and after the 1939 session, lecturers at Branch meetings should be asked to hand in either a précis or full manuscript of their addresses to the Branch Editor or Secretary. This is best mentioned to the lecturer at the time of fixing the date of his paper. Not only will such a course save extra work and ensure earlier publication, but it will also safeguard the lecturer against possible errors of fact or emphasis in reporting the lecture.

We greatly regret the resignation of Mr. L. R. L. Dunn from the Publications Committee, owing to pressure of other work. This opportunity is taken of expressing thanks for his solid and willing efforts on behalf of the *Journal* and the hope that he may soon be able to rejoin the Committee.

During 1939 and thereafter, it is desired to publish either a list or brief account of the various chemical researches in progress at the constituent colleges of the University of New Zealand and at other institutions. All who are engaged in, or in contact with, such work are requested to furnish the Publications Committee with the necessary details so that the several workers may thus be placed in closer touch with each other.

With regard to the proposed alterations in the Rules which have been discussed by the Branches, Council has handed the report of the Rules Committee to Messrs. W. A. Joiner and R. E. R. Grimmett who are now finalising the proposals.

As this issue completes Vol. 3, Fellows and Associates who have not received a copy of any previous number should inform the Editor without delay. Members whose addresses are incorrectly described in their copies of the Register, or who have recently changed their addresses, are urged to make notification to that effect; otherwise, no responsibility can be accepted for non-arrival of the *Journal*.

* * *

Associates Elected.

H. L. Longbottom (Otago).
R. L. Munro (Wellington).

CORRESPONDENCE.

(To the Editor).

Sir,—

I should like to draw the attention of your readers to the fact that the next Science Congress of the Royal Society of New Zealand is to be held at Wellington in 1940 as a portion, and, as far as New Zealand science is concerned, perhaps the most important portion of the Centennial activities.

The Royal Society has asked its Wellington branch (The Wellington Philosophical Society) to make all the necessary arrangements, and feels confident that those arrangements will be satisfactory to all concerned. The actual date of the Congress has still to be determined, but it is almost certain to be in May, 1940, probably immediately after the closing of the Centennial Exhibition so that visiting scientists may be able to visit the Exhibition and also attend the Congress without undue loss of time. It is proposed to run the Congress through a week-end in order to give a real opportunity for various social gatherings.

As usual, the work of the Congress will be carried on in sections and, as chemistry will be an important member of the physical sciences section, it is to be hoped that all members of the N.Z.I.C. will make a point of taking an active part in the work of that section.

I should like to recommend, before it is too late, that the 1940 Conference of the Institute of Chemistry of Great Britain and Ireland, and the New Zealand Institute of Chemistry, be held at Wellington, and in May, during the Royal Society Congress, instead of in January. The change of date could, I fancy, be made without great difficulty by the Councils concerned, and the change, implying as it would the co-operation of the chemists, would, I know, be greatly appreciated by those responsible for the more general Congress.

If the chemists of New Zealand hold their meeting in January they will probably read all their best papers then, and feel that they have not sufficient time to write others before May; while, if they meet in May, and are good enough to read their papers before the Chemistry Section of the R.S. Congress, they will certainly have a much larger audience, and will do much towards ensuring the success of a Congress in which they must be interested.

If my suggestion as to date is adopted, may I make the further suggestion that the Council of the Institute of Chemistry should arrange for one or two discussions on subjects of general interest to chemists, and place the leaderships of such discussions in the hands of those who appear most fitted to assume them.

A review of "Chemistry in New Zealand during the period 1840-1940" would also be well worth the trouble involved in its preparation.

W. P. EVANS, F.N.Z.I.C.,
President, Royal Society of New Zealand.

Wellington,
9th December, 1938.

SOCIAL SCIENCE RESEARCH.

In view of the rapidly-increasing interest in many countries in the social relations of science, some notes are here given regarding the Social Science Research Bureau in New Zealand. It may be mentioned that the British Association for the Advancement of Science is creating a new Division to deal with this question whilst the American Association is understood to be acting in a similar direction. The International Council of Scientific Unions has appointed a Committee on Science and its Social Relations (C.S.S.R.) which is to report to the International Council in 1940 covering " (1) the meaning of scientific research . . . not only in the philosophical sense, but also in the sense of the set if ideas with which the public is operating; (2) the influence of the applications of scientific work upon human society, the transformations that are induced by it, and the adaptations which are required in consequence; (3) reactions of human society on scientific work." A discussion and most interesting questionnaire from the C.S.S.R. is published in *The Australian Journal of Science*, October, 1938, and the problem is also the subject of an editorial in *Nature* of 29th October, 1938. One paragraph of the rather lengthy questionnaire referred to is specially commended to the thought of our readers: " Are there in your country scientific organisations, or organisations of scientific workers, which consider it as belonging to their task to enlighten the public with regard to the meaning of scientific work for the future of humanity, to the allegiance to truth which it must observe for the fulfilment of its purpose and the measure of freedom which scientific work must therefore enjoy."

The Social Science Research Bureau of the Department of Scientific and Industrial Research was established for the purpose of co-ordinating and promoting social and economic research in New Zealand. Besides attempting to stimulate interest in this type of research and to encourage appreciation of its significance, the Bureau, which comprises experts in various fields of science and a technical staff, has conduced its own investigations and has had remarkably good results from them.

On all occasions the Bureau's staff has attempted to assist the many enquirers who are engaged in social or economic research, and has supplied an information and advisory service not only for them, but also for members of the community who desire information on certain problems in which they are interested. Many requests for advice and information have been received from various social welfare organisations and the Bureau hopes that ultimately one of its functions will be to act as a clearing-house for the many projects which research workers undertake. A good deal of information regarding the organisation of social and economic research in this country has been supplied to overseas bodies which have shown considerable interest in the new work. This is particularly so of Canada which is investigating the question of establishing a similar Bureau under the aegis of the Dominion Bureau of Statistics. It is also interesting to note that a National Institute of Economic and Social Research has been set up in England since the establishment of the New Zealand Bureau.

