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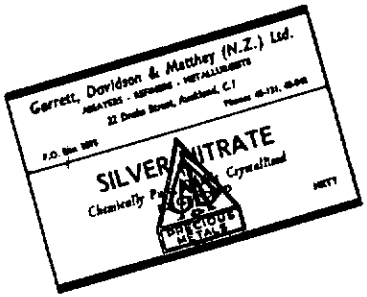

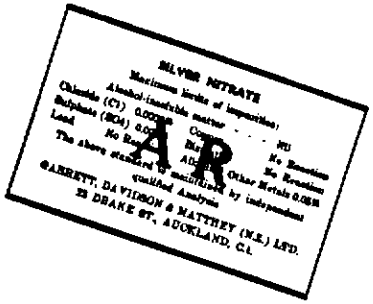

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JOURNAL OF THE NEW ZEALAND
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SALARIES, FACILITIES, AND SIXTH FORMERS

The August issue of this *Journal* was devoted to the *Chemistry in Action* papers organized by the Canterbury Branch. This issue reports the Auckland Branch's participation in a Secondary Schools Science Exhibition and reviews the R.I.C. *Monographs for Teachers* imported by the Council. Manawatu Branch is arranging a series of slides for schools; and other Branches, by Chemistry Prizes and other means, are endeavouring to interest young people in the profession of Chemistry.

What is the purpose of this activity? Most of our members find that their profession yields intellectual stimulus and satisfaction; but few will agree that the monetary rewards are adequate; and those responsible for these efforts in propaganda (in the true sense of the word) will probably claim that their activity is aimed at the common weal, not private wealth. This country needs more chemists.

Let us now look at the other end of the education process. The Professional Status Committee, surveying the whereabouts of M.Sc. graduates over the years 1955 to 1958, summarized the results in the table on page 173. Without further comment on the Committee's findings, it appears that for every trained chemist who remains in New Zealand another is trained for export; and that the better students are the more likely to go, and remain, abroad.

The results in the table also indicate that only 5 graduates trained to M.Sc. in Chemistry enter Government or industrial employment within New Zealand each year—about one for every ten staff member of the University chemistry departments. The Universities are institutions for higher learning, not merely training grounds in technologies; but these figures cannot appear very satisfying to faculty members interested in the progress of Chemistry as a science in New Zealand. Furthermore each student who stays abroad represents the loss of an investment by the country of many thousands of pounds in the form of benefits, education costs, bursaries, etc., over a period of twenty years or more. The fault for this absurd situation does not, of course, lie with the Universities but in the conditions which make New Zealand today an unattractive place for chemical workers.

The most obvious of these unsatisfactory conditions is the comparatively low salaries of scientists in New Zealand. Here

the Government, by far the greatest employer of chemists and the one to which others inevitably look in establishing basic salary levels, must give the lead. Recent increases in Public Service salaries will do little to alter the situation. It is understood that special provision for scientists is still under discussion but to be effective the increases will need to be approximately the same as those previously given to University staff after the Parry Report. The Government must realize that for scientific manpower it is competing in a world shortage market, with a particularly attractive rival only a few hours' travel away, and with other disadvantages besides salary levels to overcome.

These other disadvantages which make the scientific climate in New Zealand unattractive are very important factors in discouraging young chemists from returning. Lack of contact with fellow specialists, and of ready access to libraries and specialized apparatus, delays imposed by distance in the acquisition of equipment, and a paucity of skilled technical assistants, are frustrating to young and enthusiastic workers. These factors have been aggravated by the upsurge of scientific developments all over the world in recent years, so that conditions once accepted with resignation now appear no longer tolerable. Such disabilities of New Zealand as a research country cannot be entirely offset by high salaries, but when neither monetary rewards nor working conditions are adequate there is little inducement, beyond sentimental attachment to their native country, for scientific workers to remain here.

To expound in these pages the need for higher rewards for chemists is no doubt preaching to the converted. The Institute has frequently assembled information by surveys and other means and made recommendations on salary levels, and such activity will be continued. As the number of industries requiring chemists increases, a further activity which might be of assistance to private employers is advice on adequate salaries for chemists, coupled with indications of the desirable qualifications for various positions.

Less consideration has been given in the past to those other factors which influence the prosecution of research in New Zealand. Corporately the Institute can consider the requirements and resources in libraries and specialized equipment, facilities to bring here distinguished lecturers, and arrangements for overseas travel for conferences and for specialized research projects. Individually a number of our senior members in positions of administrative responsibility can directly influence the provision of the necessary and profitable facilities.

