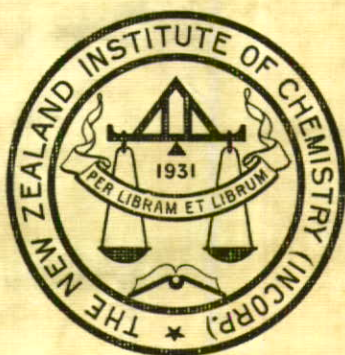


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EDITORIAL

A University course in applied chemistry and chemical engineering has long been an objective of forward looking members of the Institute. There is every hope that such a course will be started in 1944, as, subject to the proposed syllabus being approved, the New Zealand University has agreed to the introduction of a unit in applied chemistry into the B.Sc. degree. The course is such that it can be taught in any of the four University Colleges, and is an extension of the present syllabus for chemistry of engineering materials, with a course of laboratory work in advanced analytical chemistry. In addition the Council of Canterbury College intends to proceed with a Diploma in Industrial Chemistry, to be granted on completion of a post graduate course involving engineering subjects such as drawing, strength of materials, heat engines, applied electricity, and hydraulics, and also advanced applied chemistry in which unit processes will play a large part. Auckland University College is already providing facilities for chemistry students to take engineering subjects and is granting a Diploma. For the more ambitious project of producing chemical engineers, a five year course is under consideration involving degrees in both science and engineering. Included in the draft prescription, in addition to the necessary science and engineering subjects, are industrial microbiology and elementary economic geology. Progress with the more ambitious schemes awaits a decision by the Government to provide financial support, and approval by the University.

These developments should provide an answer to the plea of Dr. R. O. Page, in a lecture reported in this issue, for co-operation between the universities and industry on research problems. For it is not too much to hope that the investiga-

tional aspects of applied chemistry will not be overlooked in the new courses. Students will also have better facilities for gaining experience in modern analytical methods without any weakening in their study of the fundamental problems of the science of chemistry. That difficulties in relating university courses to industrial needs are not confined to New Zealand is shown by an address on "Analysis and Research" given by Mr. R. C. Chirnside, F.I.C. to the Newcastle-on-Tyne section of the Society of Chemical Industry, and reported in "Chemistry and Industry" on May 15th of this year. He said that industry recruits its analysts from (a) student assistants who are encouraged to go to evening classes, and who might eventually reach staff status, and (b) university graduates with post-graduate experience. The former class seem to give better results than the latter (presumably as analysts). Mr. Chirnside quoted Sir Lawrence Bragg's very valuable address on the training of physicists, to the effect that "the best boys got scholarships to universities, but there lost initiative by losing touch with life." We confess to some suspicion about these vague allusions to "Life." They appear too often to mean A's life as B thinks he ought to live it, and we are not sufficiently enamoured of life as it has to be lived in the industrial civilisation of today to wish to see the science graduate moulded too closely to the current needs of an industrial organisation which is undergoing rapid change. This is not to say that Sir Lawrence's advocacy of a break of six months as an apprentice in a laboratory between school and university, or Mr. Chirnside's scheme of two years with opportunities for day-time study, are not matters worthy of consideration. They may be excellent additions to our courses in applied chemistry, but they raise questions about the aims of a university, and its relations to its special schools where technical training is the main objective, about which many wise men have thought and written, and upon which agreement is unlikely to be reached until a new stability is achieved in our economic and political life.

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.

COUNCIL MEETINGS.

At the March meeting of the Council, the President referred to the death of Dr. H. G. Denham, and the following motion was passed:—

“That the Council of the New Zealand Institute of Chemistry, in extending its sincere sympathy to Mrs. H. A. Denham and Captain H. E. Denham in the death of Professor H. G. Denham, places on record its high appreciation of the great services rendered by him to the advancement of Industrial Chemistry, General Chemistry and Scientific Research in New Zealand.”

Messrs A. I. Biggs and C. F. Denmead were elected Associates.

Dr. H. C. Holland was elected Fellow.

Professor W. P. Evans was reappointed to the Fellowship Committee, and the President appointed to act in place of Dr. Denham until a new member is elected.

The examination requirements for the Laboratory Assistant's Certificate, as set out by the sub-committee and amended by Council were approved.