Apart from this information and advisory service which has formed so far only a small part of its work, the Bureau has carried out several important research projects, chief among which is that dealing with standards of life of rural and urban communities. Whole-hearted co-operation has been received from the men and women concerned in these investigations, and now that the field work is almost completed, it may be confidently stated that this survey will produce really worthwhile results. A significant feature of these enquiries was the attitude of the people visited. The field workers, far from meeting with hostility, since these surveys necessarily require many intimate details of living expenses, etc., were generally welcomed by the people, whose appreciation of the purpose of the surveys was already highly developed. There can be no doubt that the material collected will prove invaluable not only in regard to cost of living analyses, but also for such purposes as assessing the incidence of taxation, both direct and indirect, consumption habits and changes, medical and other expenses, time lost at work, actual income received, and so on. Every person will appreciate the need for accurate information on these matters, which are only some of the subjects covered by this survey, since they lead to a proper understanding of our industrial, social and economic problems and help to provide a satisfactory basis for policies designed to improve standards of life.

Another important problem into which the Bureau has conducted an investigation, is that of nutrition. For the purpose of studying some matters connected with this question a grant was made to a special Nutrition Committee comprising Professor Malcolm, Dr. Elizabeth Gregory and Dr. Elizabeth Gunn, and a full-time officer was employed to make an enquiry into the adequacy of New Zealand dietaries. This work will form part of the survey of standards of life and is now in progress. A portion of the work, dealing with minimum adequate low-cost dietaries has been completed and is ready for publication.

Perhaps the most vital problem facing the Dominion, and into which the Bureau will make a full enquiry, is that concerning population. A sum of money has been placed on the Supplementary Estimates to enable an investigation to be made into the whole question of population trends, the declining birth rate, changing age composition, immigration, and so on, and of the implications of probable future trends for our whole national economy. There can be no doubt that such an enquiry will assume a role of great national importance. The preliminary plans for the organisation of this project have been drawn up and it is hoped that the work will be started within the next few months.

The general progress of the Bureau during the short period of its existence has been highly satisfactory, and it is indeed gratifying for those connected with it to know that such a keen and whole-hearted response has come from the people whose co-operation has been essential for the success of its work. Already there is a great demand from the public for research of this nature, and the reception given to the field staff is indicative of a full appreciation of the value of the work and of a desire to see it carried on.

NEW FOOD AND DRUGS LEGISLATION.

Within recent months there were passed, in England and America, two Acts of considerable importance to chemists. These were the Food and Drugs Act, 1938, in the United Kingdom, and the Foods, Drugs and Cosmetics Act in the United States. We are informed that Canada has also taken similar and vigorous action.

Of these the former is mainly a consolidation Act, including legislation dating back to the 16th century. It does, however, introduce several new principles and important modifications of old ones. While the Act prohibits the sale of a drug " not of the nature, substance or quality of the drug demanded by the purchaser," it shall be a defence for the defendant to prove that the article supplied was a proprietary medicine, *and was supplied in response to a demand for that medicine*. Wide scope is given to the Minister of Health for the framing of special regulations concerning the preparation, transport, storage, and sale of food. The most radical innovation in the Act however, is the introduction of the principle of advertisement regulation. Not only is it unlawful to give with any drug a false or intentionally misleading description, but further " any person who publishes, or is party to the publication of an advertisement . . . which falsely describes any food or drug or is otherwise calculated to mislead as to its nature, substance or quality, shall be guilty of an offence." It is admitted as a good defence to the charge if a person could not reasonably have known that the advertisement was of such a character, while newspaper proprietors and advertising agents are excluded from liability as being persons "whose business it is to publish, or arrange for publication of, advertisements." Onus of proof *lies on the defendant* to show that he could not reasonably have known or ascertained that the statement was false.

The new Act passed in the United States goes much farther than the old law—and the English Act also—in that it demands informative labelling in the interests of the consumers, in addition to the prohibitions against mis-labelling in the old statute. Furthermore, it extends its scope to include cosmetics, therapeutic devices, and certain drugs that formerly escaped regulation. Its provisions include prohibition of traffic in foods injurious to health; requirement of labelling for special dietary foods to inform purchasers of their vitamin, mineral and other dietary properties; requirement of labelling of non-official drugs to list the names of active ingredients; and the elimination of the necessity of proving fraudulent intent on the labels of patent medicines. Thus under the new law any such medicine proved to be worthless may be removed from the market. The cosmetics section defines a preparation as adulterated if it contains any substance which may render it injurious to users under such conditions of use as are customary. (Use of paraphenylenediamine, which may cause serious eye injury, in eye-lash preparations, is an example of such adulteration). Cosmetic preparations in America must now work the magic which is claimed for them, or incur penalties under the misleading descriptions clause.

Comparison of the English Act with the American statute is of greatest interest in relation to this question of false claims in advertising. In America an offence is constituted by making a false claim, whether with or without fraudulent intent; in England it is still necessary to prove that a false description of a product is a deliberate mis-statement. Claims for any preparation that it will cure baldness, remove wrinkles and freckles, restore whiteness to teeth, or cure pyorrhoea are examples of misleading statements that will in future be illegal. All preparations for the skin or for mouthwashes must be absolutely antiseptic, while claims for cosmetics by virtue of hormones or vitamins which they contain are also prohibited.

One inference from these enactments is of great importance to manufacturing chemists in the industries concerned; it will now be incumbent upon them to see that advertising agents do not unwittingly make false statements in regard to their products. In the British Act there is also provision made for appointment of more Public Analysts, on a population basis, and for a more equitable basis for remuneration of analytical services.

Provided that this legislation can be effectively put into operation, it should be of distinct merit to the public of Britain and America, by improving the standard of food supply and by suppression of fraudulent aggrandisement of inferior products. The layman's semi-mystic veneration of the conventional scientist makes him more susceptible to the lure of "frank" advertisements that flatter him with sugar-coated pseudo-science. The reputable scientist will welcome these changes insofar as they make his labour of increased utility to the community and curb malpractices which bring his profession into disrepute. Similar action is necessary in New Zealand, where, despite the high average standard of education, the public remains particularly gullible on scientific matters.

In this connection may well be mentioned the growing worship, in New Zealand, of diet-fads which, in our present knowledge of nutrition may often be in themselves more harmful than beneficial, as well as creating the risk that serious organic disease needing medical treatment may be made worse when ascribed to quite incorrect dietary causes. Such perversions of science cannot well be treated by statutory regulation, they must be removed by increasing the scientific knowledge of the community. This is no easy task, but it does come within the scope of bodies such as the N.Z. Institute of Chemistry, and is a duty of each individual scientist. More than all, however, it is time for considerable improvement in the standard of scientific journalism in our newspapers, since these remain the chief instructors of the community.