The most important thing is for members to recognize and define the problems in improving the research atmosphere in this country. Then perhaps the sixth formers encouraged this year to seek a career in Chemistry will not be disillusioned by the opportunities in research in New Zealand when they graduate.

METABOLIC PATHWAYS OF THE PHENOLIC ANTIOXIDANTS

J. C. DACRE

Toxicology Research Unit of the Medical Research Council of New Zealand, Medical School, University of Otago, Dunedin.

INTRODUCTION

The addition of phenolic antioxidants to fats and foods containing fats intended for human consumption is practised in many countries throughout the world today. Their purpose is to prevent edible fats and oils from becoming rancid by autoxidation. The compounds that are at present being used, their permitted levels in the fat, and the number of countries using them are set out in Table 1. Over 1,000 tons of the antioxidants BHA, BHT and PG were added to food and animal fodders in the U.S.A. during 1956; over 400 tons of this amount were incorporated in foods for human consumption. Of these phenolic compounds, the most commonly used are BHA (55%), BHT (25%) and PG (20%) while THBP is the most recently developed of them and at the time of writing has been approved for use only in the U.S.A. Legislative approval for the use of any of the antioxidants listed in Table 1 has not yet been given in New Zealand.

Table 1: The phenolic antioxidants, their permitted maximum allowable concentrations and the number of countries that have approved their use in foods (as at Dec., 1959).

Antioxidant, accepted abbreviation	*Chemical name*	*Maximum allowable concentration in fats (%)*	*Number of countries permitting their use*
BHA[1]	2-*t*-butyl-4-methoxyphenol (85%) and 3-t-butyl-4-methoxyphenol (15%)	0.02	16
BHT[2]	2:6-di-*t*-butyl-4-methylphenol	0.02	8
PG	*n*-propyl gallate	0.01	19
OG	octyl gallate	0.015	16
DG	dodecyl gallate	0.02	
NDGA[3]	4:4′-(2:3-dimethyltetramethylene)-dipyrocatechol	0.01	12
THBP	2:4:5-trihydroxybutyrophenone	0.01	1

[1] Also known as 3-*t*-butyl-4-hydroxyanisole (major isomer) and 2-*t*-butyl-4-hydroxyanisole (minor isomer).
[2] Also known as 3:5-di-*t*-butyl-4-hydroxytoluene.
[3] Commonly called nordihydroguaiaretic acid.

Extensive toxicity studies have been carried out on all these compounds using experimental animals. These include acute toxicity tests, particularly for the determination of the LD_{50},* and both short- and long-term toxicity tests which include usually a histopathological examination of the test species. The recommended species for this testing are the rabbit, rat and dog.

An antioxidant is at present regarded as safe for human use if it satisfies two conditions. First, the LD_{50} must be not less than 1,000 mg/kg animal body weight; second, it must not have any significant effect on growth when fed to experimental animals in their total diet for long periods (up to two years) at a level one hundred times that proposed for fats for human consumption. All the approved antioxidants have, of course, passed these tests. Quinol (hydroquinone), one of the first phenolic compounds to be used as an antioxidant, has a LD_{50} well below this safe level and is not now used. The approximate LD_{50}'s of the phenolic antioxidants compared with phenol, quinol and *p*-cresol are set out in Table 2.

Is the acute and chronic toxicity study a sufficient criterion for assessing the safety of these compounds? The joint FAO/WHO expert committee on food additives recently considered this question (World Health Organization, 1958). In addition to the routine toxicity tests, the report recommended that additional knowledge of the metabolic and biochemical effects of these additives should be provided for their evaluation. It is necessary to have as much information as possible about an additive before it appears in our food.

The Toxicology Research Unit of the Medical Research Council of New Zealand was formed in 1954 to study the possible dangers to health arising from the increasing use of chemicals as food additives. Because of the growing uneasiness among those people responsible for establishing the safety for use of food additives, a research programme was planned for an investigation of the toxicity and metabolic fate of some of the phenolic antioxidants. Until we commenced this work, virtually nothing was known on how the body copes with these compounds. From the point of view of public health protection, information was required to supply the answers to the following:

* LD_{50} (Lethal Dose 50%) is a measure of toxicity—*i.e.*, the quantity of the compound, preferably expressed in mg/kg of animal body weight, which when administered to experimental animals will be 50% fatal. Toxicity may also be expressed as LD_{80}, LD_{90}, etc.

