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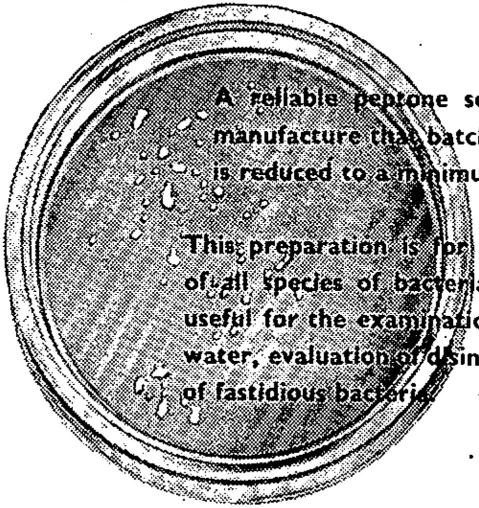

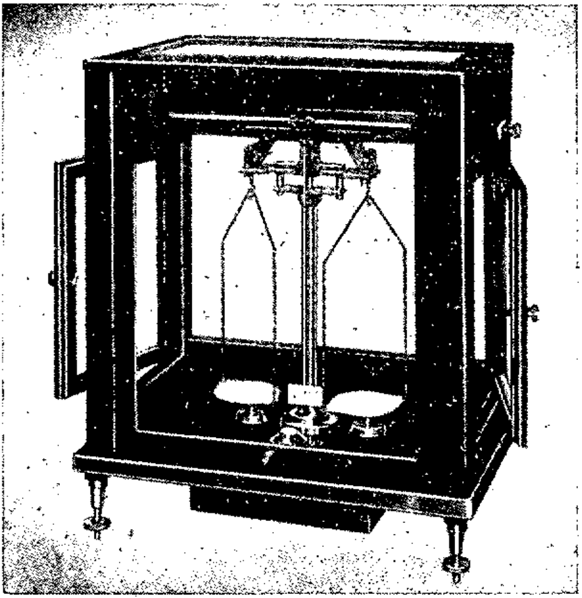

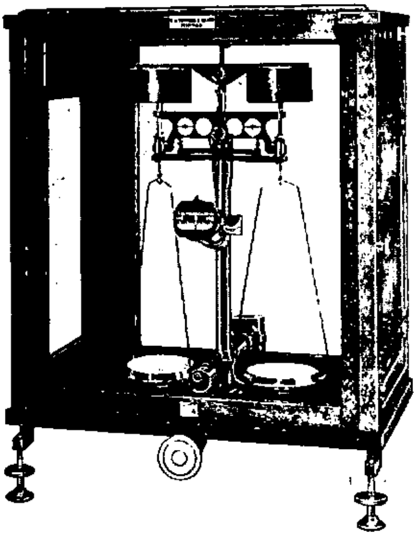

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THE NEW PRESIDENT

Mr. P. R. Parr, M.Sc.

Mr. P. R. Parr, the newly-elected President of the Institute, has the distinction of having served one industrial firm ever since his graduation over a quarter of a century ago.

He was one of the graduates introduced to industry by Professor Worley, and he fully justified Professor Worley's keenness to prove the value of chemistry to industry in the Auckland district.

Mr. Parr was a foundation member of the Auckland Chemical Society, founded in 1925 to co-ordinate the growth of chemistry in the district, and since the foundation of the Institute has been closely associated with the Auckland Branch Committee.

Perhaps Mr. Parr's most useful contribution is that, although he has to supervise the chemical work of his firm's branches in other parts of New Zealand, he has remained in the Laboratory and has thus an almost unique experience in the freezing works industry.

Another contribution that Mr. Parr has made is to find time to teach chemistry at the Seddon Memorial Technical College, Auckland.

This leaves very little time for recreation, but our President, like many Auckland students, was always in his element in the Waitakere Ranges and was one of a group of science students who many years ago built a hut on a bush-clad spur over the restless Tasman Sea. Here he can retire to consider his Presidential problems.

THE USE AND PROBLEMS IN THE USE OF ISOTOPES IN CHEMISTRY

By T. A. Rafter, Dominion Laboratory, Wellington.

(Condensed from the Mellor Memorial Lecture delivered to the Wellington Branch on 5th July, 1950.)

That the elements consist of atoms having different atomic weight was discovered by Fajans and Soddy in 1911 as a result of the study of radioactive elements which occur in Nature. It was found that two varieties of elements could be secured having different radioactive properties but identical chemical properties. The theory of radioactive disintegration of uranium and thorium showed that these varieties of atoms must have different atomic weights. As a result of the careful atomic weight determinations of Theodore Richards it was shown that samples of lead isolated from different parts of the earth's crust had different atomic weights, and in particular samples of lead isolated from uranium minerals had an atomic weight approaching 206 and lead from thorium minerals 208. Sir J. J. Thomson showed that charged atoms moving through crossed electric and magnetic fields should be separated if they have different ratios of charge to mass and hence the isotopes of atoms should be separated by such a process. He determined that this was the case for the element neon, which is non-radioactive and hence showed that ordinary elements also consist of mixtures of atoms of different atomic weight. The work of Aston then gave us an extensive knowledge of the isotopes of the elements and their exact masses. There are more than 600 varieties of atoms that make up our 98 known elements, so we must confine this lecture to just a few. I wish to describe to you some interesting work on the oxygen isotopes reported by Dr. Urey and his associates: (1) The ratios of oxygen isotopes in different chemical compositions are not the same. The normal abundance of O^{18} is taken as very close to 1 in 500 of the much more abundant isotope O^{16}. But it is possible to find samples of oxygen which vary in isotopic ratios as much as 4 or 5%, i.e., from 1 part in 500 to 1.04 or 1.05 parts in 500. This is not a very large variation though it does result in a change in the atomic weight of oxygen, as it is found in chemical substances in our laboratories, by as much as two units in the fourth decimal place.

Other elements vary in atomic weight just as oxygen does, for example, chlorine may vary in atomic weight by as much as 0.03 atomic weight units, i.e., by 1 part in 1000 of the atomic weight of chlorine. The origins of these differences in chemical properties are understood in detail in many cases. Urey has calculated the partition functions for various chemical compounds, and these he used to calculate the equilibrium constants for exchange reactions. For the reaction:—

$$\tfrac{1}{3}\ CO_3{}^{16=} + H_2O^{18} \leftrightarrows \tfrac{1}{3}\ CO_3{}^{18=} + H_2O^{16}$$

he was able to deduce that O^{18} and C^{13} will concentrate preferentially in the carbonate ion. Experimentally it has been shown by Nier that O^{18} is more abundant in limestones than in water by a factor of 1.035 and C^{13} is also more abundant in carbonates of all geological ages, including the present, than in atmospheric carbon dioxide by a factor of 1.013 to 1.022.

If calcium carbonate is crystallised slowly in the presence of water at 0°C the calculations show that the ratio of the oxygen isotopes in the calcium carbonate should be 1.026 to 500 if the ratio of the isotopes in water is 1 to 500; i.e., O^{18} is very slightly concentrated in $CaCO_3$ in relation to water. On the other hand, if the temperature is 25°C the oxygen isotope will be concentrated only to the extent of 1.022 as compared with 1 to 500 in water. This shows that there is a slight temperature coefficient for the abundance of the O^{18} isotope in the $CaCO_3$ as compared with that in the water. Accurate determination of the O^{18} content of carbonate rocks could be used to determine the temperature at which they were formed. The amount of this fractionation is so slight that the atomic weight of oxygen in the calcium carbonate will be changed by only 7×10^{-7} atomic weight units as the temperature is changed by 1°C, or 2×10^{-5} atomic weight units for the change from O° to 25°C.

The calculated differences in the ratio of oxygen 18 to oxygen 16 for 1°C difference amounts to only 0.0176% in that ratio. As the ratios of the isotopes of this kind had not been reported with a higher precision than 0.1% it was necessary for Urey to increase precision of determination of these isotopic abundances in his mass spectrometer by a factor of six. Urey was able to do this and to record a difference of 4×10^{-6} in the atomic weight of oxygen.

The method of evolution of the carbon dioxide from the carbonate had also to be thoroughly investigated. Masses 44 and 46 are measured on the mass spectrometer. Since mass 46 is $\frac{1}{250}$ as abundant as mass 44 and we wish to secure this within 1 part in 6,000, it is necessary to remove any impurity of mass 46 to the extent of 1 part in 1.5×10^{6}. It is difficult to prepare carbon dioxide of this purity because of the difficulty of preventing other oxygen from becoming mixed with the sample. Glassware and chemicals contain oxygen which may become mixed with the sample. A mixture of phosphoric acid and phosphorus pentoxide was finally used for evolving the CO_2 from the carbonate. The mass spectrometer cannot detect impurities which produce an ion of mass 46 or 44, but it can show that the gas is pure with respect to substances which will produce ions of lower and higher mass than CO_2.

The measurement of differences in isotopic abundance was successively accomplished and Dr. Urey was able to apply the method to the measurement of paleotemperatures.

An article (3) appeared in *Science* in July, 1949, by Jacob Bigeleisen, dealing with the validity of the use of tracers to follow chemical reactions. As mentioned above, it is important to know how much difference in chemical properties there is between the isotopic molecules. Unfortunately this paper is rather mathematical and follows on from Urey's paper on equilibrium constants to discuss mathematically cases in which the isotopic molecules are not in equilibrium with respect to various exchange reactions. In such cases, it is important to know whether or not the specific activity of the product of some chemical transformation of the reacting isotopic molecules is the same as the initial specific activity. If the initial specific activity is known, then the specific activity of the product can be calculated by integration of the rate equations for the respective reactions.

Bigeleisen expounds the mathematical treatment and arrives at estimates for upper limits of the ratio of the rate constants $\left(\frac{K_1}{K_2}\right)$ for reactions involving many of the common tracers. This table is rather interesting and I have reproduced part of it here.

Stable Isotope	Tracer Isotope	$\frac{K_1}{K_2}$
H^1	H^2	18
H^1	H^3	60
C^{12}	C^{13}	1.25
C^{12}	C^{14}	1.5
N^{14}	N^{15}	1.14
O^{16}	O^{18}	1.19
Na^{23}	Na^{24}	1.03
Ca^{40}	Ca^{45}	1.08
I^{127}	I^{131}	1.02
P^{31}	P^{32}	1.02

Bigeleisen develops the expression $\frac{K_1}{K_2} = 1 + E_0$ and states that in any reactions involving C^{13} or C^{14} the value of E_0 will not be greater than 0.12 and 0.25 respectively at room temperature.

This amounts to calculating the relative collision frequencies of gases. If an accuracy of this order of magnitude will suffice, then it is safe to assume that C^{13} and C^{14} are faithful tracers in both equilibrium and non-equilibrium reactions. In quantitative work it is necessary to determine E_0 experimentally or theoretically. In many experiments an appreciable fraction of the substrate is allowed to react. The isotope effect decreases with the amount of reaction.

It is clear that the maximum isotope effects in the rates of reaction decrease rapidly as one goes to isotopic compounds of higher atomic number. Of the common tracers H^2, H^3, C^{13}, and C^{14}, may require special consideration in their use in non-equilibrium systems.