For those readers who desire further information on these new enactments, together with certain decisions already reached under the American law, the following references are appended:

Ind. Eng. Chem. (*News Ed.*), 1938, *16*, 376 (July 10) ; *Perf. Ess. Oil Record*, 1938, *29*, 258 (July) ; *ibid.*, 301 (Aug.) ; *Chem. Age*, 1938, *39*, 114 (Aug. 13) ; *Mfg. Chemist*, 1938, *9*, 311 (Oct.) ; *J. Proc. Inst. Chem.* (*Gt. Britain and Ireland*), 1938, Part V, 376 (Oct.).

SOME ASPECTS OF STANDARDISATION.*

ALAN S. PRIME.

It is unfortunate that standardisation conveys to many the idea of regimentation mediocrity. The aim of standardisation, however, is simply to bring some order out of what is at present productive chaos. The Carnegie Institute has defined a standard as simply " a carefully thought out method of performing a function or carefully drawn specification covering an implement, or some article of stores or of products." Standards become of vital importance in mass production and heavy industry generally.

Modern advertising has produced a sales psychology which imagines worth to be in exact proportion to the extent of the seller's advertising campaign. The main object of standardisation may be set out as follows:

(1) The elimination of unnecessary types, sizes and qualities produced for one and the same purpose; (2) The fixing of dimensions of component parts where interchangeability is necessary or desirable; (3) The setting up of standards of performance and design to ensure safety and facilitate comparisons; (4) The definition of quality minima. This further involves the standardisation of testing methods which itself depends on the standardisation of testing apparatus.

Standardisation stabilizes industry by making it safer to manufacture for stock, thus promoting continuity of employment of labour, capital and management. To the buyer standardisation brings economies which large purchases achieve by buying to their own specifications. Standardisation by temporarily fixing quality and quantity tends to promote the mass production of the commodity concerned and has the further advantage of placing all manufacturers and sellers on an equitable footing.

The outstanding advantages of standardisation may be summarised as follows:

To the Producer:

(1) Less capital tied up in slow moving stocks; (2) More economical manufacturing due to simplified inspection requirements, continuous production, less stock to handle and reduced clerical overhead; (3) Larger units of production and less special machinery.

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*Condensed from a lecture delivered to the Wellington Branch.

To the Merchant:

(1) Increased turnover and less capital tied up in slow-moving stock; (2) Concentration on quick-selling lines; (3) Less capital invested in stocks and repair parts; (4) Less storage space; decreased overhead and handling charges.

To the Consumer:

(1) An assurance of products of reliable quality; (2) Better service in delivery and repairs; (3) Reliable and constant source of supply; (4) Interchangeability of articles and parts; (5) Ability to compare tenders on a common basis.

Immediate advantages accrue to the manufacturer and merchant, but the consumer ultimately benefits by obtaining a better service or article at a less cost. Standard specifications minimise the cost of tendering and make for accurate definitions of terms which thus avoid all misunderstandings in commercial transactions. Standards further, are only temporary and should be revised from time to time. They are merely the result of an attempt to eliminate expenditure of unnecessary industrial effort and to concentrate on essentials. Dr. John Gaillard points out that while research constitutes the most essential means of advance to the territory of the unknown, standardisation consolidates the position after the advance has been made.

Records of early examples of standardisation are contained in the Bible, *e.g.*, " Thou shalt not have in thy bag divers weights a great and a small, but thou shalt have a perfect and a just weight and a perfect and a just measure thou shalt have, that thy days may be lengthened in the land which the Lord thy God gave thee." (Deuteronomy, 25—13-15). These are what may be termed fundamental, rather than industrial standards.

The distinguishing mark of modern civilisation is power. The control and use of vast accretion of natural power was initiated by the Industrial Revolution. It was said that when King George III. visited the Soho Foundry of Messrs. Bolton and Watt he asked Bolton what he had to sell and the answer was "I sell, Sire, what all the world demands—power." Then every single nut and bolt had to be made by hand and Bolton succeeded where Watt had not, for here his practical genius realised the advantage of standardisation.

In 1840 Sir Joseph Whitworth strongly advocated the use of the uniform series of screw threads and later the Whitworth thread was adopted as standard. A story is told of the building of the Severn Tunnel. Owing to an error a door was left open, and the workings were flooded, the water rising 40ft. in the shaft. A diver went down time after time and after a terrific struggle closed the door. Realising that a certain valve should also be closed he located it and, as he thought—closed it—actually he opened it, the direction of rotation being the reverse of normal. Standards would have prevented this.

In the early days of electricity supply, lamp bases were made in over 180 different sizes and styles, so that new lamps would frequently not screw into old sockets. To-day in New Zealand it is through the standardisation in England of the dimensions of the bayonet socket and further, of our own Electrical Wiring Regulations that one type of socket only is obtainable and the householder has been saved much annoyance and trouble, and in the aggregate, the community has avoided what would otherwise have been unnecessary waste.

Standardisation of dimensions for interchangeability have in many cases grown quite haphazardly through the result of a new product being launched by a large firm, so that others fall into step. One example is the 35mm. motion picture film. There the influence of large scale advertising has succeeded in establishing one particular type firmly in the market. Standards are issued covering nomenclature, definitions of technical terms, contracts and other technical works, symbols for quantities used in equations and formulae, and graphical symbols.

In New Zealand Standards relating to safety are issued and administered by the Government Department concerned. For example, the Health Department controls the sale of Food and Drugs, the Marine Department controls the installation and operation of many kinds of machinery, and the Electrical Wiring Regulations are responsible for the safe installation of electric power in our homes. It has been desired that these very Standards should be standardised as safety codes, e.g., Building Codes and Highway Codes should be brought into line with those overseas, and if possible, a common Standard agreed upon.

Dr. Charles B. Dudley, a pioneer in the field of Standards, has said that a complete workable specification for material represents a very high order of work. This should be noted, as standard specifications for the quality of materials are the direct result of long years of research, and embody in themselves the fruits of that research, and provide the consolidation from which further research may proceed.

It is not until specifications are agreed upon by all affected interests from the purchaser of raw materials to the ultimate consumer that it can be said that the specification is a Standard. In the drafting of a Standard it is imperative that the resulting specifications should be the most perfect that can be arrived at. Their formulation should not be subject to prejudice or bias. There is, however, one notable example of this in the history of standardisation, when in 1905 the British Standard specification for steel for railway purposes was issued, it was provided that all steel should be manufactured according to the acid process. The basic process which Thomas and Gilchrist had developed was entirely disregarded with the result that it was taken over to Germany and as it was found that the basic steel was quite as good and somewhat cheaper than the former, huge quantities of German steel were sold to the colonies by Germany. Fortunately for England, this prejudice was recognised and the specification altered.