Table 2: The approximate LD_{50} (mg/kg) by oral administration to rats, mice and rabbits of the phenolic antioxidants, compared with phenol, quinol and *p*-cresol.

	Approximate LD_{50} (mg/kg)		
Antioxidant	*Rats*	*Mice*	*Rabbits*
BHA	2,200 2,900 4,130 (non-fasted) >5,000 (fasted)	1,250 2,000	
BHT	1,700 (female) 1,970 (male) 2,450	2,000	2,100-3,200
PG	2,600 3,600 3,800	1,700 2,000 3,500	
OG	4,500		
DG	6,500		
NDGA	>2,000 5,500	>2,000 4,000	
THBP	3,200-6,400	800-1,600	
Phenol	440 450 1,500	395 520	420
Quinol	320	400	
p-Cresol	1,800		620

(i) What effects on animals have very high doses of antioxidants? It is not sufficient to find the dose level at which some adverse effect is produced; it is necessary to know precisely what the effect is and how it is produced.

(ii) How does the animal's body deal with the strange chemical? This involves a study of the chemical changes that the antioxidant undergoes in the animal's body.

(iii) If the dose is repeated daily, will the material accumulate in the animal body and in one way or another produce cumulative effects?

This paper summarizes the results of investigations that have been carried out in the last six years in an attempt to answer the above questions. It is hoped that metabolic studies of this kind will provide the essential additional evidence required for assessing the safety for use of these antioxidants in our foods.

DETOXICATION PATHWAYS OF PHENOLIC ANTIOXIDANTS

Phenolic compounds are detoxified in the body by conjugation with various compounds involving both the hydroxyl group and the benzene ring system. In certain cases other groups attached to the phenolic ring may undergo some metabolic reactions also. These conjugation reactions involve glucuronic acid in glucuronide formation, sulphuric acid in ethereal sulphate formation, glycine in hippuric acid formation, and rarely *O*-methylation or hydroxylation of the aromatic ring.

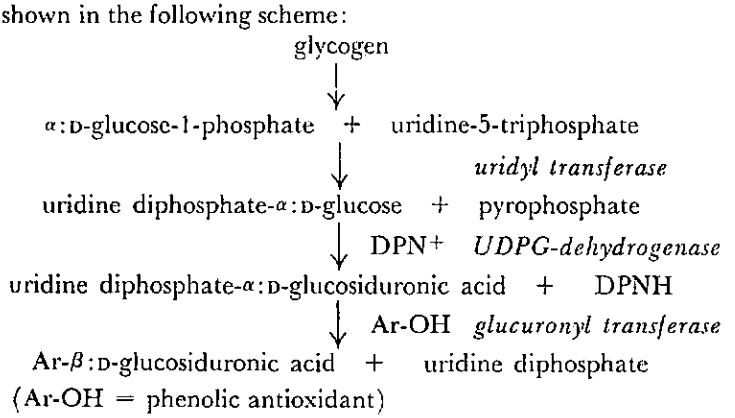
The first section of this account considers the origin of the principal compounds in the body that are available to conjugate with the phenolic antioxidants to form the metabolites that are ultimately excreted in the urine. The second section outlines the forms in which the phenolic antioxidants take on conjugation—*i.e.*, the structural patterns of the metabolites of which the antioxidant constitutes the aglycone portion.

A. Enzymic pathways for the conjugation of the phenolic antioxidants with glucuronic acid, sulphuric acid and glycine.

When phenols are administered to animals, the main portion of a dose can be accounted for by the excretion in the urine of the corresponding aryl-sulphuric acid and β:D-glucosiduronic acid, Aromatic and phenolic acids are also excreted by conjugation with sulphuric and glucuronic acids, and a portion of the dose may be combined with glycine as the hippuric acid.

1. Glucuronide synthesis.

Within the last few years, the steps in the enzymic synthesis of glucuronides have been fairly well established. The steps in the formation of a phenolic glucuronide, which takes place in the liver, are shown in the following scheme:



The important point to note is that at no time does glucuronic acid occur in the free state; it is produced from the glucose of uridine diphosphate-α:D-glucose by oxidation. The conjugated glucuronic acids of the phenolic antioxidants are all β:D-glucuronides and in the last step in their synthesis, which is catalysed by glucuronyl transferase, a Walden inversion reaction probably takes place. The same enzyme systems are involved in the formation of the ester-linked type of glucuronide (conjugation through a carboxy acid group) as distinct from the ether-linked type (conjugation through the phenolic hydroxyl group).