As an example a paper by Pr. Yankwich (2) was read recently at a conference at Brookhaven on chemical kinetics. Malonic acid was synthesised from C^{14} active cyanide and unlabelled chloracetic acid. It was then decarboxalated at its M.P. (133°C.). The CO_2 was absorbed in NaOH and precipitated as $BaCO_3$. The acetic acid was caught in a "coldfinger" later burned to CO_2. Radioactivity determinations were made on the solid $BaCO_3$.

The frequency of rupture ratios were obtained for the $C^{12}-C^{12}$ and $C^{12}-C^{14}$ bonds. These came to 1.12 ± .03. He also decomposed bromo-malonic acid M.P. 115°C and obtained a higher ratio 1.41 ± .08.

This data corresponded to an activation energy difference of 96 Cal./mole in the first case and 250 Cal./mole in the second and, Yankwich stated, the differences were larger than one can account for in terms of the effect of mass on the frequency of the C–C stretching vibration.

Another experiment on the pyrolysis of propane indicated an isotope effect such that the frequency of rupture of the $C^{12}-C^{12}$ bond was 8% greater than the $C^{12}-C^{13}$ bond at 10% cracking. In both cases Bigeleisen showed that the calculated results were at variance with the experimental data.

I must leave this isotope effect at this unsatisfactory stage but, knowing that such an effect exists, steps can be taken to interpret possible discrepancies.

I have no time to mention some uses of isotopes in chemistry. Isotopes have recently been used to test the validity of Fischer's intermediate carbide theory. Fischer postulated that it seemed reasonable to expect the synthesis of hydrocarbons over metals such as Ni, Co and Fe to proceed through carbiding mechanism.

Since all of these metals were known to be capable of reacting with carbon monoxide at synthesis temperatures to form carbides, it was suggested that the metal carbides were intermediates in the hydrocarbon synthesis. The reduction by hydrogen of the carbides formed by the reaction of the metal and CO was assumed to result in the formation of the observed hydrocarbon.

When C^{14} became available an experiment was performed in which a small amount of hydrocarbon was synthesised from a mixture of H and normal CO over a mixture of metal and metallic carbide, the carbon content of the latter containing a known amount of C^{14}. If the hydrocarbons formed were produced through the carbiding mechanism the radioactive content of the hydrocarbon should be the same as that of the carbon in the carbide during synthesiss. On the other hand, if the synthesis was proceeding by some mechanism not involving the formation of carbide as an intermediate the hydrocarbon should have the same isotopic composition as the synthesis gas. It was found that at temperatures of 260° and below no more than 10% of the synthesis appeared to be going through a carbide mechanism and at 300° about 16%. Thus for the most part the hydrocarbon formation does not involve the carbides of iron or cobalt as intermediates. Even the 10% does not probably proceed by the carbide mechanism but may have been introduced by some exchange during synthesis rather than by direct reduction of the carbide.

Perhaps the most extensive application of the artificial radioelements in chemical work has been to study "exchange reactions" (5). Experiments of this type give information on

(1) Chemical bond types.
(2) The strength and reactivity of chemical bonds and the effect of solvents on these properties.
(3) The structure of ions and compounds.
(4) The mechanism of reaction.
(5) The mechanism of catalysis.
(6) A method of introducing radioactive atoms into compounds.

General rules for homogeneous Exchange Reactions:

(1) If we consider exchanges of a given element between two sorts of molecules or ions in which it is held by electron-pair bonds to different numbers or kinds of other atoms, we may say in general that such exchange reactions do not proceed with appreciable rates except in those cases where there are reversible reactions which enable the exchanging atoms to reach equivalent stages of chemical combination. For example, there is no exchange of

> atoms between phosphate and phosphite, sulphate and sulphite, sulphur and carbon disulphide, the iodine ion and iodoform. On the other hand exchanges have been found between chlorine ion and chlorate (due to oxidation-reduction equilibrium), lead nitrate and lead chloride (an extreme example of ionization exchange mechanism), and between iodine ion and the iodine molecule through the formation of I_3^-. Where the two exchanging molecules differ only in their net charge, another exchange mechanism, the transfer of an electron from one to the other may become possible, as in the case of ferrous ion to ferric, and manganic ion to permanganic.

Studies are being made of systems and conditions under which kinetic studies can be made, partly with the idea that such data might permit a correlation of the rate and kinetics with factors such as the bond type and structure of the exchanging complexes and partly to aid in the discovery of complex compounds which might be useful in the concentration of metals by the Szilard-Chalmers recoil method.

Radioisotopes can be separated through the breaking of a chemical bond by the recoil of a nucleus that has emitted a gamma ray. Such recoils may amount to 100 ev. for energetic gamma rays. Since chemical bonds are much less than this value, we see that such recoils may break the chemical bonds of a radioisotope and its compound substance.

Isotopes with a high specific activity can be obtained from an $(n\,\gamma)$ reaction by utilizing the Szilard-Chalmers reaction. As an example consider the formation of I^{128} by the neutron bombardment of ethyl iodide. When I^{127} absorbs a neutron I^{128} is formed in an excited stated which is stabilised by the subsequent emission of a gamma ray. The gamma ray carries off a momentum $\rho = \frac{hv}{c}$ and consequently a recoil momentum is imparted to the nucleus. The energy of recoil is sufficient to rupture the chemical bonds and free iodine is liberated.

$$C_2\,H_5\,I + \eta \rightarrow C_2\,H_5 + I^*$$

The free iodine can be readily separated from the unaltered ethyl iodide by chemical methods. High specific activities cannot be obtained by the Szilard-Chalmers reaction if there is appreciable exchange which in the above example would give

$$C_2\,H_5\,I + I^* \rightarrow C_2\,H_5\,I^* + I.$$

Another interesting observation was explained to me by Dr.

Maddock of the radiochemical department, Cambridge. Sources of S^{35} of high specific activity are commonly prepared by irradiation of KC1 in the pile. Thermal neutrons produce an (n p) reaction in the Cl^{35} isotope. It is known to be difficult if not impossible to extract the sulphur from the irradiated material, other than in the form of sulphate.

Some biochemists desire the sulphur in more reactive form and it has been observed that if RbC1 instead of KC1 be irradiated about 50% of the active S can be separated as H_2S by treatment of the irradiated salt with aqueous HC1 containing a trace of H_2S as carrier.

As an example of the use of radioactive tracers in heterogeneous reactions, the action between CO_2 and C as explained by Dr. Turkevich (4) may be taken:—

$$CO_2 + C = 2CO$$

This reaction is of interest because of its importance in the gasification of coal and because of the problem of "burning off" carbonaceous deposits on many catalysts. The reaction has been investigated using radioactive CO_2 and the following mechanism suggested:—

CO_2 + charcoal → CO+ oxygenated charcoal with the CO_2 molecules approaching the surface, depositing their oxygen on the surface, and the reactant molecules coming off as the product molecules of CO. The results obtained exclude the possibility that one CO_2 molecule is absorbed and a CO molecule involving another C atom desorbed. Furthermore, if the process of adsorption of CO_2 is to be considered as a dissociation process on the surface, then only one carbon oxygen bond is dissociated.

Runs at higher temperature and at various pressures showed

(1) that the process is pressure-independent at the chosen temperatures and pressures;

(2) over 95% of the CO_2 was converted into CO within at the most four minutes from the start of the reaction with no increase in pressure.

The process can therefore be visualised as taking place in two stages.

1st. The CO_2 is adsorbed on the surface, leaving the surface as CO, dropping its oxygen and leaving an oxygenated charcoal surface. This process is slow at 500°C, rapid at 700-848° C. The specific activity of the CO is the same as that of the CO_2.

2nd. The decomposition of the oxygenated surface with the desorption of the surface oxygen as CO removing at the same time carbon from the charcoal. This slow process involves an increase in pressure and a decrease in the specific activity of the CO.

Surface Exchanges

Experiments have been carried out to determine whether mineral surfaces (6) can be made radioactive by undergoing exchange reactions with radioactive ions in solution. Such radioactive coatings, if selective, would serve as a means of differentiating between minerals in an ore and enable them to be separated mechanically by a Geiger counter operated device.

Paneth states that natural minerals offer great resistivity to exchange reactions; however tarnished or weathered mineral surfaces might react.

The method is to place the mineral in a conditioning solution to produce a surface coating, then to transfer it to the active solution for a required time. Then, after washing and drying, the activity of each piece is measured.

Galena ($Pb.S$) oxidises readily in moist air to $Pb.SO_4$. For this reason S^{35} in the form of $SO_4^=$ in acid solution was used in attempts to activate the surface by exchange reaction. To produce the desired coating the freshly broken mineral was given a pretreatment with dil. nitric acid before transferring to the active solution. No exchange was observed in the fresh surface of the galena. As oxidation of the surface progressed, exchange took place more and more readily. Even when only a slight tarnishing was apparent, the surface assumed a quite high activity after a few minutes in the active solution.

Pyrite (FeS_2) surface oxidises to Fe_2O_3 instead of sulphate as any sulphate formed goes into solution. Consequently, the mineral surface could not be made radioactive by using $S^{35}O_4^=$.

Apatite (CaF_2, $3\ Ca_3P_2O_8$). It was found that no exchange occurs between the surface of the apatite and P^{32} as phosphate in acid solution. Attempts to produce a coating on the mineral that would exchange with $P^{32}O_4$ in acid failed. This was to be expected since $Ca_3(PO_4)_2$ is soluble in dilute acid. It was found, however, that dil. sulphuric produces an insoluble coating of calcium sulphate on the apatite and that this exchanges very readily with $S^{35}O_4^=$ in solution. In this way the mineral surface could be given a high activity. The $CaSO_4$ coating was, however, not nearly as firm and adherent as the $PbSO_4$ coating on galena.

The condition necessary for exchange is that the mineral surface be coated with a slightly soluble compound produced by weathering or by chemical treatment.

This exchange on the surface of minerals has another important aspect in the interpretation of results using tracers in soil chemistry. Dr. Strzemienski of the Soil Bureau, in a paper presented last year in Australia, referred to a paper written by McAuliffe et al. (7) in America on exchange reactions between phosphates and soils. The authors did not draw any implication as to the bearing this isotopic exchange may have upon experiments with fertilizer and soil phosphorus uptake.

Dr. Strzemienski explained that while conditions in field or pot experiments are different, i.e., there is no continuous aqueous phase shaken with the soil, yet some opportunity obviously exists for isotopic exchange between the original fertilizer phosphate or the phosphate formed from it by chemical interaction with soil on one hand, and the original phosphates on the other hand. They must often be in contact with the same minute layer of soil solution, and the trend towards establishing equilibrium in $P^{32}:P^{31}$ ratios would generally lead to a decrease of specific radioactivity in the phosphate derived from the fertilizer. This would lead to over-estimating the percentage of soil phosphates in the total phosphates taken up by the plant.

The paper by McAuliffe also gave details of how to estimate the specific hydroxylic surface of soils and their component minerals. The amount of exchangeable hydroxyl groups were measured for kaolinite, halloysite, diaspore, goethite and gibbsite using gaseous exchange of D_2O with surface OH groups.