Standards are drafted for methods of testing, for where several methods may be employed results from research work would prove to be at variance. Therefore, there is as obvious a necessity for the standardisation of the process of testing as there is for the actual apparatus.

A different aspect of the standardisation of testing processes and apparatus is that relating to large tenders for materials. If tests differing in any small respect were employed, results would not tally and misunderstanding, loss and waste would result. Mass production demands frequent testing of the article in order to ensure that it does not fall below the required standard.

Dr. Shewhart of the Bell Telephone Co., U.S.A., by the application of statistical mathematics is able to show the exact place where sampling should be made. This valuable information enables the manufacturer to control his production with a minimum cost by eliminating much unnecessary testing. This corollary of standardisation carrying production to the realms of hyper-efficiency shows the exact time and place where a test should be made. It provides the article which at that given moment mathematical probability shows to embody the maximum degree of faulty construction and minimum quality.

In 1932 the British Standards Institution appointed a Committee which, in consultation with the well-known statistician, E. S. Pearson, brought out the valuable B.S.S. 600/1935, "The Application of Statistical Methods to the Standardisation and Quality Control." This publication shows how statistics may be applied in all branches of industry to determine how sampling should be carried out so that samples are truly representative.

Enormous demands made on industry during the Great War produced a curious result, e.g., in U.S.A. it was found that although one-quarter of the total man-power was absorbed wholly in war, the standard of living of the remaining 75 per cent. rose and that more goods were produced by the 75 per cent. remaining than had ever been produced before. The outstanding reason seems to be that during the war industry was forced to concentrate on essentials and not on a multiplicity of unnecessary fancy styles.

The Committee on Waste in Industry appointed in 1921 reported that the value of the output of manufacturing industries in the U.S.A. was approximately £12,000,000,000, and that approximately half of this enormous sum represented the loss in industry occasioned by waste of misdirected effort. One-third of this wasted effort was attributed to the lack of standardisation. In other words something like £2,000,000,000 or the work of one-sixth of the total man power of the U.S.A. was wasted due to lack of standardisation.

British Standards Institution:

In 1901, the Engineering Standards Committee was formed by the Institutions of Civil and Mechanical Engineers together with that of the Naval Architects and the Iron and Steel Institute. In 1902, the Institution of Electrical Engineers joined the above. It was estimated that the saving to the British steel trade was £1,000,000 a year or 5/- a ton on total output. The manufacturers found production more continuous and employment was stabilised.

In 1918, the name of the Committee was changed to the British Engineering Standards Association and incorporated with the agreement of the Board of Trade. The objects specified were:

(1) To co-ordinate the efforts of producers and users for the improvement of standardisation in engineering materials; (2) To prepare and promote general adoption of standards; (3) To register, approve, license and protect the mark of the Association; (4) To establish in foreign countries and the Dominions, local committees to further the objects.

The war provided great impetus to the movement and in 1929 a Royal Charter was given and the title again changed to the British Standards Institution. The four main divisional councils of the Institution are the Engineering, Textiles, Chemical and Building, each of which have large numbers of divisional committees and sub-committees totalling some 406 or more.

The drafting of many British Standards usually follows upon detailed research by the National Physical Laboratory. About 1903 a standard specification was issued for Portland cement. The cement industry had previously tendered to hundreds of specifications, many purchasers insisting on their own peculiar fads and fancies. Within a few years practically the whole production was manufactured to British Standard Specifications. This specification is an effective answer to those who consider that standardisation must necessarily mean rigidity and restriction of progress, for since the first specification was issued there have been numerous revisions and to-day the quality of cement is greatly superior to that of even 1918 quite apart from the earlier part of the century.

Other International Standardising Bodies:

In the closing years of the war, Germany, France, Switzerland and the U.S.A. all established standardising bodies. Belgium and Canada followed closely. An impetus was provided throughout the Empire by talks at the Imperial Conferences, 1926-1930, and in 1932 Mr. Le Maistre, the Director of the British Standards Institution, visited Australia, New Zealand and Canada preparatory to the Imperial Conference held at Ottawa in 1932.

The various International Committees ensure that the standards promulgated by National Standardising Bodies become where possible international standards, e.g., the International Committee on Weights and Measures, the International Commission of Illumination, the International Electro Technical Commission. There is also in existence an International Federation of National Standardising Associations representing nineteen countries but at the present time it does not appear that any countries within the Empire are associated with this movement. Lastly, there is the International Association of Testing Materials with headquarters at Zurich. A permanent committee meets twice a year and International Conferences are held at which papers are read discussing the testing of all types of materials.

New Zealand Standards Institute:

A few years after the war a local committee of the British Engineering Standards Association was set up in New Zealand. Due to lack of finance the Committee was not able to carry through any of its projects although in some cases comments from New Zealand were actually included in the final British Standard Specifications.

In 1935 Sir George Julius, one of the founders of the Standards Association of Australia, visited New Zealand on a health tour and further, discussed with the Hon. D. G. Sullivan, Minister of Scientific and Industrial Research, the possible co-operation between New Zealand and Australia concerning standardising and research problems generally.

The N.Z. Standards Institute receives copies of all proposed standards from other Imperial Standardising Bodies. Several draft specifications are sent to New Zealand and are circulated for comment to all interested parties. Drafts and comments are then referred for consideration by the appropriate committees of the N.Z. Standards Institute and all comments are sent to the originating body and an indication as to whether the proposed standards will prove suitable as New Zealand standards. The procedure of the N.Z. Standards Institute may be summed up as follows:—

(1) The adoption of British Standard Specifications wherever possible; (2) The adoption as N.Z. Standards of standards promulgated by other countries of the Empire, or if no such standards are available from other countries, such as the American Standards Association or the American Society for Testing Materials; (3) The promulgation in New Zealand of N.Z. Standard Specifications.

New Zealand is fortunate for it has the experience of the heavily industrialised countries at its disposal. Thus New Zealand could adopt standards and profit by the experience of other countries before industries come to that stage where confusion reigns and the need for standards is as imperative as the difficulty of their introduction. For the individual unit the capacity to earn can only be provided in terms of increased production and reduced production costs. For the community this means that with the limited markets immediately available efficient production is of vital importance and is and must be recognised as such by all branches of industry.