2. *Ethereal sulphate synthesis.*

It is now quite clear that the enzymic synthesis of the aryl sulphates takes place in the liver also. A process of sulphate activation is brought about which requires both ATP and magnesium ions. Sulphate then is transferred enzymically from the active sulphate (PAPS) to the phenolic antioxidant to form the ethereal sulphate as shown in the following tentative scheme:

Adenosine-5′-triphosphate (ATP) + SO_4^{--}

↓ *ATP-sulphurylase*

Adenosine-5′-phosphosulphate (APS) + pyrophosphate

↓ ATP *APS-kinase*

Adenosine-3′-phospho-5′-phosphosulphate (PAPS) + ADP

↓ Ar-OH *phenol sulphokinase*

$Ar\text{-}SO_4^-$ + 3′:5′-diphosphoadenosine (PAP)

(Ar-OH = phenolic antioxidant)

3. *Hippuric acid synthesis.*

The synthesis of hippuric acids occurs in the liver and the kidney in some animals. The process requires an activated form of the benzoic acid derivative which appears to be a benzoyl-coenzyme A. The pathway can be represented as follows:

Benzoic acid derivative + ATP ⟶ Adenylbenzoate + pyrophosphate

Adenylbenzoate + CoA ⟶ Benzoyl-CoA + adenylic acid

Benzoyl-CoA + glycine ⟶ Hippuric acid derivative

This enzymic synthesis involves a phenolic carboxy group only.

B. Structural patterns of the metabolites of the phenolic antioxidants.

The study of the metabolism of these compounds is essentially an investigation of the urinary excretion following administration of

the phenolic antioxidant to the animal. An initial analysis of the urine for the different conjugates has been carried out for the majority of them. The percentage excretion of the urinary metabolites of the phenolic antioxidants (including quinol) is summarized in Table 3.

Table 3: Urinary metabolites of the phenolic antioxidants
(Results expressed as a percentage of the dose)

Antioxidant:	*BHA*		*BHT*	*PG*	*THBP*		*Quinol*
Species used:	Rabbit	Rat	Rabbit	Rabbit	Dog	Rat	Rabbit
Dose level:	1g	0.08-0.1g	0.8-1.6 g/kg	1g	0.3g/kg	0.4g/kg	0.1-0.2 g/kg
Metabolites:							
Glucuronide conjugate	46.4	71.5	35.9	72.0	30	23	42.9
Ethereal sulphate	9.2	13.5	8.0	—	45	52	30.0
Unconjugated phenol	5.8	5	8.4	6.7	2.3	6.3	+
Glycine conjugate	0	—	1.8	—	—	—	—
Total recovery:	61.4	90.0	54.1	78.7	77.3	81.3	>72.9

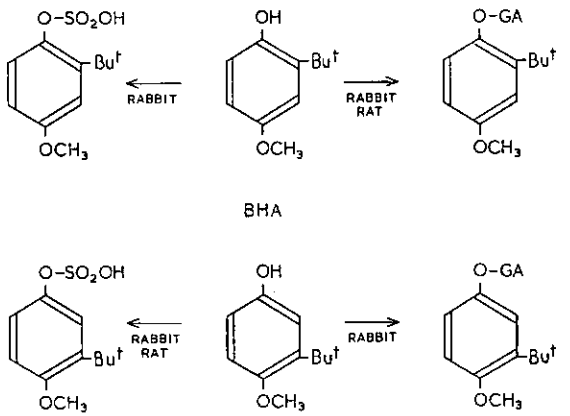
The next section outlines the structures of the urinary metabolites of the individual antioxidants as determined by analysis, by degradation and in some cases by their synthesis, which naturally follows after their isolation from urine.