In conclusion, the isotope technique is just another powerful tool for the chemist to probe into the secrets of science. Many advances have already been made, but the breadth of future knowledge is limited solely by our ability to introduce modern methods to solve problems that are intractable to the well-tried methods of the past.

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SOME CHEMICAL PROBLEMS ENCOUNTERED IN NUCLEAR ENGINEERING

By G. C. J. Dalton, Ph. D. (Oxon), B.E. (Civil), B.Sc.,
Professor of Mechanical Engineering, Auckland University College.

To deal adequately with the work of the chemist in the development of Atomic Energy would require several volumes written by numbers of specialised chemists.

This paper has the more modest aim of sketching the background from which some of the chemical problems arise. Such topics as radiation chemistry and tracer techniques are not discussed, as these are best left to the expert.

The branch of engineering which has come to be known as Nuclear Engineering has three main objects:

1. The separation of naturally occurring Uranium isotopes.
2. The production of new materials, and
3. The useful production of heat.

The first is the separation of the fissionable U_{235} from U_{238}.

The second is the production of plutonium and U_{233} as nuclear fuels and the production of isotopes such as tritium and of radioactive isotopes.

The third object represents the attempt by engineers to harness nuclear energy to useful purposes.

The separation of U_{235} from Natural Uranium is best done by physical methods based on the difference of mass of the 235 and 238, i.e., electro-magnetic, gaseous diffusion and centrifuge methods. It is, however, worth noting that these methods require the Uranium to be in the form of a gas and that UF_6, the only satisfactory gas, is extremely corrosive. Thus the development of suitable containers and porous barriers for the gaseous diffusion plant was a major chemical problem.

PILE DESIGN:

The production of new materials such as Plutonium and Uranium $_{233}$ involves the construction of Atomic Piles or Nuclear Reactors which are devices for obtaining a controlled chain reaction.

When a heavy nucleus Uranium or Plutonium disintegrates into two lighter nuclei, these have more neutrons than are required for stability and some of the excess neutrons are ejected; others decay into protons by electron emission. The excess neutrons which are ejected may, if not lost from the system, cause further fissions. A chain reaction is a possibility if the number of neutrons ejected and used to cause fission is at least one. Neutrons may be lost from the system by:

1. Escape from the surface.
2. Non-fission capture by Uranium.
3. Competitive capture by impurities.

As (1) is a surface effect and (2) and (3) are volume effects (as is fission), the proportional loss of neutrons will decrease as the size (vol./surface) increases. The size at which a chain reaction is just possible is the "critical size." Above this size, one neutron gives rise in the system to more than one neutron and there is an increase from generation to generation of the total number of neutrons in the system. Below this size the chain reaction dies out.

The design of the pile will depend on the purpose for which it is intended, but there are many common chemical problems. The Natural Uranium Reactor using graphite as a moderator is a representative example. Natural Uranium (U_N) consists of one part of U_{235} to 139 parts of U_{238}. Only U_{235} is markedly fissile and in a system of pure U_N the non-fission capture of neutrons by U_{238} is excessive and a chain reaction is not possible. However, if the units of U_N are surrounded with a light material (such as Beryllium, Graphite, heavy water) the neutron energy is reduced by collisions to a level at which the probability of a neutron causing fission of U_{235} is greater than the probability of its capture by U_{238}. These piles are called thermal piles as the neutrons are in thermal equilibrium with the surrounding nuclei.

In a natural Uranium-graphite pile moderation is not in itself quite sufficient to allow a chain reaction to occur, since the neutrons in passing from fast to thermal energy pass through an energy level at which U_{238} has a resonance for capture. In order to overcome this the Uranium is lumped in the form of rods in a background of graphite. In this way the probability that the neutrons born in a rod will return or reach another rod before reaching thermal energy, is very much reduced.

It is clear, then, that considerable trouble must be taken to produce a chain reaction with U_N and neutrons must not be wasted. Some impurities, Boron, Cadmium, Indium, etc., absorb neutrons very strongly and cannot be tolerated in a pile. Thus graphite must be chemically free from Boron to 1 part in 10^6. Some of the rare earths are even worse. For example, Gadolinium has a capture cross-section of tens of thousands of barns compared with that of Carbon of .0045.

The purification of tons of graphite to the required standard is one of the more awkward chemical problems.

Similarly, the Uranium must be free from these strongly capturing impurities. The removal of ordinary impurities may be effected by standard chemical methods, but the removal of traces of Boron, Cadmium, and various rare earths require special techniques. One must remember that the purity required is often greater than that found in standard laboratory reagents.

The radioactivity of U_N presents no problem as it has only a low activity.

One of the most irritating problems presented to the chemists and metallurgists was that of the "canning" of the Uranium rods. Owing to the radioactivity of the fission products the rods must be separated from the coolant fluid by cans. The material of these cans must have a low neutron capture cross-section and must have the required properties of a canning material, i.e., the can must not crack. Aluminium has the necessary nuclear properties and ductility but unfortunately Aluminium and Uranium tend to interact. This apparently trivial problem nearly prevented the operation of thermal reactors both in the U.S. and in Britain, and possibly chemists spent more time on this problem than on any other associated with the construction of a pile. Needless to say the solution of the problem is not for publication.

PLUTONIUM SEPARATION:

The problems so far mentioned have to be solved before the Pile is put into operation. However, the serious worries begin with start-up, and elements of danger not previously encountered are created.

Let us assume that the graphite pile is intended for the production of Plutonium. The pile is run until a certain proportion of the U_{238} has been converted to Pu_{239}.

The reaction may be represented thus:

$${}_{92}U^{238} + {}_{0}n^{1} \longrightarrow {}_{92}U^{239} \xrightarrow[23m.]{\beta^-} {}_{93}Np^{239} \xrightarrow[2.3d.]{\beta^-} {}_{94}Pu^{233}$$

The rods of Uranium must be then removed from the pile, the cans removed, and the Plutonium separated by chemical means. Unfortunately this is by no means straightforward. The first difficulty is that the pile material is now intensely active and it is necessary to handle millions of curies of radioactivity. Secondly, we have at present, as fission fragments of the U_{235}, practically every element from atomic number 30 to 70 and in radio-active form.

Thirdly, we have only grams of Plutonium to be separated from tons of Uranium fission fragments and the cans.

To emphasise the role of fission products let us consider the process of fission. The result may be represented as:

$$ {}_{92}U^{235} + {}_{0}n^{1} = (\underset{\text{unstable}}{{}_{92}U^{236}}) = Z_2\,X^{A_1} + Z_2Y^{A_2} $$
$$ + \nu_0n^1 + \gamma + Q $$

where Z_1, Z_2 are the atomic numbers of the two fragments.
A_1 A_2 are the atomic weights.
v = number of neutrons ejected at fission.
γ = γ energy emitted.
Q = kinetic energy of the fragments.

After fission has occurred each fragment, having a surplus of neutrons for stability, undergoes approximately six decays before the nucleus becomes stable. The half lives of these reactions vary from seconds to years, so that even long after the pile is shut down the by-products of fissions are still radio-active.

e.g.
$$ Xe^{140} \xrightarrow[\text{16sec.}]{\beta^-} Cs^{140} \xrightarrow[\text{40sec.}]{\beta^-} Ba^{140} \xrightarrow[\text{12.8 days}]{\beta^-\gamma} La^{150} \xrightarrow[\text{40 hr.}]{\beta^-\gamma} Ce^{140} $$

It is possible, knowing the proportion of the various elements in the fission products and their decay behaviour, to calculate the radio-activity associated with each in a pile operating at a continuous power output. The interesting, and unpleasant, result of such calculations is that a relatively low power output is associated with large activities of the fission products; in fact, 1 watt is associated with approximately one curie of radio-activity. A trivial amount of power results in a dangerous amount of radioactivity. Since the amount of Plutonium in the Uranium rods will depend on the number of fissions which have occurred, it is obvious that Plutonium production also means production of unpleasant activity.

The separation of Plutonium is thus one of the most difficult problems facing the chemist and the engineer—not eased by the fact that Plutonium is one of the most toxic substances known. Because of the γ-emitters, all the separation processes must be carried out behind shields by remote control, and servicing of the equipment is practically impossible, even if the Uranium rods are stored for some weeks to allow the short-lived activity to decay.

Because of the toxicity of Plutonium the separation must be practically 100%. Also most waste has to be stored indefinitely; as the long-lived fission products may be dangerous for hundreds of years.

The by-products of the chemical processes may be bulky diluted solutions of the fission products, and these are the most difficult to handle. Concentrated fission products of high activity may be stored in relatively small tanks, but the bulky "low grade activity" requires very large tanks which are expensive in both space and materials. Many methods have been proposed for the concentraion of this low grade waste, but at the moment an ideal solution to the problem of the disposal of radio-active wastes has yet to be found.

The U_N-Graphite pile may also be used for the production of U_{233}, another nuclear fuel. Inserts of Th_{232} are placed in the pile and after irradiation the U_{233} is separated by chemical methods from the Th.

The reaction is

$${}_{90}Th^{232} + {}_{0}n^{1} \rightarrow {}_{90}Th^{233} \xrightarrow[\text{23 min.}]{\beta^-} {}_{91}Pa^{233} \xrightarrow[\text{27 days.}]{\beta^-} {}_{92}U^{233}$$

As with the Plutonium in the irradiated U_{238}, the U_{233} will be present as a few grams per ton in the Thorium. It is therefore necessary that the original Thorium should be free (to $<$ 1 part in 10^6) from Uranium (mostly U_{238}) contamination, as otherwise the separated Uranium would be made up of U_{233} plus U_{238} impurity, and these are inseparable by chemical methods.

In the case of U_{233} there is a difficulty not encountered with Plutonium in the relatively long half-life of the intermediate element ${}_{91}Pa^{233}$. Either the irradiated material must be aged for five or six months to allow the Protactinium to decay or the Protactinium must be extracted from the Thorium as well as the U_{233}.

It is not possible to give details of the separation processes, but the basic problem of having to remove grams of one substance from tons of another which is not greatly different in chemical properties, obviously will require modification of ordinary precipitation processses. The method of solvent extraction has more general application in these cases.

The production of the nuclear fuels Plutonium and U_{233} represent only two examples of the much more general application of piles, the production of radio-active isotopes. The pile is a neutron source in which the parent element is irradiated.

The majority of isotopes are formed by one of the processes, (a) simple neutron absorption (n reaction); (b) transmutation (n, p or nα) which give isotopes differing chemically from their parents, and (c) (n, γ) reactions which are followed by a decay or series of decays yielding radio-active daughter substances which differ chemically from the target element.. Type (b) must be separated chemically and although most of this work is straightforward, apart from the radio-activity, there are special techniques required to get short-lived isotopes from the pile to the experimenter before they lose most of their activity.

Other types of reactors such as those using pure U_{235} or Plutonium present special problems. With U_N reactors the fissionable material is diluted with inert material in the ratio of 1:139 and it is possible to burn an appreciable amount of the 235 isotope before the presence of the fission products begins to have a chemical effect. However, when there is only fissionable material present, the burning of, say, 1% introduces 2% of foreign atoms and these are created in the body of the fuel metal. Some, such as Xenon, are insoluble in the metal in which they are created. Others react chemically with the parent fuel, with the canning material and with each other. It is a complex problem for the chemists to forecast the probable chemical behaviour of the reactor elements.