The Secretary was instructed to draw the attention of the Director of Scientific Development to the fact that a register of chemists was prepared about three years ago, and that unless arrangements are made to keep it up to date, its value would soon be reduced.

At a meeting on May 25th, it was resolved that no conference be held at present, owing to travelling difficulties.

The fee for the laboratory assistants' examination was fixed at £1/1/-.

Mr. F. J. T. Grigg, Government Analyst, Christchurch, was elected Fellow.

The following Associates were elected: Miss Joyce Watson, Nelson; Mr. W. E. Russell, Auckland; Mr. T. A. Rafter, Mr. E. P. Sanford and Mr. D. J. Fraser, Wellington.

Two entries were received for the Industrial Chemical Essay Prize, and examiners were appointed, to report to the next Council meeting.

Dr. R. Gardner was elected to the Membership Committee to fill the vacancy caused by the death of Dr. Denham.

Representations were received from Auckland and Dunedin with regard to coupons for laboratory coats, and it was decided to approach the rationing controller to ascertain what procedure should be adopted for coupons to purchase protective clothing and replace civilian clothing damaged in a laboratory by chemicals.

The Secretary was empowered to spend up to £15 for a typewriter, should a suitable machine be offered for sale.

At a Council Meeting held in Christchurch on August 20th, the President, Sir Theodore Rigg was in the chair and the following delegates were present: Dr. L. H. Briggs (Auckland), Mr. G. S. Lambert (Wellington), Dr. M. M. Burns (Canterbury) Dr. F. G. Soper (Otago) and the Hon. Secretary.

A report was received from the examiners for the Industrial Chemical Essay Prize, which was awarded to Mr. C. G. W. Mason for his essay on "The Coal Tar Industry in N.Z., its achievements and possibilities." Mr. S. H. Wilson was highly commended for his contribution on the electrochemical industry as it affects New Zealand. It was decided, subject to Mr. Mason's consent, to publish the winning essay.

It was reported that in reply to a letter asking for special consideration to be given to laboratory workers in the matter of coupons for protective clothing, the Rationing Controller is of the opinion that this is covered by the present regulations, but that special consideration will be given to industrial cases as they arise.

Messrs. A. L. Odell and J. O. Elphick were elected Associates.

The following were elected Fellows: Dr. H. E. Annett, Dr. C. R. Barnicoat, Dr. M. M. Burns, Dr. N. L. Edson, Dr. E. Gregory, Messrs K. M. Griffin, W. G. Hughson, E. W. Hullett, W. A. Joiner, Miss E. B. Kidson, Dr. J. Melville, Mr. A. D. Monro, Dr. F. B. Shorland.

The Editor's report on the Journal was received and the Editor thanked for the continued production of the Institute publication.

It was decided that nominations for Officers of the Institute may come from both individual members and Branch Committees.

A long discussion on finance resulted in a decision to proceed with the setting up of a Reserve Fund into which surplus moneys are to be paid. Three Trustees are to be appointed to control the fund, in consultation with Council. Rules were drawn up for such control.

The Annual Subscription was fixed at £1/1/- per annum without rebate, as from November 1st, 1943.

The following reasons were advanced:—

1. It should stabilise the annual subscription for a number of years.
 2. It would make possible the building up of a sound Reserve Fund to meet legal and other extraordinary expenditure.
 3. It would facilitate the financing of the Industrial Chemical Essay Prize and could cover the costs of publication. These items are not included in the budget presented by the sub-committee on finance.
 4. It would also make possible an extension of the activities of the Institute. In this connection, we may be able to—
 - (a) Increase prizes and establish funds for the assistance of students.
 - (b) Increase the scope of the Journal, if required, and to cover increased costs of printing which may have to be met if even the present size of the Journal is to be maintained.
 - (c) Through the giving of grants to University Libraries, make literature available to members of the Institute on direct loan. This would be of special value to country members.
 5. It should cover any increased expenditure on the Annual Conference.
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BRANCH NOTES

AUCKLAND BRANCH

THE CHEMISTRY OF LEATHER MANUFACTURE.

Mr. R. A. W. Green.

13th May, 1943

When chemists began to interest themselves in leather manufacture it was already a highly skilled art abounding in jealously guarded trade secrets. Vegetable tanning was well understood even 12,000 years ago and until recently was still the most important.