It will be seen from the foregoing that standardisation is a very necessary part of our industrial and social advancement. In the past the strength of standardisation has lain in the emphasis which has always been placed on voluntary co-operation and voluntary acceptance by the affected interests combined with a readiness to amend and improve specifications agreed upon as conditions change.

Standards should be regarded as a guide. They must be relative both to time and place, not absolute. British Standard Specification 161 for electric lamps has been amended and improved at least four times within the last five years. Standards properly conceived and properly designed do not stultify progress but they should be regarded as concentration points in the advancement of science in the interests of our civilisation. Uninterrupted progress, that is to say, continuous change, would use up too much energy and ultimately would be too exhaustive.

In the past standardisation has always been promoted by technologists. It is the *sine qua non* in mass production, which in many cases it makes possible by the concentration of production where before was chaos and diffusion.

THE BRANCHES.

AUCKLAND.

OFFICERS ELECTED FOR 1939: *Chairman*: P. R. Parr; Secretary: J. Ricketts, P.O. Box 36, Newmarket, Auckland, S.E.1.

Committee: L. H. Briggs, R. T. D'Anvers, F. H. V. Fielder, R. H. J. Stansfield.

Branch Editor: R. T. D'Anvers.

Papers read, 1938 session—

"The Scientist Goes Farming."—*Dr. H. E. Annett.*

"Water Purification."—*G. B. Jones.*

"Sewerage Schemes Abroad."—*K. M. Griffin.*

"Chemical Aspects of Plant Disease and Peat Control."—*Dr. G. H. Cunningham.*

"The Impact of Science on Industry and Society."—*Dr. E. Marsden.*

"Facial Eczema."—(General Discussion).

"The Brown's Island Sewerage Scheme."—*H. H. Watkins.*

"Pharmacy in Relation to Modern Science."—*W. K. Hounsell.*

THE SCIENTIST GOES FARMING—*H. E. Annett.* The lecturer stated that for successful experimental farming it is very necessary to maintain complete records of all stocks carried, milk produced, and crops raised, together with full details of fertilisers and weather. Far too many conclusions are drawn from visual observation in grasslands culture instead of relying on proper statistical methods. Many experiments are abandoned by farmers after being tried out for only one or possibly two seasons, whereas it often takes four or five years for the result of certain fertilisers to become evident.

An interesting feature of the address was a series of lantern slides showing various leaf conditions arising out of mineral deficiencies in the soil. The speaker then dealt briefly with the enzyme content of grasses and clover in relation to the flavour and fat content of the milk produced.

* * *

Some other papers have been recorded in the earlier issues of this volume of the *Journal.* The roll for the year ending 31st October stood at forty-four members, which includes nine "local members." Miss A. E. Lorimer and Messrs. G. B. Jones and G. S. Lambert have been transferred to the Wellington Branch.

WELLINGTON.

OFFICERS ELECTED FOR 1939: *Chairman*: A. D. Monro; *Secretary*: J. A. D. Nash, Dominion Laboratory, Sydney Street, Wellington, N.1.
Commitee: W. G. Hughson, K. J. McNaught, Miss A. E. Lorimer.
Branch Editor: F. G. Caughley.

Papers read, 1938 session—

"A Modern Conception of Diet and Public Health."—*J. Jephcott.*
"Distillation from a Chemical Engineering Standpoint."—*W. A. Joiner.*
"Lundegardh Flame Emission Method of Spectral Analysis."—*Dr. E. B. Davies.*
"Applications of Absorption Spectra in Chemical Analysis."—*Dr. F. B. Shorland.*
"Prospective Developments in the Manufacture of Coal Gas."—*H. Rands.*
"Recent Work on the Chemistry of Wool."—*Prof. F. G. Soper.*
"N.Z. Olivine Rocks as Refractories and Fertiliser Improvers."—*J. J. S. Cornes.*
"The Measurement of Fluid Flow."—*G. Maskill Smith.*

PROSPECTIVE DEVELOPMENTS IN THE MANUFACTURE OF COAL GAS—*H. Rands.* In the coal gas industry, progress is synonymous with research. The past and prospective achievements concern the conversion of any of the various types of coal into a reliable, convenient and cheap gaseous fuel. Reliability has been attained by the elimination of constituents which corrode or block pipes and appliances. Naphthalene stoppages have automatically ceased with the introduction of modern continuous vertical retorts. The problem of rusting has been solved by drying gas to a dew point safely below normal temperatures. Gummy deposits, where they occur, are a more intricate problem. It has been shown that they form in the vapour phase by the interaction of oxygen, unsaturated hydrocarbons and, specifically, nitric oxide, which if present to more than 0.05 p.p.m. may cause trouble. The compound formed in the vapour phase aggregates into suspended particles which, according to their size and other circumstances, are deposited at various more or less distant sections of the distributing system. The chemistry of the formation of the gum is only partly understood, but nevertheless good progress has been made with practical remedies. With big gas holders, the gas is held long enough to cover the important induction period of the reaction and most of the gum settles before the gas enters the mains. Solvents, absorbents, electrostatic precipitation and, as seen later, catalytic processes have also been tried as remedies.

The elimination of all organic sulphur compounds from coal gas is a problem whose solution research seems to have nearly reached. With the organic sulphur content below a very low critical value the consequent advantages include reduced corrosion of appliances, improved and extended industrial uses such as in heat treatment and bright annealing of metals, and in the melting of glass. The principal result would be the possibility of flueless appliances and nearly double the heat available to the consumer without discomfort. Advances have been made by passing gas over catalysts of nickel in various forms and compounds at different temperatures. Eventually with nickel sulphide as catalyst and at 150°C. not only are carbon bisulphide, carbon oxysulphide and mercaptans oxidised to CO_2 and SO_2, but also simultaneously NO, responsible for gummy deposits, is hydrogenated to ammonia. A semi-industrial trial plant has proved successful along these lines, the catalyst requiring no rejuvenation or renewal, and the objective appears to have been reached.