HEALTH PROBLEMS:

The problems which are usually allocated to health physics belong often to the chemist. High energy neutrons on entering animal tissue may collide with nuclei and give rise to secondary charged particles. Also their energy is sufficient to break down complex molecules.

This disruption of heavy organic molecules and ionisation leads to new chemical combinations. Thus there is not only the destruction of tissue: there is also the creation of new foreign substances within the cells. When this chemical change occurs in genes it seems that it may set in train biological changes which result in mutations. There is a very interesting field of research on the bio-chemical changes resulting from neutron irradiation.

TRANS-URANIC ELEMENTS:

A note on the position in the Periodic Table of the new artificially created elements may be of interest.

From evidence based largely on the oxidation state of the transuranic elments (and some of this evidence obtained by tracer techniques) it appears that the elements Ac, Th, Pa, U, Np, Pu, Am, Cm form a heavy element transition group similar to the rare earth group. Am and Cm may be made by helium ion bombardment of U and Pu respectively.

With Xenon we have all the electron shells up to the 5p shell completely filled except the 4f shell, which is empty. With Ba the 6s shell is filled and in the following rare earth elements, the Lanthanide series, the 4f shell is systematically filled with a few discontinuities due to an electron in the 5d shell in certain cases.

In the case of Radon the 6s and 6p shells are filled and the 5f shell is empty. At Ra 88 the 7s shell is filled and the transuranic elements may form a transition group in which the 5f is gradually filled just as the rare earths are the result of the filling of the 4f shell with a few excursions into the 5d shell. In the case of Ac, Th, Pa, U, it is possible that the electrons go to the 6d shell and the filling of the 5f shell begins with Np.

Undoubtedly, as larger quantities of the heavier elements become available, elements up to atomic number 100 or more will be manufactured. However, their life will get progressively shorter as their atomic number increases and it is improbable that they will have important chemical significance.

HETEROCYCLIC COMPOUNDS, Vol. I. Edited by R. C. Elderfield, Columbia University; 730 pages; 1950; John Wiley & Sons, New York; $11.00. The heterocyclic division of organic chemistry has grown greatly in importance lately for several reasons, one being the large numbr of compounds of medicinal value, such as penicillin and sulphathiazole. Another reason is the increasing industrial application of compounds such as furfural and morpholine. Text-books on the heterocyclic division are limited to the appropriate divisions of Meyer-Jacobson (1920) and of Richter (1935) and the useful "Chemistry of the Heterocyclic Compounds," by Morton (1946), in one volume. Realising the need for a fuller treatment, Messrs John Wiley and Sons have commissioned R. C. Elderfield to edit a series of volumes in this field, and the first one is now on hand. It deals with 3, 4, 5 and 6 membered rings containing one hetero-atom, and consists of a series of reviews by various authors as follows: Ethylene and trimethylene oxides; ethylene imine; derivatives of azete; furan; thiophene; pyrrole and derivatives; pyran and thiopyran; pyridine; piperidine and partially hydrogenated pyridines. There are certain guiding principles to be noted: (1) Fields which which have been adequately treated in recent books and less extensively treated here; (2) no detailed treatment of the alkaloids; (3) only general principles are discussed. Physical data, experimental details and industrial applications are therefore almost completely ignored. In view of the size of the field it is natural that the editor should try to limit the work in some way, but it seems likely that the omission of such details will restrict the usefulness of the work to students and academicians, and it is disappointing because such details are widely scattered in the literature at present. Perhaps the publishers may consider the issuing of companion volumes of practical details on the lines of Huntress' "Chlorine Compounds" before the series is closed. Otherwise the work is excellently done and the series will in any case take an important place in the literature of chemistry.

ROYAL SOCIETY OF NEW ZEALAND

SEVENTH SCIENCE CONGRESS, CHRISTCHURCH, MAY 15-21, 1951.

FIRST NOTICE.

The Seventh New Zealand Science Congress will be held during the Centennial celebrations of the Province of Canterbury. It will be organised by the Canterbury Branch of the Royal Society of New Zealand, with the co-operation of kindred bodies, on behalf of the Royal Society of New Zealand, and will be held at Canterbury University College, Christchurch, from Tuesday, May 15th, to Monday, May 21st, 1951.

The aim of the Congress is to bring together workers in various branches of science and interested members of the public for the purpose of reviewing progress in scientific endeavour. It is proposed to arrange the programme chiefly in symposia; some of these will be conducted jointly by different sections showing how various scientific disciplines are brought into co-operation for a common purpose, and how the various sciences are becoming increasingly linked. Besides joint symposia, all sections will have sessions dealing with particular topics. This will concentrate attention on subjects of live interest. In addition, there will be sessions for miscellaneous papers apart from symposia, enabling work of an independent nature to be reported.

It is intended that papers submitted to section meetings should be intelligible to scientists generally. Contributions are invited; offers and inquiries thereon should be directed to the secretaries of sections, **not** to the General Secretaries.

The proposed section programme for Section B, Chemical Science, will be:

1. Bioassay.
2. Biochemistry.
3. Chemical Physics.
4. Toxic Constituents of Plants.

The Section Secretary is Mr. R. M. Allison, Crop Research Division, Private Bag, Christchurch.

Accommodation will be available in hotels and in private homes, and is being arranged by the Canterbury Centennial Committee.
Application for hotel accommodation should be made immediately, and all enquiries re accommodation should be made to the Accommodation Officer, Canterbury Centennial, City Council Chambers, Christchurch.

(The usual August Conference of the Institutes of Chemistry will be held in Hamilton in August, 1951.)

BOOKS RECEIVED

PRACTICAL ORGANIC CHEMISTRY. By J. J. Sudborough and T. Campbell James. 2nd edition., 1949; 450 pages; Blackie & Son, London; 15/-. After forty years a new edition of this work, which is a companion to Bernthsen & Sudborough's "Text-book of Organic Chemistry," has been issued as a handy little volume, which has been well received by the reviewers overseas. The apparatus used is simple and relatively inexpensive, but the treatment is sufficiently modern to include the preparation of higher polymers and chromatography. There are a few printer's errors and in a few places the directions could have been made a little fuller, e.g., in the hydrogenation of olive oil where there is a grave risk of fire when heating with a naked flame. The price is very reasonable.

THE NEW BRANCH CHAIRMEN

Mr. A. W. Mackney, Auckland

Mr. Mackney graduated M.Sc. from the University of Sydney, where he was associated with Prof. J. C. Earl in the discovery of the "sydnones," a new class of organic compounds appropriately named after the city of their origin (Earl and Mackney, J.C.S., 1935, 899). The structure has not been unequivocally decided, but may prove quite unique. (See Baker et al., J.C.S., 1950, 1542.) He spent four years in the Division of Forest Products, Melbourne, and four years with the Australian Newsprint Mills, before joining New Zealand Forest Products in 1944, to organise sulphate kraft investigations. This involved taking logs of timber to the Herty Foundation Laboratory, Savannah, Georgia, and carrying out pilot plant tests there. Since then he has made several other trips abroad, including frequent visits to Australia to confer with pulp and paper chemists over there. He joined the Institute in 1944, and was elected to the branch committee last year.

Dr. C. R. Barnicoat, Manawatu

Dr. Barnicoat joined the Dominion Laboratory, Wellington, as a professional cadet in 1920 and attended V.U.C. He graduated M.Sc. in 1925, with honours in organic chemistry, being awarded a senior scholarship as well as Jacob Josephs and Sir George Grey scholarships. At the Dominion Laboratory Dr. Barnicoat was engaged in general analytical work and later specialised in meat and food storage research. He spent 1929-30 at the Low Temperature Research Station, Cambridge. From 1930 until 1938 he was with the Dairy Research Institute (N.Z.) at Palmerston North, working mainly on fat oxidation problems. Dr. Barnicoat spent 1938-39 at the University of Minnesota as a Commonwealth Fund Fellow and graduated Ph.D. in Agricultural Biochemistry. He joined the staff of Massey College in 1939 as a senior lecturer and is now Head of the Department of Agricultural Biochemistry (Animal Nutrition and Dairy Chemistry). His present research interests are fat oxidation and the wear in sheep's teeth. Dr. Barnicoat is also chairman of the New Zealand section of the Royal Institute of Chemistry for 1949-50.

Prof. S. N. Slater, Wellington

Prof. Slater's career was reviewed in our issue for June last. He is Professor of Chemistry at Victoria College, and has just been elected Vice-President of the Institute.

Mr. N. P. Alcorn, Canterbury

Mr. N. Patrick Alcorn was born in 1911 and educated at Wellington College and Victoria College, where he took his M.Sc. degree. In 1929 he joined the Department of Agriculture as a clerical cadet, but shortly afterwards transferred to the Dominion Laboratory, Wellington, where conscientious work led to his appointment at a comparatively early age to the position of Government Analyst, Christchurch. He was elected an Associate in 1939, and is also an Associate of the Royal Institute. He has served on the Committee and as Secretary of our Wellington Branch, and in his three years in Christchurch he has served on the Branch Committee and on the Conference Committee. He therefore brings a wide experience of Institute affairs to his new task.

Mr. Alcorn's other activities include a notable record of service in the Methodist Church.

Dr. G. M. Richardson, Otago

Dr. G. M. Richardson is an old boy of Wanganui Technical College. He graduated from Victoria College in 1926, and in 1927 he gained his M.Sc. degree for work of cryoscopic irregularities in phenolic solution. The award of an 1851 Exhibition Science Research Scholarship then enabled him to further his studies in London. He worked at University College and at the Royal College of Science on the electrode potentials of oxidation-reduction systems and on specific pH titrations of biochemical interest. On this work the University of London granted him the degree of Ph.D. in 1930 and D.Sc. in 1934, and the Imperial College also granted its Diploma. He was next attached as chemist to a unit of the Medical Research Council established at the Middlesex Hospital for study of chemical requirements for the growth of bacteria. Subsequently, he became serologist to the Ministry of Health, in which capacity he worked during the war years at the London School of Hygiene. In 1945 he came to Dunedin, and is now attached to the Nutrition Research Department of the N.Z. Medical Research Council, working at the Medical School. He is at present interested in selecting solid, constant-humidity buffers for making controlled studies on the storage of foods.

CONFERENCE OF THE N.Z. AND ROYAL INSTITUTES OF CHEMISTRY

August 20th — August 22nd, 1951

The Conference will be held at Hamilton on the above dates, the meeting-place being the Hamilton High School.

Sessions will be arranged round the general theme of "Food and Agriculture." Provision will be made also for aspects of Industrial and Engineering Chemistry not covered by the main theme and for current research in the University Colleges. A combined session on analytical methods is also a possibility. The conference committee invites those who can contribute papers to communicate as early as possible with Dr. D. D. Perrin, Box 490, Hamilton, indicating the subject and probable length. The length in general should be about 25 minutes, as at the 1950 conference, but 10-minute contributions will be acceptable, more particularly in the analytical session. The programme is still open to modification and papers on any topic will be considered. The committee will welcome any constructive suggestions.

THE TWENTIETH ANNUAL REPORT

For the Year Ended 31st October, 1950.