The basic materials for leather making are both chemically and mechanically very complex. The skin is made up of 4 layers and the 2 outer ones have to be removed before tanning. The skin proteins are keratin in the epidermis and collagen, as the main constituent of the fibres. Within these fibres the collagen molecules lie side by side parallel to the direction of the fibril and forming, with their side chains, an open three dimensional network. The molecular chains of keratin and collagen differ in that alpha-keratin can be stretched under the action of moisture and heat while collagen is already in the fully extended form. When collagen is warmed in water the cross links are ruptured allowing the chains to fold back on themselves and thus the fibres shrink. In contrast to the other fibrous proteins, silk fibroin and keratin, collagen is readily putrescible when wet, due to the weakness of these cross links and the object of tanning is to give extra stability by chemical means.

The first process in making leather is unhairing, usually done by the action of a mixture of a reducing agent, such as sodium sulphide, and lime, although an enzyme process has been tried. The liming process, besides removing the hairs, swells the collagen fibres by osmosis and their reticular sheaths are ruptured, providing openings for the subsequent entry of the semi-colloidal tannin molecules.

After unhairing, all light leathers are put through a bating process which improves the dyeing properties and makes the finished leather smoother and more stretchy. Besides neutralisation of the lime there is also an enzyme action, the mechanism of which is still debated. The skins may then receive an acid salt pickle to adjust the pH to a suitable value for tanning.

An essential of any tanning material is that the molecule must have at least two groups which can combine with some point on the collagen molecule, thus forming a strengthening bridge. There are two types of vegetable tannins; hydrolysable tannins are glucosides of gallic and ellagic acids and their derivatives, and condensed tannins are polyhydric phenol derivatives. The most important "artificial" tanning material is basic chromic sulphate which forms large semi-colloidal complex ions. Chrome leather, when once dried, is very hard to wet back, demonstration the completeness of saturation of the polar groups. There are a number of other tanning materials, such as salts of molybdenum, iron, cerium, etc., as well as several organic compounds.

PHYSICO-CHEMICAL PHENOMENA IN THE PATHOLOGICAL LABORATORY.

Mr. D. Whillans

8th July, 1943.

Mr. Whillans first enumerated certain basic principles in connection with proteins since most of his lecture dealt with them, especially the blood proteins. These are fibrinogen, albumin and globulin. Fibrinogen forms fibrin in a blood clot leaving the serum containing the other two proteins. The form in which globulin exists has caused much conjecture. One theory suggests that it is in the form of a piece of velvet, the cyclol skeleton forming the basis of the textile with the amino acid residues all pointing in one way, and this is then folded into a large spherical molecule.

The lecturer then spoke about antibodies, which are substances formed in the blood of animals into which have been introduced foreign proteins. Thus if a toxin is injected an anti-toxin is formed. In general these antigen-antibody reactions are specific, i.e. an antibody reacts only with its own antigen although reactions do occur where the configurations of the reactants are similar as in the phenomenon of the formation of mixed crystals.

The antigenic structure of protein is a most difficult subject and there are numerous complications. For instance some groups of bacteria exhibit several forms of growth, and each form produces a different antibody.

Mr. Whillans then described the diagnosis of some diseases. In the early stages of a typhoid infection the serum has little effect on a suspension of typhoid bacillus in an electrolyte. As the antibodies are formed progressively greater dilutions of

the serum will cause the typhoid suspension to agglutinate. Usually the serum is put up against several possible bacteria to identify the one causing the infection. When the patient has been inoculated with T.A.B. vaccine indirect methods have to be used as the vaccine has caused identical antibodies to be produced. Mr. Whillans also described the complicated procedures for the detection of syphilis in humans, none of which were entirely satisfactory.

The final subject dealt with was the blood grouping of humans. Most blood contains agglutinogens and agglutinins, and if certain of these are brought together clotting will occur. Therefore the object is to be able to transfer blood from one person to another with the certainty that clotting will not take place. The use of serum in place of whole blood overcomes this difficulty and allows it to be kept indefinitely.

After the meeting adjourned Mr. Whillans' assistant typed the blood of several of the members present.

Dr. L. H. Briggs was presented with the Hector Medal of the Royal Society of N.Z. for his work on the Chemical Constituents of New Zealand Plants. The presentation was made by Dr. H. H. Allan, the President of the Royal Society of New Zealand on August 16th.