Present day gasworks practice produces from one ton of coal (representing 300 therms in an inconvenient form) 115 therms in the form of coke, 95 therms as gas, 18 therms as tar, and the remaining 72 therms are used up in production in various ways. With this high yield of coke rather than gas, manufacturers have long been discontented, but in the past no commercial process has been established which will convert coal with any approach to completeness into a gaseous fuel of suitably high calorific value. Recent research has revived interest particularly in view of (1) high pressure hydrogenation of coal and tar (Bergius), and (2) the commercial production of very cheap oxygen (Linde-Frankl). The Lurgi Company, Germany, appears to have successfully applied these advances in solving the problem—at least so far as lignite or brown coal is concerned. The starting point is the water gas reaction $C + H_2O \rightarrow CO + H_2$. By introducing a rich oxygen supply $CO + O_2 \rightarrow CO_2$ + Heat, the last item maintaining the reaction temperature and rendering the process continuous. Furthermore, the reaction is carried out under pressure (20 atmospheres). The results of this are several. First, the high CO_2 content of the final mixture is readily removed by washing. Secondly, the pressure, it is claimed, tends to produce heavier molecules, i.e., CO_2 and CH_4 with its high calorific value rather than CO and H_2. Also producing, storing and distributing gas under pressure, although not yet practised, offers definite advantages such as reduced size of plant and mains and increased area of distribution.

British investigators have been faced with the necessity of having to work with British strongly coking bituminous coals which are not suitable for the Lurgi process. However, research has given the general outlines of the solution to this problem. The broad, generally accepted view of the unmodified chemical constitution of coal is that it is mainly a hydrogen carbon complex in which the benzene ring nucleus is prominent. These relatively inert nuclei are linked by highly reactive chains containing carbon, hydrogen, and other elements. The present gasworks practice of high temperature carbonisation may be considered to gasify the components of the active chains during which process the nuclei condense into relatively unreactive coke. British experiments indicated that during low temperature carbonisation (below 700°C.) and under pressure, hydrogen combined with the semi-coke, i.e., coke with sufficient remnants of side chains to be partly reactive, to give gaseous hydrocarbons at a stage where heat without the hydrogen would have caused condensation to less active coke plus hydrogen evolved from the semi-coke. Although the German theory for the high methane content of their gas does not harmonise with the above mechanism, it is from the Lurgi Company that the basis for the necessary cheap and plentiful hydrogen has been obtained. If their fuel gas generator is operated with a higher proportion of steam to oxygen and at a higher rate of gasification, the gas produced will, after the removal of CO_2, contain about 80 per cent. hydrogen already compressed, and the output can be enormous. With this source of hydrogen available a picture of future gasworks can be drawn where coal charged into a vessel will be treated below 700°C. and at up to 50 atmospheres to produce tar and as much rich gas as desired. About half the weight of coal having disappeared in this operation the remainder will be fed into a generator operating under high pressure and fed with oxygen and steam. Here it will be gasified to produce hydrogen for the first operation. This prolific production of the rich gas, methane, by the hydrogenation of semi-coke is one of several possible lines of commercial development. The vigorous research now being carried out on the semi-industrial scale indicates that the gas industry is only in its infancy.

RECENT WORK ON THE CHEMISTRY OF WOOL—*F. G. Soper.* The lecturer gave a brief history of the English woollen industry showing that even three hundred years ago a commission found that the trade was suffering from foreign competition, high taxation, manufacturing costs, and other similar factors which have periodically since then been sources of worry. Mechanical developments which so advanced the production of woollen goods took place one hundred and fifty years ago since when few spectacular innovations have occurred. The rapid increase in the production of staple fibre (estimated in 1937 to be one-sixth by weight of the world wool production of 1936) has given a new impetus to wool research, and much progress both of fundamental and practical importance has been made.

Much of the scientific progress is due to the information given by X-ray examination of wool fibres. An informative description of the physical principles and procedure in this technique was given. The most noteworthy advances which have resulted from the scientific attark on the wool industry are (1) The new knowledge of the molecular structure of wool fibres, which explains so many of its properties, largely due to the work of Astbury and Speakman at Leeds University; (2) anti-shrinkage treatment; (3) protection against bacterial and moth attack; (4) improvements in washing dyeing and finishing, so that wool garments to-day are much in advance of what they used to be.

The first, second and last of these points were enlarged on, and the lecturer gave a clear idea of the practical advances made on the basis of well directed theoretical investigations.

N.Z. OLIVINE ROCKS AS REFRACTORIES AND FERTILISER-IMPROVERS—*J. J. S. Cornes.* The lecturer described a series of analyses of N.Z. dunites, harzburgites and serpentines showing that the only known olivine rocks in N.Z. which are comparable with the high-grade Norwegian material in percentage of forsterite (magnesium orthosilicate) occur at Mt. Dun, Nelson, and at Anita Bay, Milford Sound. In neither case, however, is the available quantity known. The dunites of Norway and of the U.S.A. are used as refractories (see *Ind. Eng. Chem.*, 1938, *30*, 27; 32).

Another interesting property of these ultra-basic rocks is the complete solubility of their orthosilicate fraction in dilute mineral acid, with liberation of colloidal silicic acid. The evidence of Russian agricultural scientists suggests that the incorporation of ground olivine rock with superphosphate thus improves the superphosphate both physically and chemically, i.e., in texture and in availability of phosphoric acid. It was considered desirable that this be further investigated in view of the extensive use of superphosphate in the Dominion, as a large proportion of this is believed to be wasted at present.

THE MEASUREMENT OF FLUID FLOW—*G. Maskill Smith.* The necessity of measuring the quantity of a liquid or gas had arisen with the advent of quantitative work in chemistry. Direct measurement was the obvious method and presented little difficulty in the laboratory, but when applied to the industrial scale such methods as a rule proved cumbersome and expensive. Apparatus had therefore been designed to take advantage of the hydrodynamic properties of the flowing fluid, and for other purposes mechanical methods of measuring the volume had been devised.

Perhaps the simplest method of the first type was the pitot tube. Used in conjunction with a sensitive pressure gauge it could give accurate measurement for velocities from 4 feet per second upwards. Suitable manometers are the Krell inclined manometer, the differential U-tube, or a sensitive instrument such as that made by the Casella Instrument Company. A more convenient method for permanent installation was the orifice meter which is the simplest to construct and use. An improved meter on the same principle was the Venturi tube, this having the advantage of not absorbing as much power as the orifice. For liquids in open channels a weir was in common use, this principle being capable of adaptation to small scale work. The operation and construction of a domestic water meter was explained, and the relative advantages of the two types in common use discussed.

For gases in smaller quantities the ordinary displacement meter was in common use, while for larger quantities the pitot, orifice, Venturi or the vane anemometer could give accurate velocity readings over a wide range of speeds. Various other methods were mentioned involving dilution or heating effects, some of these methods being capable of great accuracy and being used for the more unusual applications.

* * *

The Branch has during the year completed arrangements with the Victoria University College Council for the annual award of a Prize for first year students in Chemistry. The award has now been made and the N.Z.I.C. Prizeman is Mr. P. B. de la Mare, to whom we offer our congratulations.