Council has pleasure in presenting to members a record of activities for the year ending 31st October, 1950.

OFFICERS FOR THE YEAR

have already been recorded in earlier issues of the *Journal.*

ELECTIONS OF FELLOWS AND ASSOCIATES AND RECORDING OF RESIGNATIONS

have been recorded in the *Journal* after each meeting.

MEMBERSHIP

Membership figures for recent years are as follows:—

	1947.	1948.	1949.	1950.
AUCKLAND	71	76	88	95
WELLINGTON	122	132	137	147
CANTERBURY	51	55	54	60
OTAGO	47	44	55	54
OVERSEAS	29	40	36	44
	320	347	370	400

MEMBERS OVERSEAS:

We still maintain practically a Branch of the Institute overseas. Members are continually taking up overseas scholarships or proceeding abroad for further study. About half of our Overseas Group are on special leave, while the others are in permanent overseas positions.

During the year special leave was granted to R. A. J. McIntyre, Miss J. B. Ross and Dr. C. J. Wilkins.

REGISTRAR:

Mr. H. K. Palmer has continued as Registrar to the Institute and Members of Council, Secretaries of Branches, and Secretaries of sub-committees will recognise the large amount of detailed work which has to be attended to annually by such an officer.

FINANCIAL:

The Balance Sheet shows that the financial position is healthy. During the year £500 was deposited in a National Savings Account as an investment for two years. The Trust Fund investment has been built up to £451, while the cash balances in hand total £350.

The Income and Expenditure Account records a surplus of £138 for the year. The main items of expenditure are Printing and Stationery (including printing the list of members) £83, Registrar's Salary £125, Duplicating £40. Travelling Expenses £69 and *Journal* £326. £216 of the *Journal* costs are recovered from subscriptions and advertising. Subscriptions for the year total £607, an increase of £51 over last year's figures.

I.C.I. PRIZE:

This is the second year of award of the Imperial Chemical Industries (N.Z.) Ltd. prize of 25 guineas for the best contribution to some branch of chemical science, judged by research work published over the previous five years. The prize was presented to Dr. F. B. Shorland at the annual conference for his work on Fats and Fish-oils.

INDUSTRIAL CHEMICAL ESSAY PRIZE:

This Institute prize is of the value of £25 and is offered at intervals of a few years for an essay on some aspect of Chemical Industry in New Zealand. The competition was well contested this year, the prize being awarded to H. A. L. Morris, Dunedin, for his essay on "Furfural."

INSTITUTE COMMITTEES:

It has become the policy in recent years to ask all sub-committees of the Institute to submit reports of the year's activities to the General Meeting of members held during the annual conference. This year in Christchurch reports were submitted by fourteen sub-committees and a very brief summary of these reports is included herewith.

CONFERENCES:

Conference, 1950, was held at Canterbury College, Christchurch, under the chairmanship of Professor Packer, from August 22nd to August 25th. A full programme of papers, addresses, and visits to industrial works was arranged by a local committee representative both of our Institute and of the New Zealand Section of the Royal Institute of Chemistry. About 190 attended a most successful conference.

Arrangements are already well under way for the 1951 conference, which will be organised and run in Hamilton during August.

Section B of the Royal Society Congress, to be held in Christchurch from Tuesday, May 15th, to Monday, May 21st, 1951, will be organised by a committee representative of the N.Z.I.C. and of the N.Z. Section of the R.I.C.

CONRACTS OF SERVICE:

The final draft of a Contract has been submitted to Council and has been commented on by our solicitors. It is proposed that this should be used as a guide to chemists desiring to conclude a contract with an employer.

EMPLOYMENT REGISTER:

This service has continued as in past years. Eight circulars have been distributed advertising 139 vacancies pertaining to industry, government and teaching both in New Zealand and in Australia.

EXAMINATIONS COMMITTEE:

This Committee transferred from Wellington to Dunedin after the November, 1949, examinations for Laboratory Assistants. The Dunedin Committee has had a very busy first year of operations, arranging a syllabus for each of the following new optional subjects for the Laboratory Assistants' Examination:—

Elementary Microbiology; Foreign Languages; Librarianship. This committee, particularly, calls on a large number of Institute members in the various centres for voluntary work, and it would like to thank all those who have assisted as examiners, or as supervisors in any other way. We are also grateful for assistance from others who are not Institute members and appreciate the generosity of University and Government authorities who make laboratory accommodation available for examinations.

JOURNAL:

We are indebted to Editor S. G. Brooker and an active Auckland Committee for another progressive and successful year with the *Journal.* The circulation has risen over recent years as follows: 1948—433; 1949—490; 1950—529.

Costs have, of course, risen, but the greater proportion of printing costs have been offset by an increase in the number of advertisers, and an increasing membership has made more money available for this most essential service.

LIST OF MEMBERS:

The Journal Committee this year revised and reprinted the List of Members, which contains the names of N.Z.I.C. and R.I.C. (N.Z. Section) members. This is a valuable publication but very rapidly gets out of date. Present policy is that it should be reprinted every other year.

MEDICAL ADVERTISEMENTS:

This matter is still an interest of the Institute but no cases have been reported for investigation and it appears that in recent years the standard of advertising has been much improved.

MEMBERSHIP COMMITTEE:

This committee, which consists of three Fellows of the Institute, has examined the qualifications and recommended the election of two Fellows and thirty-seven Associates. It has also been asked to consider modifications of Rules relating to membership.

PATENTS COMMITTEE:

Particular attention has been given to two patents concerning molecular distillation and wool shrinkage. The main purpose of the committee is to scrutinize the Patent Journal for patents of particular interest to chemists with the object of noting items which are not considered patentable.

PROFESSIONAL STATUS COMMITTEE:

This committee was appointed from the Auckland Branch to consider matters relating to the professional status of members, e.g., Membership of Unions, Registration, Graduate membership, the position of Laboratory Assistants and Technicians, matters relating to Charters, etc. The particular problem under consideration this year has been the question of including Technicians or graduate chemists working in hospitals under an industrial union's award. Judgment has been given that "hospital" should not have been added to the title of the union concerned. It is felt that the position regarding membership of Industrial Unions is one which the Institute will do well to watch carefully and the committee intends to procure a full copy of the recent judgment for further study.

SALARIES:

The main activity of this committee has been the publication in our Journal of a comparison of British, Australian, and New Zealand salaries for chemists. A number of general enquiries have also been answered.

STANDARDS INSTITUTE:

Mr. G. A. Lawrence (a past President) continues to represent us on the Council of the Standards Institute.

Seven other members represent us on a number of chemical committees and we are indebted to them for the time spent in considering specification and in attending meetings.

STANDARD METHODS OF ANALYSIS:

The work of this Committee is necessarily long-range, but since its inception in 1945 it has published in the *Journal* a number of standardised methods for the analysis of plant materials. This year standard methods for phosphate (gravimetric and volumetric), copper, crude fibre and nitrogen were accepted and published. The Soils Sub-committee has concluded its report on the estimation of organic carbon, and this has also been published in the *Journal*. The Animal Tissues Sub-committee has gone into recess.

U.N.E.S.C.O.:

In order to obtain unity of action between scientific bodies interested in UNESCO affairs, our Institute appointed two representatives to a small committee representative of the various societies. Cyclostyled lectures on "FOOD AND PEOPLE" have been distributed as part of a programme in the field of social implications and popularisation of science. Scientific groups have considered the subject matter of the lecture in various ways.

Two UNESCO Fellows, one from Malaya and one from Burma, are at present studying in New Zealand.

UNESCO has made a grant to the Australian and New Zealand Association for the Advancement of Science to assist scientific co-operation in the Pacific.

FOOD PARCELS:

Branches have been pleased to continue sending food parcels to Great Britain. While it is realized that the need is not so urgent in many quarters, we feel and know that members of the R.I.C. benevolent fund deeply appreciate these gifts from fellow chemists.

OTHER EMPIRE INSTITUTES:

During the year certain aspects of reciprocal relations between the Royal Institute of Chemistry, London, and our Institute have been discussed. We are very greatly indebted to the R.I.C. for its most generous attitude towards ourselves and towards all Empire Institutes of Chemistry. Some years ago the exchange of publications was arranged between all Empire Institutes and other matters of interest to all are receiving further consideration.

Ph.D. REGULATIONS:

Arising out of the Manpower Report, the question of widening the Ph.D. regulations so that research workers may, under the direction of the University, carry out researches for the degree in research establishments outside the University, was raised by the Wellington Branch. After reference to Council and consideration by Branches, it was placed on the agenda of the General Meeting, where Wellington and Canterbury placed alternate views before members. After discussion it was decided to take no action.

TIMBER PRESERVATION:

At the General Meeting held in Auckland on August 24th, 1949, a special resolution was passed drawing attention to the increasing use of pinus radiata and sap timbers and the necessity for a more positive attitude towards timber preservation. Mr. Lawrence, our representative on the Standards Council, was asked to bring the matter to the notice of the Standards Institute. Since that time the Standards Institute has been active and has reported progress regularly. A full report was submitted to the 1950 annual meeting at Christchurch. As will be readily understood, the subject is a wide one and cannot be concluded in a limited time. As chemists we will maintain our interest in this subject of such Dominion-wide importance.

LIFE MEMBERSHIP OF THE INSTITUTE:

A number of reports have been made on this subject and various formulae have been suggested, and it is hoped to place the final scheme before members shortly.

NEW BRANCH:

It is with pleasure that we announce the setting-up of a new Branch of the Institute with headquarters at Palmerston North. It will be known as the Manawatu Branch. Dr. G. R. Barnicoat is chairman and Dr. A. T. Johns, of Plant Chemistry Laboratory, is Secretary.

BOOKPLATES:

A special Bookplate is now available for all Institute prize-books, and copies may be obtained on request.

AUSTRALIAN AND NEW ZEALAND ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE:

Our Institute will be well represented by our President at the next meeting of the above Association, to be held in Brisbane, May 23rd to 30th, 1951.

INTERNATIONAL UNION OF CHEMISTRY:

Council has obtained the Statutes and Regulations of the International Union of Chemistry, and while in sympathy with the aims of the Union we do not feel we are in a position to contribute the annual subscription of possibly 375 dollars.

NEW YEAR HONOURS:

Congratulations have been extended to two of our members, Professor F. G. Soper (past-President), C.B.E., and Dr. H. E. Annett (Fellow), O.B.E.

THANKS:

Our thanks are due to all Institute officials and voluntary workers with a special word of thanks to Mr. W. A. Joiner for inscribing all membership and examination certificates.

For and on behalf of the Council,

J. MELVILLE, President.
W. G. HUGHSON, Hon. General Secretary.

ITEMS FROM THE MINUTES OF COUNCIL-IN-PERSON

Friday, 24th November, 1950

PRESENT: Dr. J. Melville, President, in the chair; P. R. Parr, Vice-President; Prof. F. J. Llewellyn, Auckland; B. E. Jackson, Auckland proxy; F. H. G. Johnstone, Canterbury; O. H. Keys, Otago; Dr. C. R. Barnicoat, Manawatu; A. P. Oliver, Wellington proxy; W. G. Hughson, Hon. General Secretary; H. K. Palmer, Registrar.