1. Metabolites of BHA.

BHA was the first phenolic antioxidant to be studied in any detail. The metabolism of BHA and of its isomers (2-*t*-butyl- and 3-*t*-butyl-4-methoxyphenol) in the rabbit was investigated by Dacre *et al.* (1956). They found BHA to be conjugated with both glucuronic acid and sulphuric acid. A small part of the BHA was excreted unchanged in the urine. The glucuronide conjugates of the two isomers were isolated by these workers as the crystalline barium salts; the free glucuronides were found to have the structures 2-*t*-butyl- and 3-*t*-butyl-4-methoxyphenyl-β:D-glucosiduronic acid. From the urine of rats after the administration of BHA, the glucuronide of the 2-*t*-butyl isomer was isolated as the crystalline triacetyl methyl ester (Dacre, 1958). Astill *et al.* (1960) found that rats metabolized the 2-*t*-butyl isomer chiefly to the glucuronide and the 3-*t*-butyl isomer to the corresponding

ethereal sulphate. The ethereal sulphates of the two isomers of BHA were synthesized and shown to be constituted as 2-*t*-butyl- and 3-*t*-butyl-4-methoxyphenyl hydrogen sulphate. Both the sulphates were isolated from rat urine and shown to be identical with the synthetic compounds. These workers also presented evidence for the probable formation by demethylation of 2- (or 3-) *t*-butyl-4-hydroxyphenyl hydrogen sulphate.

The metabolic pathways of BHA are set out in Scheme 1.



Scheme 1.

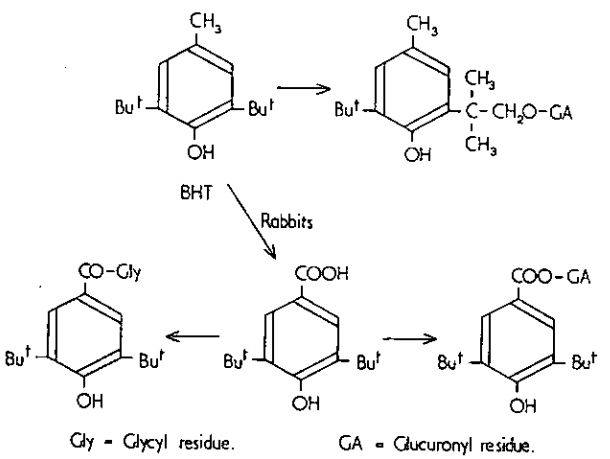
2. Metabolites of BHT.

The metabolism of BHT in the rabbit was investigated by Dacre (1960a, 1960b). This antioxidant presents an unusual metabolic problem to the animal because the hydroxyl group is sterically blocked by the two large *t*-butyl groups in the 3 and 5 positions. Conjugation of this hindered group with glucuronic acid and sulphuric acid in the conventional manner cannot, of course, take place. How then does the animal manage to cope with this antioxidant? The compound was found to be metabolized by oxidation along two separate pathways: firstly, one of the *t*-butyl groups is converted by ω-oxidation to the 2:2-dimethyl-2-ethyl structure; and, secondly, the methyl group in position 1 is oxidized to the carboxy acid. The conjugates are then formed through one of these two new groups.

Four metabolites of BHT were isolated and characterized by Dacre (1960a) from the urine after feeding BHT to rabbits. The major portion of the dose of BHT was conjugated with glucuronic acid as both ester-linked and ether-linked glucuronides; some was

excreted as a glycine conjugate; and some was present in an uncombined but oxidized form. The two glucuronides were isolated as the crystalline triacetyl methyl ester derivatives. Acid and enzyme hydrolysis experiments showed that these conjugates have the structures 3:5-di-*t*-butyl-4-hydroxybenzoyl-β: D-glucosiduronic acid and β:β'-dimethyl-β''-(2-hydroxy-3-*t*-butyl-5-methylphenyl) -ethyl-1-β:D-glucosiduronic acid. Similar hydrolysis experiments on the glycine conjugate show that it is formulated as 3:5-di-*t*-butyl-4-hydroxyhippuric acid. The tree phenol was identified as 3:5-di-*t*-butyl-4-hydroxybenzoic acid. Analysis of the urine indicated some excretion of BHT as an ethereal sulphate but nothing is known at present about the structure of this metabolite. The same benzoyl-β:D-glucosiduronic acid and hippuric acid conjugates were found in rabbit urine following the oral administration of 3:5-di-*t*-butyl-4-hydroxybenzoic acid in the amounts 84.0% and 8.8% respectively of the dose (Dacre, 1906b).

The metabolic pathways of BHT are set out in Scheme 2.



Scheme 2.