The Annual Dinner was held on October 4th at the Royal Oak Hotel, with Mrs. W. A. Joiner as hostess and Sir Thomas Easterfield and Dr. E. Marsden as guests. In the presence of twenty members the usual toasts were honoured. While proposing the toast of the Institute, Dr. Marsden spoke of the part chemistry has played in our industries and of what the chemist is still able to do. Sir Thomas Easterfield in reply to the toast, gave a brief and vivid survey of the state of chemistry when he arrived to fill the chair at Victoria University College; his reminiscences were much enjoyed. The other speakers were Mr. W. A. Joiner (Chairman), Mr. G. A. Lawrence, Mr. R. L. Andrew, Prof. W. P. Evans, and Mr. R. E. R. Grimmett.

Professor Alexander Findlay, of Aberdeen, who was scheduled to address the Branch in September, was unfortunately prevented from doing so by indisposition. In place of the cancelled meeting, and as he had only one day in Wellington, Professor Findlay was entertained at afternoon tea where he was introduced to the thirty-one members present.

CANTERBURY.

OFFICERS ELECTED FOR 1939: *Chairman*: E. W. Hullett; *Secretary*: L. H. Bird, Wheat Research Institute, Christchurch.

Committee: M. M. Burns, H. N. Parton, L. W. Ruddle, T. W. C. Tothill.

Delegate to Council: M. M. Burns.

Branch Editor: H. N. Parton.

Papers read, 1938 session—

"Some Functions of an Institute of Chemistry."—*Dr. H. N. Parton.*

"Major Tends in Agronomic Research."—*Dr. M. M. Burns.*

"Research in the Woollen Industry."—*Prof. F. G. Soper.*

"Teaching of Chemistry in Schools."—*T. W. C. Tothill.*

"Methods of Investigation in Plant Chemistry."—*Dr. J. Melville.*

"Research."—*Dr. R. M. Barrer.*

"Proteins."—*J. Packer.*

"Titrations in Mixed Solutions."—*Dr. H. N. Parton.*

"Science and the Community."—*Prof. Alexander Findlay.* (Read by Prof. H. G. Denham).

As *Professor Findlay* was unable to lecture on September 16th, two short talks were given.

Mr. J. Packer spoke on some recent work on proteins. It has been known for some time that if the weights obtained from 100 g. of a soluble protein of those amino-acids which can be determined with some accuracy are converted into gram moelcular ratios, then the number of gram molecules of some of the acids, which corresponds to the number of their residues in the unhydrolysed protein, stand in a simple numerical relationship to each other. This suggests the existence of some fundamental law of protein structure which determines the ratios in which the constituents can be present. Astbury suggested that the results mean that gelatin, for instance, consists of a polypeptide chain in which glycine and hydroxyproline occur at regular periodic intervals. Bergmann and Niemann have generalised the result, assuming it to be true for every amino-acid in every protein, and developed a method of obtaining the molecular weights of proteins from chemical analysis. Their law seems to provide an improvement in the classification of the proteins which makes it an important contribution to protein chemistry.

Dr. H. N. Parton explained the principles underlying acid-base titration in mixed solvents. The Bromted-Lawry theory of acid-base equilibria was described, and the dependence of the strength of an acid on the dielectric content (ϵ) of the solvent pointed out. By transferring a weak acid from water ($\epsilon = 80$) to a mixture of acetone and water containing 90 per cent. of the former, giving $\epsilon = 26$, weak and moderately strong acids, such as acetic and oxalic, are weakened from 10,000 to 100,000 times.

On the other hand strong acids such as hydrochloric are practically unaffected. This makes it possible to titrate strong inorganic acids in the presence of weak or moderately strong acids, or *vice versa,* without appreciable overlap. Such estimations are important biochemically in the analysis of gastric contents for "free HCl," in titrating blood for "organic acids," and determining free acidity during the course of peptic digestion. Chemically it is useful to be able to estimate by direct acid titration moderately strong acid groups combined as salts, such as sodium acetate, potassium citrate, etc. Data obtained by G. M. Richardson (a New Zealander now working in Great Britain) were discussed. By the use of dioxan-water mixtures, solvents down to $\epsilon = 2$ can be obtained, though low solubility of the materials to be estimated is a complicating factor.

On October 21st, Dr. H. G. Denham read Professor Findlay's lecture on "Science and the Community."

The Annual General Meeting of the Branch was held on November 18th. The balance-sheet showed a satisfactory financial position. After the reading of the Annual Report, and the election of officers for 1939, a short discussion was held on the activities for the coming year. It was generally thought desirable to have at least some of the lectures directed to a common theme. Members also supported the idea that some lectures should consist of expositions of recent developments in theoretical chemistry. The field of protein chemistry was particularly mentioned as one in which many are interested, and in which the newer viewpoints are important, and require clarifying.

OTAGO.

Papers read, 1938 session—

"The Chemistry of Soap Manufacture."—*G. Bagley.*
"A Survey of Sulphuric Acid Manufacture."—*P. Rouse.*
"The Chemistry of Apple Storage."—*J. T. Holloway.*
"Recent Research in Wool."—*Prof. F. G. Soper.*
"Microchemical Estimation of Iodine."—*H. D. Purves.*
"Microchemistry."—*C. L. Carter.*
"Fifty Years of Chemistry."—*Prof. Alexander Findlay.*

MICROCHEMISTRY—*C. L. Carter.* Microchemistry was first introduced in the 'nineties by Professor T. H. Behrens whose text books have been a guide in microscopical chemistry even up to the present time. His technique for the investigation of inorganic substances by means of the microscope, although later improvements in apparatus have been introduced, is still incorporated in later publications by Chamot in his "Chemical Microscopy."

F. Emich, of Graz, about the year 1910, attempted to carry out quantitative microchemistry in inorganic chemistry using a quartz balance of the Nernst type. There were, however, serious limitations to the load which necessarily could not exceed 100 mg. Since the Great War F. Feigl, of Vienna, was responsible for the introduction of new spot or drop tests for inorganic and organic substances. Some of these novel tests are specific for certain metals and have a great sensitivity.

The diphenylbenzidene test for nitrate is sensitive to 1 in 10^7 in giving a blue green colouration. This test is of interest in that it can be applied to detect added water in milk. The water in unadulterated milk or in distilled water is nitrate free. Tap water and also sulphuric acid in the presence of which the test is applied usually contains sufficient nitrate to give a positive test.