WELCOME was extended to Dr. Barnicoat, delegate of the newly-formed Manawatu Branch.

CONFERENCE, 1951: The Hamilton Committee has decided on a three-day conference from August 20 to 22 inclusive. It is possible that excursions will be run on Sunday, August 19th. Council-in-Person will be held in Hamilton on Sunday, August 19th. It was decided not to further pursue the proposal to include a separate chemical section in the Eighth Pacific Science Congress.

INTERNATIONAL UNION OF CHEMISTRY: Branches are asked to inform Council of any members who may be available to represent the Institute at the meeting in New York, September, 1951.

EXAMINATIONS: Resolved that it be a recommendation to the Examinations Committee that it communicate with the branch secretaries of those centres where practical examinations will be held, requesting the branch committee to appoint a supervisor for each subject, who will receive the papers direct from the Examinations Committee at least two weeks before the examination.

JOURNAL: It was decided to place the Addressograph work of the Institute in the hands of the Wellington firm known as "Mac's," the charges being as follows: Envelopes and wrappers, 2/6 per 100; new plates, 6d each; alterations to plates, 3d. This arrangement will be given 12 months' trial. Branches are asked to send the Registrar requests for envelopes in good time, and to advise him promptly of any changes of address. The Registrar will in future keep the official list of members.

Resolved that a Remington portable typewriter, at a cost of £39/10/-, be purchased for the use of the Editor.

Resolved that Council continue the policy of publishing the Journal five times a year, including one issue to be devoted to such conference material as the Editor and Conference Committee shall mutually arrange. Conference Committees may in addition make available a cyclostyled booklet, including graphs, tables, etc., with a view to reducing the number of lantern slides used during lectures.

Resolved that the sum of £120 be allocated to the *Journal* from the general funds.

LOCAL MEMBERS AND THE *JOURNAL*: Branches are asked to discuss Rule 21.7 in the light of the following facts: Local members get many of the privileges of full members without any of the responsibility. Increased circulation of the *Journal* would benefit the Institute and our advertisers. It is suggested that a subscription of 7/6 should be charged each local member in addition to the Branch subscription.

PROFESSIONAL STATUS COMMITTEE: Resolved that the Committee be asked to look into the position which arises when a member of the Institute is employed in his professional capacity in the Public Service Clerical Division.

STANDARDS INSTITUTE: A letter was received from Mr C. G. Mason, our representative on the Timber Preservation Committee. It was resolved that his attitude be supported and the Hon. General Secretary take action with a view to overcoming the difficulties mentioned by Mr. Mason.

INSTITUTE PRIZES: The question of providing a medal to accompany the I.C.I. Prize is being investigated, and it has been suggested that the Institute should provide a similar medal for all prizes, one side being left blank for the inscription and the other carrying the Institute seal.

Resolved that the *Industrial Chemical Essay Prize* be awarded every two years, at a value of £25, and that the closing date for the next awarde be June 30th, 1952.

Resolved further that the age limit for applicants for the prize be 30 years, and that for each competition a list of subjects chosen by the Council be published, but a candidate may select a topic outside this list should he so desire.

It was also resolved that it be a recommendation to Branches that the prize be offered for an essay on any branch of chemistry and that the name of the prize be altered to the "N.Z.I.C. Essay Prize." Regulations were approved for the Morcom-Green and Edwards Prize, and are published elsewhere in this issue. The first award will be made in 1951.

UNESCO: Resolved that the nominations of Drs. Parton and I. L. G. Sutherland, and B. E. Swedlund be confirmed. On the question of the best method of Unesco aid, the Council was unable to reach a decision for lack of information. It was decided to refer the matter to the Institute representatives on the Wellington Scientific Societies' Advisory Committee, in order that a uniform policy might be determined by member bodies.

LIFE MEMBERSHIP: Council approved the principle of making Life Membership available to members over 50 years of age on payment of a suitable fee, to be decided by actuarial formula. Such fees will be paid into a trust fund, the revenue from which will be transferred annually into the general fund. The Registrar will present the actuarial formula to the next meeting of the Council, and the scheme will operate from the beginning of the next financial year, i.e., November 1st, 1951.

FINANCE: Accounts for £348/3/2 were passed for payment. It was decided to close the Travelling Expenses Reserve Account and to meet all travelling expenses from the general funds.

MEMBERSHIP: The following were elected Associates:—

L. P. Gregory, Works Chemist, A. Wander, Ltd., P.O. Box 7, Papanui, Christchurch.
G. J. Halliburton, Works Chemist, Kempthorne, Prosser & Co., Ltd., Burnside, Dunedin.
W. B. Healy, Soil Bureau, 54 Molesworth Street, Wellington.
Dr. R. H. Locker, Assistant Chemist, Meat Research, Dominion Laboratory, Wellington.
Dr. G. M. Moir, Dairy Chemist, Wallaceville Dairy Laboratory.

W. H. Oliver, Dairy Research Institute, Massey College P.O., Palmerston North. (Since appointed Principal, Pharmacy College, Wellington.)

Messrs. N. H. Law, Wellington, and A. K. R. McDowell, Palmerston North, were elected Fellows.

Miss M. P. Bartrum and Messrs. P. G. Harris, A. R. Caverhill and J. L. Mangan were granted leave of absence with remission of subscription.

The resignations of Messrs. P. White, H. Revell, C. H. Hassell and W. E. Russell were accepted with regret.

NEW BRANCH: Resolved that the Manawatu Branch include the areas now known as Taranaki, Hawke's Bay and Manawatu.

HONORARIA of twenty-five guineas to the Hon. General Secretary and ten guineas to the Editor were approved.

OFFICERS were appointed as set out elsewhere in this issue.

A.N.Z.A.A.S.—The President, Mr. Parr, was appointed to represent the Institute at the Conference in Brisbane in May, 1951.

DISTINGUISHED VISITORS: It was decided that the Hon. General Secretary should establish liaison with the Scientific Liaison Officers in London, Washington, and Melbourne and the Royal Australian Chemical Institute, so that advanced information may be obtained and decisions made at Council meetings.

RULES: Resolved that Council appoint the President, the Editor, Dr. Briggs and Mr. Griffin as a sub-committee to consider the Rules and Regulations of the Institute. Branches are asked to send details of proposed changes and comments on Dr. Gardner's proposals to the President.

THANKS were expressed to Dr. Melville, retiring President, and to the Department of Scientific and Industrial Research, for providing facilities for meetings, and to Mr. W. A. Joiner for inscribing certificates.

NEW ASSOCIATES

The following Associates were elected at the August meeting of Council-in-Person:—

BECK, John Richard, B.Sc. Mr. Beck, who graduated from Victoria University College in 1948, has been with H. W. Lawrence & Son, Wellington, for seven years.

CALVERT, Lauriston Derwent, M.Sc., B.A. Mr. Calvert is a University Research Fund Fellow at Auckland University College.

HAGYARD, Thomas, B.Sc. (Lon.), Ph.D. (Lond.). Before taking up his present position as Senior Lecturer in Applied Chemistry at Canterbury University College, Dr. Hagyard spent ten years as Development Chemist and Chemical Engineer to the Boots Pure Drug Co., England, prior to which he was associated as Chemist with other important industries.

McDONALD, Ian Robert Clark, M.Sc. Mr. McDonald, who graduated from Victoria University College in 1949, has had seven years' service with the Dominion Laboratory.

MURPHY, Alan Maxwell, B.Sc., C.O.P. (Bact. and Clin. Path.). Mr. Murphy, who now holds the position of Bacteriologist in Charge at the Green Lane Hospital, Auckland, has had six years' experience at that hospital and at the Auckland Public Hospital.

REEVES, John Edmund, B.Sc. Prior to graduating from Canterbury University College, Mr. Reeves spent some time with the Wheat Research Institute. He is now Assistant Chemistry Master at Christ's College.

RICKARD, Donald Stuart, M.Sc. Mr. Rickard, who graduated from Canterbury University College in 1949, was for twelve months a Demonstrator at that College before taking up his present position as Chemist at the Winchmere Irrigation Research Station.

RITCHIE, John Adolph, B.Sc. (Edin.). After graduating in 1938, Mr. Ritchie spent ten years in mineralogical chemistry in Peru, before coming to this country. He is now with the Dominion Laboratory, Wellington.

WILSON, Hector Muir Dawson, A.R.I.C. Mr. Wilson, who holds the Certificate in Chemical Science of the Royal Technological College, Glasgow, was associated with the Dunlop Rubber Co., the Strathclyde Paint Co., and the Alexander Ferguson Co., of Glasgow, before taking up his present position as Factory Manager to Jas. Wren & Co. Ltd., Dunedin

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THE NEW ZEALAND INSTITUTE OF CHEMISTRY

LIST OF OFFICERS

FOR THE YEAR ENDED 1st NOVEMBER, 1950--31st OCTOBER, 1951

President: P. R. Parr, Westfield Freezing Co. Ltd., Private Bag, Auckland.

Vice-President: Professor S. N. Slater, Victoria University College, Wellington.

Hon. General Secretary: W. G. Hughson, P.O. Box 250, Wellington.

Auckland Delegate: A. W. Mackney, N.Z. Forest Products Ltd., Penrose, Auckland.

Manawatu Delegate: Dr. C. R. Barnicoat, Massey Agricultural College, Palmerston North.

Wellington Delegate: A. P. Oliver, P.O. Box 250, Wellington.

Canterbury Delegate: F. H. G. Johnstone, P.O. Box 325, Christchurch.

Otago Delegate: O. H. Keys, P.O. Box 562, Dunedin.

Editor of *Journal*: S. G. Brooker, P.O. Box 12, Newmarket, Auckland.

Past-President: Dr. J. Melville, Plant Chemistry Laboratory, P.O. Box 623, Palmerston North.

Registrar: H. K. Palmer, P.O. Box 250, Wellington.

Assistant Secretary: A. P. Oliver, P.O. Box 250, Wellington.

AUCKLAND BRANCH

Chairman: A. W. Mackney, N.Z. Forest Products Ltd., Penrose, Auckland, S.E.6.

Secretary: G. S. Lambert, P.O. Box 29, Newmarket, Auckland, S.E.1.

Treasurer: R. C. Selkirk, Dominion Laboratory, Durham Street West, Auckland, C.1.

Committee: Prof. F. J. Llewellyn, Dr. H. Bloom, J. Ricketts.

Auditor: A. J. Parker.

MANAWATU BRANCH

Chairman: Dr. C. R. Barnicoat, Massey Agricultural College, Palmerston North.

Secretary-Treasurer: Dr. A. T. Johns, Plant Chemistry Laboratory, P.O. Box 623, Palmerston North.

Committee: Dr. J. M. Melville, Dr. R. M. Dolby, C. V. Fife, A. K. R. McDowell.

WELLINGTON BRANCH

Chairman: Dr. S. N. Slater, Victoria University College, Wellington.

Secretary-Treasurer: Miss F. B. Hurst, Soil Bureau, 54 Molesworth Street, Wellington.

Committee: W. A. Joiner, A. P. Oliver, R. C. Bell, G. M. Smith.

Auditor: G. A. Lawrence.

CANTERBURY BRANCH

Chairman: N. P. Alcorn, Government Analyst, P.O. Box 1290, Christchurch.