WELLINGTON BRANCH

On Tuesday the 1st June, the Wellington Branch of the N.Z. Institute of Chemistry was addressed by Lieut. M. S. Burns who is attached to the U.S. Joint purchasing board. Lieut. Burns is a chemical engineer and food technologist, and he spoke of the place of the chemist and the chemical engineer in industry in U.S.A. with special reference to the food industries. The chemist first found a place in industry in 1906 when the food and drugs act was passed. Now he plays an important part in helping the manufacturer to turn out better and cheaper products. In bakery it is necessary to blend different types of flour to obtain the most suitable for bread or cakes or biscuits. Problems of fermentation arise for the chemist to solve and there are many fakes such as bread improvers to be exposed. Custard filled products were nearly taken off the market; but a method of sterilization was devised. The refractometer and pH meter help in the manufacture of jams and jellies. The flavour is improved if the acidity is controlled and the necessary amount of sugar lessened. Flocculation at the

bottom of soft drinks was found to be due to impure sugar. Discarded almond shells were converted to sugar, alcohol and activated carbon. Lieut. Burns also dealt with a number of other subjects including bacon, cheese, cake, fog on photographic films, some legal cases, and finished his talk with a short account of the part played by the chemist and the food nutrition officer in the U.S. Army.

A joint address on "Some Aspects of Vegetable Dehydration" was given by Dr. B. W. Doak, Plant Chemistry Laboratory, Palmerston North, and Mr. W. A. Joiner, Dominion Laboratory. Dr. Doak dealt with the processing side of dehydration and briefly described the objects of dehydration and the various methods of processing. Particular stress was laid on the necessity for adequate blanching treatment. This treatment consists in immersing the prepared vegetable in boiling water or treatment in steam for an appropriate time. The object of the blanching is to inactivate the enzyme systems to prevent undesirable changes in the dried product. Incomplete blanching results in poor colour, poor flavour, toughness, impaired keeping qualities and capacity to reconstitute and particularly in reduced ascorbic acid and carotene content. The method of testing for enzyme inactivation is based on tests for catalase and peroxidase. A negative peroxidase is generally considered to be necessary though this requires more severe treatment of the vegetable than would be necessary to obtain a negative catalase test. The drying temperatures have to be fairly closely controlled. The air temperature at the inlet end may be as high as 180-190°F. but it is imperative that the final temperature should not be above 145-150°F for most vegetables. Samples of dehydrated products were shown to the audience.

W. A. Joiner discussed "Chemical Engineering Aspects of Vegetable Dehydration." The speaker dealt briefly with various means of removal of water from solids and outlined the mechanism of the drying of solids in air. The function of the air as a medium for supplying the necessary heat and for carrying away the water vapour, and the effects of air velocity and humidity were described. The significance of the "constant rate" period while the surface of the solid being dried remained wet, and of the "falling rate" period, when the rate of drying is controlled by internal diffusion of moisture, and by transfer of heat through the solid, was discussed.

The speaker then went on to describe the work of the Chemical Engineering Section, Dominion Laboratory, in designing and supervising the construction of the first plant specially designed for vegetable dehydration in the Dominion. Special attention had to be given to the materials of construction as it was necessary to use materials available in this country, and to avoid as far as possible, the use of materials of strategic importance.

Details of plant and factory lay-out were described and it was pointed out that as the technique of vegetable dehydration was advancing rapidly the various units used in the preparation of the vegetables were designed on the simplest, possible lines to facilitate modifications in the process. The plant which had been erected at Hastings had been in operation just over four months and most of that time had been working 24 hours per day, 6 days per week. Potatoes and carrots had so far been treated and a very satisfactory product had been prepared.

In addition to being a full scale production unit, the plant had always been regarded as a proving ground for new advances in technique, and developmental work was being actively pursued.

CANTERBURY BRANCH.