Another useful reagent, rubeanic acid was also demonstrated to test for copper nickel and cobalt in the presence of one another. Using a spot paper the three metals in the presence of ammonia give concentric zones, inner green for copper surrounded by a zone of red purple for cobalt and an outer zone of blue for nickel.

The most important branch of microchemistry deals with quantitative organic analysis, the true founder of which was Fritz Pregl, of Innsbruck, whose success in this direction was due to the introduction of the Kuhlmann micro-analytical balance sensitive to 1—2 micrograms with a maximum load of 20 g. in each pan.

Prior to 1914 F. Emich had used an improved assay balance of W. Kuhlmanns which was sensitive to 1/100 mg. At Pregl's suggestion Kuhlmann by improved methods of grinding the knife edges was able to increase the sensitivity of his balance tenfold while maintaining the capacity of a 20 g. load.

By the use of a modern microchemical balance of this type it was possible to analyse accurately 1/100 of the amounts necessary in macro analysis. Two to five mg. of materials were ample for the determination of elements carbon, hydrogen, nitrogen, etc.

The saving in time and reagents, the elegance and accuracy of micro methods and the safety with which dangerous chemicals may be analysed are some of the advantages over macro analysis. The macro-Dumas and Kjeldahl methods were now regarded as obsolete and no one would use them if the micro apparatus were available.

The lecturer described the apparatus and technique employed in Pregl's method for carbon and hydrogen, and the improved methods for the volumetric estimation of the same elements by Prof. van Neiuwenberg, of Deft, who had employed cinnamoyl chloride to absorb the water and liberate hydrochloric acid which was titrated. The carbon dioxide was absorbed in standard baryta. Other methods outlined were the micro-Dumas and Kjeldahl with the modification introduced by A. Friederich to make the Kjeldahl more widely applicable, the halogen combustion, sulphur, acetyl and methoxyl determinations.

Methods for the determination of physical constants such as melting point, boiling point, density by the Schlieren method, and molecular weight determinations were then outlined in some detail.

In the discussion which followed the lecture, Mr. T. A. Thomson, who has made a special study of micro-chemical methods, emphasised the many pitfalls to be avoided by the inexperienced beginner, and the value of the training of students in chemical ascepsis.

Professor F. G. Soper said that but for the methods this made available many of the great advances in physiological and biological chemistry would not have been possible. He thought Otago

University was fortunate in being the first of the Colleges in New Zealand to adopt the new technique which had been of great advantage in research.

ESTIMATION OF IODINE IN BIOLOGICAL SUBSTANCES—*H. D. Purves.* During the past fifteen years iodine analysis has been performed at Dunedin in connection with researches on goitre. Gradual improvements in methods and the projected work on iodine metabolism led the lecturer to review the principles and defects of the methods hitherto employed. The chief limitation arises from the extremely low concentrations of iodine in biological materials, and a satisfactory method would have to estimate amounts of iodine less than one microgram with an accuracy of one per cent. Iodine analysis involves three main operations, namely ashing, concentration of iodine and estimation.

Ashing.—Vegetable substances which yield a basic ash may be ashed at a low temperature, about 450°C. in a muffle. This is unsatisfactory because the material ignites in the initial stages and glows with uncontrollable incandescence, so that there results an unavoidable loss of iodine.

The material may be burnt in a stream of oxygen in a silica tube, and the products trapped by bubbling through alkali, etc. The estimations are tedious and time consuming, but combustion in a bomb with oxygen has been tried.

The method which involves charring after the addition of liberal quantities of potassium carbonate or hydroxide is improved by performing the heating in an electric muffle at an accurately controlled temperature of 500°C. or less. This is the method now used and it is found that the loss of iodine under these conditions is very small. The defect of the method is that the unburnt carbon must be separated by extraction and filtration and then burnt separately.

The principle of wet ashing was introduced by Pfeiffer, who used sulphuric acid and hydrogen peroxide. Leipert utilised sulphuric chromic acid mixtures for the same purpose. The results obtained for blood by this method are often lower than by any other method, so that it appears that with some materials loss of iodine occurs.

In general the ashing difficulties limit the size of sample that can be manipulated. Small samples can be handled much more expeditiously, but the difficulty of the subsequent estimation is then correspondingly increased.

Concentration of the Iodine.—Firstly, the iodine is liberated as the free element and separated from other substances by volatilisation or steam distillation. This procedure follows of necessity after the wet combustion methods and has also been applied to the residue of alkaline ashing and to the products of closed combustion. This procedure has a very strong attraction in that it effects a remarkable degree of purification from substances which might interfere with subsequent estimation. It is, however, difficult to make the distillation quantitative unless large volumes of distillate are collected.

The second property utilised for concentration of the iodine is the solubility of the alkali iodides in alcohol. This property was first utilised by von Fellenberg. The potassium carbonate residue from his method of combustion forms with water a pasty mass which is favourable for quantitative extraction of iodide by small amounts of alcohol. The disadvantage of the use of alcohol is that it introduces traces of organic matter which require special procedures to prevent interference with the estimation.

Estimation.—The free element when liberated by the action of nitrous acid is very soluble in such organic solvents as chloroform, carbon tetrachloride, and carbon disulphide, and has in such solutions an intense purple colour, which forms a delicate and specific test for the element. Unfortunately the technical difficulties of micro-colorimetry have prevented so far the accurate colorimetric estimation of much less than 100 micrograms of iodine.

The second method utilised the procedure of Winkler, followed by the sensitive starch iodide indicator. The iodide in acid solution is oxidised with excess of chlorine or bromine to iodic acid. The excess of oxidising agent is removed by boiling, or by heating with sodium formate. To the cold solution iodide is added in excess and the liberated iodine titrated with thiosulphate. By this means the amount of free iodine obtained is six times the iodine content of the sample. When the volume of solution is kept as low as possible the end point is sensitive to 0.05 microgram which falls short of what is desired. However, since the results are accurate within the limits given and free from subjective errors, this method is nowadays almost universally used where the smallest quantities of iodine are dealt with.

Recently, however, McClendon has described an ingenious and practical method for replacing the starch indicator by a potentiometric measurement of oxidation-reduction potential for the determination of the end point.

In the ideal method, ashing and concentration, the latter preferably by distillation, would take place in the one apparatus which would deliver the iodine in a form suitable for the immediate application of the Winkler oxidation. Estimation would follow by potentiometric titration. Such a method is feasible and it is to be hoped it will be shortly forthcoming.

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