Secretary-Treasurer: F. H. G. Johnstone, P.O. Box 325, Christchurch.

Committee: R. M. Allison, G. S. Holmes, A. H. Swaney, L. Wilkinson.

Auditor: G. D. Law.

OTAGO BRANCH

Chairman: Dr. G. M. Richardson, Medical School, King Street, Dunedin.

Secretary-Treasurer: J. Rogers, School of Mines, University of Otago, Dunedin.

Committee: G. Beath, G. W. Broughton.

Auditor: T. A. Thomson.

SUB-COMMITTEES 1/11/50 — 31/10/51

1. CONFERENCE COMMITEEE, 1950:

N. T. Clare (Chairman), Ruakura Animal Research Station, Private Bag, Hamilton; Dr. E. B. Davies (Deputy Chairman) (representing R.I.C.), P.O. Box 490, Hamilton; Dr. D. D. Perrin (Secretary), Ruakura Animal Research Station, Private Bag, Hamilton;

J. L. Grigg, Dr. R. H. Jackman, R. J. Lancaster, F. E. Mason, F. B. Thompson, W. G. Whittleston (representing R.I.C.).

2. CHEMISTS' EMPLOYMENT COMMITTEE:

L. H. James (Chairman), P.O. Box 250, Wellington; G. M. Smith (Acting Secretary), P.O. Box 250, Wellington.

3. EXAMINATION COMMITTEE:

O. H. Keys (Chairman), Dominion Laboratory, P.O. Box 562 Dunedin, C.1.; A. D. Campbell (Acting Secretary), Chemistry Department, University of Otago, Dunedin.

4. *JOURNAL* EDITORIAL COMMITTEE:

S. G. Brooker (Editor), P.O. Box 12, Newmarket, Auckland; G. M. Wallace (Associate Editor), Dominion Laboratory, Durham Street West, Auckland; A. G. Frieberg (Business Manager), 42 Nottingham Street, Westmere, Auckland; G. L. Calnan (Distribution Manager), Dominion Laboratory Durham Street West, Auckland; D. Whillans, c/o Public Hospital, Park Road, Auckland; G. W. Stace, Dominion Laboratory, Durham Street West, Auckland; Dr. H. Bloom, Auckland University College, Auckland.

Branch Editors:

Auckland: G. W. Stace, Dominion Laboratory, Durham Street West, Auckland.
Wellington: L. Hartman, Department of Scientific and Industrial Research, Wellington.
Canterbury: G. S. Holmes P.O. Box 1168, Christchurch.
Otago: G. W. Broughton, McLeod Bros. Ltd., P.O. Box 229, Dunedin.
Manawatu: Dr. A. T. Johns, Plant Chemistry Laboratory, P.O. Box 623, Palmerston North.

5. MEDICAL ADVERTISING COMMITTEE:

L. H. James (Convenor), P.O. Box 250, Wellington.

6. MEMBERSHIP COMMITTEE:

W. A. Joiner Department of Scientific and Industrial Research, Sydney Street, Wellington; Dr. L. H. Briggs, 63 Brighton Road, Parnell, Auckland; Dr. R. Gardner, P.O. Box 271, Dunedin.

7. PATENTS COMMITTEE:

Dr. F. B. Shorland, Fats Research Laboratory, Wellington (with power to co-opt).

8. PROFESSIONAL STATUS COMMITTEE:

Dr. J. C. Andrews, 63 Onslow Avenue, Auckland, S.E.3; J. Ricketts (Secretary), 113 Valley Road, Auckland, S.2.

9. STANDARDS INSTITUTE OF NEW ZEALAND:

9.1. Representative on N.Z. Standards Institute Council.
G. A. Lawrence, Johnsonville.
9.2. Chief Representative for all Standards Institute Affairs:
M. L. H. Stewart, P.O. Box 1663, Wellington.

10. STANDARD METHODS OF ANALYSIS:

10.1. Plant Materials:

Dr. H. O. Askew (Chairman), Cawthron Institute, Nelson; Dr. J. Melville (Secretary), P.O. Box 632, Palmerston North.

10.2 Animal Tissues (In Recess).

10.3 Soils and Fertilizers:

Dr. J. K. Dixon (Chairman), Soil Bureau, 54 Molesworth Street, Wellington, N.1.; Dr. E. B. Davies (Secretary), P.O. Box 490, Hamilton.

11. U.N.E.S.C.O. REPRESENTATIVES:

J. A. D. Nash, P.O. Box 250, Wellington; A. P. Oliver, P.O. Box 250, Wellington; B. E. Swedlund, Victoria University College, Wellington.

12. FOOD PARCELS:

Dr. J. K. Dixon, Soil Bureau, 54 Molesworth Street, Wellington, N.1.

13. SALARIES:

Dr. J. K. Dixon, Soil Bureau, 54 Molesworth Street, Wellington, N.1; J. L. Mandeno, Pinchin Johnson & Co. (N.Z.), Ltd., Wellington; W. B. Healy, Soil Bureau, 54 Molesworth Street, Wellington.

LABORATORY ASSISTANT'S CERTIFICATE

The following letter has been received from the Seddon Memorial Technical College, Auckland:—

Following our conversation on the telephone regarding the organising of assistance to those desiring to study for the Laboratory Assistants' Certificate Examination, I have made a few brief notes for you.

1. The College has made available a syllabus which will cover certain parts of the course.
2. These classes are already functioning on a syllabus which will cover most of the requirements of the Laboratory Assistants' Examination.
3. If, however, sufficient numbers are enrolled the College would be happy about commencing special classes of instruction dealing with your work.
4. The subjects available this year are: (a) Chemistry, (b) Physics, (c) Elementary Calculations, (d) Practical Chemistry, (e) Metalwork, (f) Woodwork, (g) Technical Drawing.
5. Enrolments will commence approximately in the middle of February, 1951.
6. Those enrolling should state particularly that they intend studying for the Laboratory Assistants' Examination.

I trust this information will be of service to you.

Yours faithfully,

H. O. HAIGH,

Head of the Industrial Department.

REGULATIONS COVERING THE MORCOM GREEN, EDWARDS PRIZE

Donated by Messrs. H. H. Edwards, F.N.Z.I.C., and Morcom Green

1. *Name*.....This prize shall be referred to as the "Morcom Green, Edwards Prize."

2. The value of the Prize is £25.

3. The Prize is offered for the encouragement of original work by young Chemists in pure and applied chemistry and shall be open to any member of the New Zealand Institute of Chemistry actually living in New Zealand, who has not attained the age of 35 years on the 1st of June in the year of the award.

4. Application for the Prize shall be made to the Secretary of the applicant's Branch not later than the 15th of May. The Branch committee, having promptly ascertained that the application is in order and that all relevant documents are attached, shall forward the application to the Hon. General Secretary-Treasurer to be in his hands not later than the 1st of June.

5i. The President and the Vice-President shall consider the applications and shall submit a report thereon together with their recommendations to the August meeting of Council.

They may appoint one or more assessors to assist them if necessary.

ii. The candidate will be assessed on:—

(a) Work he has published.
(b) Processes he has designed or developed.
(c) The product he produces.
(d) By any other means appropriate to his circumstances.

Special consideration will be given to work done during the year prior to the application.

6. There shall be no award made if in any year no suitable candidate is forthcoming.

In this case the monies shall be retained for the purpose of awarding an additional prize when circumstances warrant.

7. An applicant may, upon request, sustain his application for one year, after which fresh application must be made.

8. The Prize shall be awarded at the Annual Conference of the Institute.

NEWS AND NOTES

Mr. D. Sandys Wunsch has recently retired from the position of Managing Director of Dairy Products Limited, Edendale, Southland; and has taken up residence at New Plymouth. He holds an impressive array of degrees, being M.A. (Oxon.), a foundation member and ex-Vice-President of the Institution of Chemical Engineers, A.I.M.M., and B.Sc. He came to New Zealand in 1929 after mining experience in Canada and South Africa and some chemical engineering in England, and took up the position as Managing Director of what was then N.Z. Sugar of Milk and Casein Co. He has been a member of the Council for Scientific and Industrial Research for eight years. Mr. Wunsch will continue as Consultant Director of his company. In the meantime he has secured a little publicity through the fact that his new residence in New Plymouth has been found to have a number of secret rooms and passages in the best old-world tradition.

Mr. D. L. Stacey, Associate, has been appointed manager of the Kinleith Pulp Mill of New Zealand Forest Products Ltd. He graduated from A.U.C. in 1942, and has been on the staff of N.Z. Forest Products since 1944, with the exception of two years spent in ganning experience in Canada and U.S.A.

Mr. R. W. Green, who has been doing research on dental caries at the Dental School, Dunedin, has been appointed to the staff of the University of Malaya, Singapore, where he will join his old teacher, Prof. R. A. Robinson, F.N.Z.I.C.

Prof. Ivon Graham, Fellow, Professor of Coal Mining at Otago, has been awarded the Douglas Hay medal of the Institution of Mining Engineers, in recognition of his outstanding contributions to the transactions over a period of many years, with particular reference to his work for the improvement of the health and welfare of miners.

Mr T. H. Kennedy, Associate, of the Thyroid Research Department Medical School, Dunedin, and lately Secretary of the Otago Branch, has been awarded a grant by the Medical Research Council in order to further his studies under Sir Charles Harington, F.R.S., at the National Institute for Medical Research, Mill Hill, London. He expects to be away for about a year.

Mr. J. K. Martin has been awarded a Joseph E. Seagram and Sons Inc. International Fellowship, available for one year's study of industrial fermentation and allied subjects in the company's plant at Louisville, Kentucky. Six months are to be spent in plant control and six months in the company's research division. Mr Martin will study large-scale production of yeast and its utilisation as a source of protein amino-acids, etc.

The following transfers from the Otago Branch are noted:—

Mr. E. J. Hay, from King's High School, Dunedin, to Waimate Boys' High School.

Mr. J. T. Linzey, from McSkimming and Son, Dunedin, to Nilcrom Porcelains Aust. Pty., Ltd., 221, Separation Street, Northcote, Melbourne, N.16.

Mr. C. C. Roberts from King's High School, Dunedin, to be Inspector of Secondary Schools, Wellington.

Mr. P. McL. Thompson, from Kempthorne, Prossers, Dunedin, to Kempthorne, Prossers, Christchurch.

As a natural consequence of the establishment of the Republic of Ireland, the Institute of Chemistry of Ireland has recently been formed, having aims and objects similar to those of our own Institute. It is hoped that the new body will work in co-operation with the Institutes of Chemistry within the Commonwealth, and it is a good sign that the first President is Dr. A. G. G. Leonard, who is district member of the R.I.C. Council for the Republic of Ireland.

The Wellington branch and the Institute as a whole have lost a valuable member in Mr. S. E. Wright, until recently Principal of Pharmacy College, Wellington, and now Senior Lecturer in charge of the Pharmacy Department, University of Sydney. In the few years he was in New Zealand, he came to take a very keen interest in Institute activities, serving on the Wellington Committee and as Delegate to the Council. He is the author of several papers on essential oils and other aspects of plant chemistry. We wish him every success in his new sphere.