The May meeting of the Canterbury Branch was addressed by Dr. P. R. MacMahon of Lincoln College on "Fibre Chemistry." He pointed out that the results achieved in this field have the greatest significance to both the academic chemist and the industrialist. Crystallographers have shown that interatomic distances are constant for a given bond in different compounds, and calculations from appropriate data give the length of a cellobiose unit as about 10.3 \AA . X-ray investigations of natural cellulose fibres show a marked crystalline structure, with a spacing of 10.3 \AA along the fibre length, suggesting that the plant fibres are made up of long parallel chains of glucopyranose residues. It is possible to find roughly the chain length, and to show that mean chain length influences the strength of fibres. This knowledge has been applied in synthetic production, as viscose solutions are allowed to age to permit polymerisation, and hence increase in chain length, to take place. Fibre strength also depends on orientation, which can be assisted by stretch spinning, i.e. the fibre is stretched after extrusion from the spinning nozzle. This has resulted in a large increase in the strength of acetate silk fibres.

Animal fibres are built up of proteins. A crystal spacing of 3.5 \AA^0 would be expected if fully extended peptide linkages form chains in the direction of the fibre length, and this figure is found for silk. Keratin fibres such as wool and hair give 5.1 \AA^0 , but the stretched fibres show spots indicating a spacing of 10.2 \AA^0 , corresponding to three residues each of 3.4 \AA^0 . The stretched hair, like natural silk, is built of protein chains in a fully extended state, which implies that in the unstretched hair the same chains are folded in some regular manner. In both forms of keratin, the side chains lie more or less parallel to one plane of the molecule, binding the main chains like the rungs of a ladder. The folding of the main chains and the presence of various types of cross linkage, profoundly affect the elastic properties of keratin fibres. Investigations by Speakman showed that with increasing water content, and/or temperature, hair stretches more readily and further. Although the structure will allow 100 per cent extension, 30 per cent is about the limit for the dry fibre, without breaking. In cold water reversible elasticity up to from 50 to 70 per cent extension is shown. In steam or boiling water, the fibres behave very much like rubber, provided the tension is not kept on too long. The stretching phenomena are complex, due to the existence of the cross linkages which break under strain.

Dr. MacMahon discussed the cystine linkage in wool, and the bearing of ionic linkages on the problem of shrinkage, and dyeing. The lecture concluded with a discussion of the future of artificial fibres. As the price of rayon staple fibre is less than half of that of wool, it is clear that though the characteristics of wool are still superior in many respects, post-war conditions are likely to require some change in our ideas of wool values. Fortunately not all staple fibre is to be regarded as replacing wool; more than half is processed on cotton spinning machinery, while some is used to enhance the value of cheaper cross bred wools. New Zealand cross bred are largely used for purposes where durability is a main requirement, and here the natural fibre has qualities superior to the artificial. It is, however, clear that we must either increase the efficiency of sheep farming and decrease costs of production or prepare for lower living standards which must result from decreased prosperity in a large section of the community.

For the June and July meetings the Canterbury Branch joined with the Canterbury Branch of the Royal Society, the Canterbury College Scientific Society, the Geographical Associa-

tion and Branches of the D.S.I.R., in sponsoring three lectures on the Organisation of Scientific Research in New Zealand.

The first lecture was given by Dr. R. O. Page on Industrial Research. He sketched first his ideas on future developments in New Zealand industry and made this a background for consideration of the problems of research organisation.

The structure of the Department of Scientific and Industrial Research was explained, and its liaison with Medical Research and the Standards Institute. Dr. Page showed that it is impossible to get all the information we need for our industries from abroad, since our raw materials are of agricultural origin and differ from those of other countries. The large scale research which is necessary is beyond the resources of small firms, and requires co-operation and planning. After describing some of the main accomplishments of Research organisations, the speaker mentioned some weaknesses, such as the financing of the work, and the fact that the Standards Institute was outside the D.S.I.R., though standardisation obviously depends on careful previous investigation. Study of social problems by scientific means is urgently needed, particularly those bearing on rehabilitation of soldiers, and the choice and location of new industries. Finally Dr. Page made a plea for co-operation by the universities in industrial research work. He claimed that industry could provide many fundamental problems suitable for investigation in university laboratories, and suitable also for training students in research methods. Interchange of personnel between the universities and industrial research organisations would be of great value.

The Organisation of Research in the New Zealand University was discussed by Professor E. Percival, of the Biology Department of Canterbury College, and Dr. H. N. Parton, of the Chemistry Department. The former speaker stated that no organisation should exist, and in fact none does exist. A university teacher claims the right to choose his own research problem and pursue it in his own way, maintaining personal contact with others interested in allied problems. The teaching burden in New Zealand is so heavy that a teacher finds little time for his special interest, but turns to it as a relief.

Supporting his colleague's views, Dr. Parton divided the problems in physical science which are being studied in the New Zealand University into those which are specifically New Zealand problems, and those which could be investigated anywhere. As examples of the first class were mentioned the study of the ionosphere by radio methods, and the investiga-

tions on plant products; notably in Auckland and Otago. The second type of investigation is represented by the work on the mechanism of organic reactions in Victoria, Canterbury and Otago, and the work of physical chemists in all the colleges. The speaker quoted Irving Langmuir in support of the view that industrial research, as well as university research, was best done when full freedom was allowed to the initiative of the individual. Langmuir said "directors are rare who can foresee the solution sufficiently well to plan out a good campaign of attack in advance. The best type of research man does not like to be told too definitely what must be the object of his experiments." While the university could derive considerable benefits from industrial contacts, the idea that those outside the university are the best judges of what problems provide the best training for students, does the university staffs considerably less than justice; and the idea that men overloaded with teaching duties can solve industrial problems does them perhaps more than justice.

OTAGO BRANCH

For the May meeting, Mr. F. N. Fastier spoke on "Pressor Drugs."

This subject was chosen to illustrate modern trends in pharmacology. The study of the mechanisms responsible for the control of the blood pressure has proved to be as difficult as it is fascinating and such progress as has been made is due largely to the co-operation of workers from different professions. It seems probable that further notable advances will result for the most part from 'combined operations' in which physicians, surgeons, pathologists, physiologists, chemists and physicists all take part.

After describing some of the functions of the autonomic nervous system, the speaker showed how evidence in support of the existence of 'neuro-hormones' had been obtained from many sources and indicated the sequence of events when an autonomic nerve discharges. The practical significance of these investigations was then discussed.

Sympathomimetic drugs closely resembling atropine and physostigmine have not yet been discovered. However, adrenaline itself, which is very closely related to, if not identical with the neuro-hormone 'sympathin,' is one of the most valuable of all drugs and it has a variety of uses. Many chemical relatives of adrenaline are now known. Although they resemble

each other in many respects, each possesses certain unique properties, which are often of value for specific clinical purposes. Perhaps the best known are neo-synephrin, benzedrine and ephedrine.

In practice, the best method for restoring the blood pressure in cases where it has either fallen to a low level or is likely to do so, is to increase the volume of fluid in circulation. Unfortunately, the technique of blood transfusion is not altogether easy, nor are facilities always available. Consequently, the above pressor drugs are also invaluable for the treatment of 'shock,' especially when it occurs suddenly or in some out-of-the-way spot, as in a battle or an air raid.

There are a few other substances apart from the sympathomimetic amines which are known to cause a strong rise of blood pressure by producing a peripheral vasoconstriction. To this group belong certain amidine and iminazole derivatives, barium salts and one or two natural products of unknown constitution, such as pituitrin and renin. Some of these are also used in the treatment of surgical shock.

Another aspect to the subject of pressor drugs which is at present attracting considerable attention is in connection with the disease popularly known as 'blood pressure.' Actually, it is only in the last decade that reliable methods for producing hypertension experimentally have been developed, notably by Goldblatt. The rise of pressure seems to be due to some agent present in the blood, which may be identical with an enzyme called 'renin.' This substance was first isolated from normal kidney extracts in 1898. It is thought to act on the pseudoglobulin of plasma to form a pressor agent called 'angiotonin' or 'hypertensin.' In closing, the speaker outlined two hypotheses which attribute the cause of malignant hypertension to the elaboration of renin in damaged kidneys.

On July 14th, Professor F. G. Soper addressed the Otago Branch on "Recent Advances in Physical Chemistry." He referred to the ever-increasing application of physical chemistry and physico-chemical methods of analysis in industry, but pointed out that equally great advances had been made in the realm of fundamental conceptions. For many years science had to be content with examining matter in bulk, but with new methods there was increasing attention to properties that had formerly been statistical averages. This was illustrated by reference to atomic weights and the history of the discovery of deuterium. Dr. Soper showed the great importance of iso-

topes as tracers in elucidating the finer points of adsorption and chemical reactions.