Mr. K. W. Kiddle has left Fletcher, Humphries and Co., Ltd., Christchurch, to join N.Z. Plywoods (S.I.) Ltd., as chemist

Dr. G. Malcolm Dyson, M.A. (Oxon.), D.Sc., Ph.D. (Lond.), F.R.I.C., has resigned his position as Technical Director, British Chemicals and Biologicals Ltd. (formerly Genatosan Ltd.), Loughborough, England, in order to devote himself to the development of systems and machines for recording chemical data. During the last few years, in addition to his responsibilities with the above firm he has worked out his new system for the enumeration of organic compounds, publishing two editions of a monograph describing it, and he has also published the first volume of his three-volume work on advanced organic chemistry, while the second one is nearly completed. In addition he takes a keen interest in the activities of the various chemical societies, having recently organised a very successful trip to Holland for the Society of Chemical Industry. Reviews of the two works mentioned are published in this issue.

Dr. W. I. Taylor, Associate, has been awarded an Imperial Chemical Industries Fellowship at Cambridge for the study of plant products, particularly alkaloids. Since leaving New Zealand in 1947 he has spent two years under Professor Prelog at the Federal School of Technology, Zurich, and one year with the National Research Council, Ottawa, Canada.

Mr. W. E. Russell, Associate, has resigned from the position of Chief Chemist, N.Z. Farmers' Fertilizer Co., Te Papapa, Auckland, to take the position of Chief Chemist, Australian Fertilizers, Port Kembla, N.S.W. Mr. Russell has served as Auckland Branch Treasurer since 1946, and at an informal farewell gathering before his departure was the recipient of a gift from Auckland Branch members in appreciation of his services.

We regret to record the death of Mr. W. Donovan, an Honorary Fellow of the Institute. A full obituary will be published in a later issue.

Mr J. L. Mangan, of the Plant Chemistry Laboratory, has been granted 15 months' leave of absence to take up a position with the Ministry of Food on vegetable dehydration work at Aberdeen.

Mr. G. Butler, of the Plant Chemistry Laboratory, has left on two years' leave of absence to study plant physiology with Prof. H. Burström at the University of Lund, Sweden.

Dr. R. P. Newbold, of the Plant Chemistry Laboratory, has returned after four years' absence. He took the degree of Ph.D. in comparative biochemistry at the University of California and then spent three months visiting research establishments in England, including two months at the Low Temperature Research Station, Cambridge.

Mr. W. H. Oliver, of the Dairy Research Institute, has been appointed Principal of the New Zealand School of Pharmacy.

BOOKS RECEIVED

Many chemists will welcome the issue of Austin M. Patterson's *"GERMAN-ENGLISH DICTIONARY FOR CHEMISTS,"* in a new third edition (John Wiley, $5.00). It has been increased in size by over a hundred pages, thus adding twenty-five per cent. more definitions, while the handy format and flexible binding have been preserved. The reviewer has found the old edition the best dictionary of its kind and appreciates the opportunity to replace a now well-worn volume.

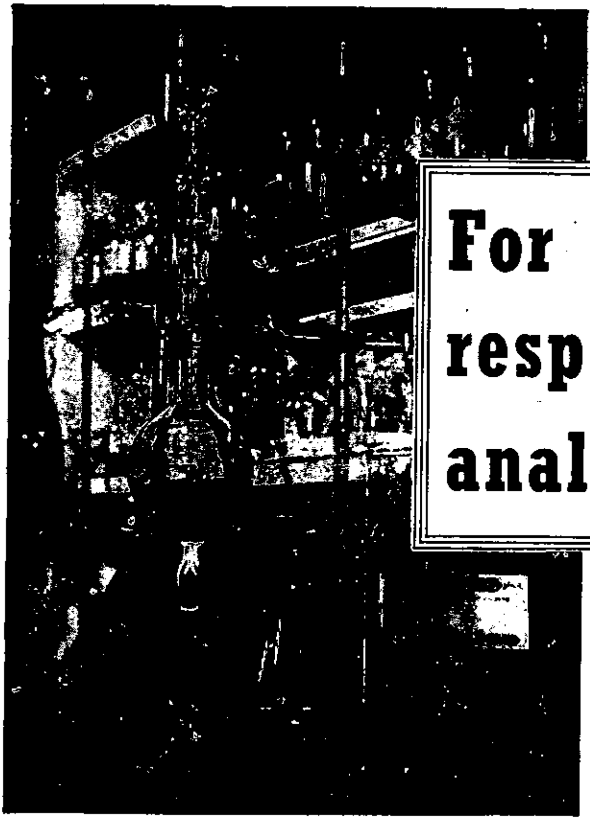
ORGANIC SYNTHESES, VOLUME 30, edited by Arthur C. Cope, is now available (John Wiley, $2.50) and contains a further forty preparations in this useful series.

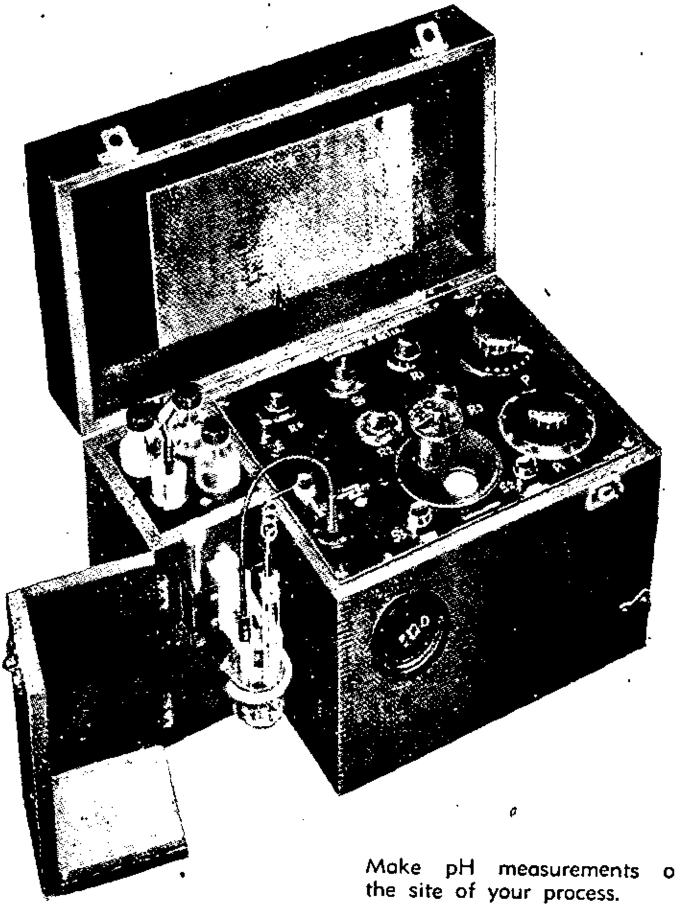
SYNTHETISCHE METHODEN DER ORGANISCHEN CHEMIE, REPERTORIUM 4, by W. Theilheimer (S. Karger, Basle; 37 Swiss francs), deals mainly with papers published in 1947 and 1948, with supplementary references to previous volumes. It has a reference to every important organic reaction on which new work has been done during this period, with details of conditions and yields, thus enabling a research worker readily to ascertain what recent methods have been used to carry out a desired step in the synthesis or breakdown of organic compounds. The work has been financed in part by eleven American firms in the fine chemical field, one of them also providing office facilities for the author during the writing of this volume. It is mentioned in the preface that several other big firms refused to assist. Volume 5 of the series, which will be in English, will contain a cumulative index to the whole series. The binding and printing are very good.

FORTSCHRITTE DER CHEMISCHEN FORSCHUNG, published by Springer Verlag, Heidelberg and Berlin, is a new German review journal to be published at irregular intervals. The first number (1949; 36 Dm.), of 416 pages, contains seven articles on silicones, carotenoid synthesis, free radicals, separation and estimation of amino-acids, biochemical applications of counter-current distribution, size and shape of protein molecules and heat transfer in gases at low pressures. Some of the articles are in English.

A MANUAL OF ORGANIC CHEMISTRY FOR ADVANCED STUDENTS. By G. Malcolm Dyson. Vol. I. The compounds of Carbon, Hydrogen, Oxygen and the Halogens. 984 pages. 1950. London: Longmans, Green. 63/-. This volume is the first of a set of three: the second will conclude the systematic study of organic compounds and the third will be devoted to theoretical aspects. Such a large treatise on organic chemistry in English is valuable in itself, the only comparable work being the translation of Richter, which was written, originally in German, from 1928 to 1935, and by now is a little out of date. As the work of one man, the new treatise is a "tour de force" which is written in a direct, incisive and very readable form. There are some excellent features, such conditions, advantages and disadvantages and yields of the standard prepara- as a wealth of structural formulae and equations; useful discussions, on the tive methods; and numerous tables of compounds in the various classes. The work will therefore be a useful work of reference as well as a textbook for advanced students. There are minor errors, such as an incorrect spelling in the short table on page 77, while the headings for amides on page 632 and soaps on page 667 are followed by no further references to these compounds at all. There are useful chapters on nomenclature and literature. War-time publication difficulties may account for the small number of references to work later than 1942, which appears to be the weakest feature of an otherwise excellent book. The printing and binding are more than adequate.

It is surprising that more space is not devoted to the Dyson system of organic notation, and a little disappointing to those who have been won over to it, but this is probably due to the author's feeling that the system is still in a state of flux. Certainly the second edition of his *"NEW NOTATION AND ENUMERATION SYSTEM FOR ORGANIC COMPOUNDS"* (Longmans, Green, 1949, 10/6) contains several changes from the first edition of 1947 made largely as a result of suggestions from a number of prominent American chemists. These changes appear to be logical, such as the use for Br for bromine instead of BR—as suggested in our review of the first edition. The new edition is offered as a "definitive proposal for an international system," an offer which, we hope, will be accepted by organic chemists and teachers who will train the rising generation of chemists in the system as they go along. An important feature of the system is that it is designed for easy recording of organic compounds and data by means of punched cards and the newer mechanical methods. In the main the system is not greatly altered from that outlined in the first edition, which was reviewed in our issue for March, 1948.





'Gammexane'

'Gammexane' is a proprietary name given to a range of remarkable new insecticides developed as a result of wartime discoveries by I.C.I. research chemists. They are based on benzene hexachloride (BHC), a compound first prepared by Michael Faraday as far back as 1825, which can exist in four forms—known as the alpha, beta, gamma and delta "isomers"—each having the same molecular formula but different properties. The achievement of the I.C.I. chemists was their discovery that one of these isomers possessed remarkable insecticidal properties. By isolating and testing the different isomers, they established in 1943 that BHC's insecticidal powers lay almost entirely in its gamma isomer, and that in pure gamma BHC they had an insecticide which was, in some respects, the most effective ever discovered.

'Gammexane' insecticides, based on gamma BHC, marks a significant advance because, though their effect on insects is both deadly and persistent, they are almost entirely harmless to men and animals. At home, in farms and factories, they have eradicated pests ranging from cattle ticks and wireworms to cockroaches, bed-bugs and the house fly. Overseas they have proved the most powerful of all weapons against the locust.

ICI IMPERIAL CHEMICAL INDUSTRIES (N.Z.) LTD.