The revolutionary conception of de Broglie and its subsequent demonstration, that material corpuseles possessed a wave structure, had been responsible for many of the advances in the outlook of the physical chemist. Wave mechanical theory was responsible for the concept of resonance, where the possibility of alternative electron distributions in the molecule contributed to its energy. The various written structures were only to be regarded as "intellectual scaffolding" however, for benzene, with at least five alternative formulations is actually symmetrical, and there is no oscillation between the alternatives.

Information as to the shapes and sizes of molecules and the strengths of valency forces could be obtained from molecular spectra. By this method also the presence of isotopes could be demonstrated. The use of Raman spectra in identifying certain linkages was illustrated by reference to bivalent hydrogen. Dipole moments gave other information as to structure and free rotation in organic molecules.

In conclusion the lecturer emphasised how much more sharply into focus our mental picture of molecules and their behaviour had been brought in the past twenty years.

PROGRESS ON THE NUTRITIONAL FRONT.

Dr. M. E. Bell

June 9th, 1943.

Dr. Bell said that she had selected a few items to mention from the swiftly-growing subject of nutrition. The first of these was the new working basis that had been formulated by the publication of a tentative set of nutritive standards by the National Nutrition Conference for Defence in U.S.A. in 1941. This defined the amounts of various nutritional elements recommended for good health at different ages and at different degrees of metabolic activity. As example, these recommended allowances were quoted as being in the case of the average adult man and woman, and the pregnant woman as follows:

	Calories	Protein gms	Ca gm	Fe mg	Vit.A I.U.	BI mg	Riboflavin mg	Nicotinic Ac. mg	Vit.C mg	Vit.D I.U.
Man (moderate activity)	3000	70	0.8	12	5000	1.8	2.7	18	75	...
Woman ,, ,,	2500	60	0.8	15	5000	1.5	2.2	15	70	...
Pregnancy	2500	85	1.5	15	6000	1.8	2.5	18	100	400-800

... Vitamin D when not available from sunshine should probably be provided up to 400 I.U.

Journal of The New Zealand Institute of Chemistry.

The foods able to provide the average diet were given as: milk, 1 pint; meat, 4lb; potatoes, 3 medium; baked beans or an egg; cabbage, $\frac{1}{2}$ cup; carrots, $\frac{1}{2}$ cup; tomato juice, 1 cup; prunes, stewed, 1 cup; oatmeal, cooked, 1 $\frac{1}{2}$ cups; bread, wholemeal, 6 slices; butter and fats, 5 tablespoons; piece of cake or pudding.

The connection between nutrition and resistance to disease had been tested on laboratory animals; so far, on man, few experiments which might be regarded as statistically significant had been done. One was quoted: A naval training school consisting of 1500 boys were suffering from epidemics of sore throat, with rheumatic fever and pneumonia as occasional complications; the diet was deficient in vitamin C at the training school; 300 of the boys were given additional C; at the end of the observation period, the supplemented boys had shown greater resistance to the complications of this epidemic—there were no cases of pneumonia or rheumatic fever among them, while there were 17 and 18 cases respectively among the untreated group.

A new method of testing for vitamin B₁ deficiency had been evolved; this applied the principle of applying a "metabolic load" to see whether the body could deal with it. As vitamin B₁ is concerned in the decarboxylation of pyruvic acid, glucose was given and the accumulation of pyruvic acid in the blood was followed. In the subject deficient in vitamin B₁, the blood-pyruvic acid curve was much higher and more prolonged.

Vitamin requirements may be defined as "minimal," "marginal" and "optimal." The minimal requirement for vitamin B₁ was that which prevented beri-beri; the optimal was the amount beyond which no betterment could be achieved by food. It was necessary to have a new concept in medicine, based on this idea. We should no longer think in terms of the diseases that would result if certain elements were in short supply, but think in terms of positive and buoyant health. We had still a long way to go before we could be certain of the standard requirements of different nutrients for man.

Dr. Bell then demonstrated how the present N.Z. Battle Ration aimed at providing these nutrients, while at the same time it was very light to carry. She spoke of the effect of dehydration on foods.

She also demonstrated the dichlorophenol-indophenol test for vitamin C to show that potatoes were superior to most apples in providing vitamin C.

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