The nature of the cause of death when relatively large, repeated doses of BHA and BHT were given orally to experimental animals was studied by Denz and Llaurado (1957). The fatal effects of large doses in rabbits are due to a gross disturbance of water and salt balance. There is an increased urinary excretion of sodium, potassium and aldosterone, associated with a fall in serum and muscle potassium, a rise in muscle sodium, and a fall in extracellular fluid volume. Large doses of BHA do not produce in the rat the

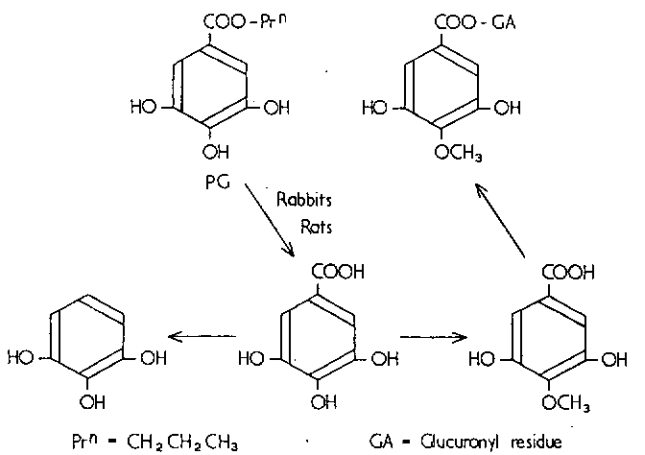
large increase in potassium excretion that is found in the rabbit. It is well known that phenolic compounds are toxic in large doses but this is the first evidence of the way in which they produce their toxic effects.

3. Metabolites of PG.

It is only recently that the metabolic fate of gallic acid and its related compounds, propyl gallate and lauryl gallate, was investigated (Booth *et al.* 1959). When PG was given to rats by stomach tube, the metabolites identified chromatographically in the urine were mainly 4-*O*-methyl gallic acid and smaller amounts of gallic acid. Some evidence for a conjugate of 4-*O*-methyl gallic acid was found, when this acid was given to rats.

The metabolism of PG was studied by Dacre (unpublished results). The initial analysis of rabbit urine for conjugates following the administration of PG is summarized in Table 3. A paper chromatographic analysis for metabolites in the urine showed the presence of a glucuronide as the major urinary metabolite. Other metabolites identified were 4-*O*-methyl gallic acid, gallic acid and pyrogallol. From its chemical reactions, the glucuronide conjugate almost certainly has the structure 4-*O*-methyl galloyl-β:D-glucosiduronic acid. It seems clear then that the main pathway is by cleavage of the ester linkage followed by methylation of the hydroxyl group in the 4 position and/or conjugation with glucuronic acid.

The metabolic pathways of PG are set out in Scheme 3. There are no studies reported on the metabolism of OG and DG in animals.

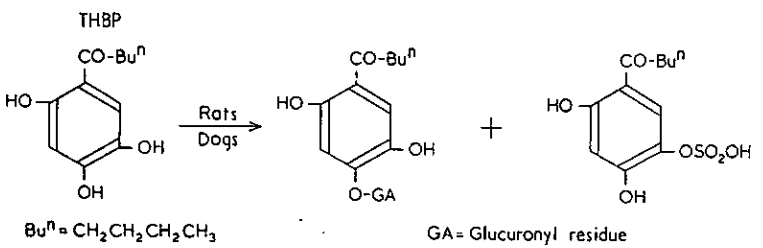


Scheme 3.

4. Metabolites of THBP.

The metabolism of the antioxidant THBP in the rat and dog was recently investigated by Astill *et al.* (1959). They showed that this compound was metabolized largely by ethereal sulphate formation, with a lesser amount of conjugation with glucuronic acid. The butyryl side-chain appeared to survive intact and no evidence of oxidation to more complex phenols was obtained. The ethereal sulphate conjugate was isolated as its potassium salt and shown to have the structure 5-butyryl-2:4-dihydroxyphenyl hydrogen sulphate. The glucuronide of THBP was not isolated but experiments showed that its structure was 4-butyryl-2:5-dihydroxyphenyl-β:D-glucosiduronic acid. There was also some evidence for a third conjugate (an ethereal sulphate) of THBP in both rat and dog urine. Small quantities of THBP were also excreted unchanged in the urine.

The metabolic pathways outlined above are set out in Scheme 4.



Scheme 4.

5. Metabolites of Quinol.

This was the first phenol to be used as an antioxidant. Garton and Williams (1949) studied its metabolic fate in the rabbit as part of their extensive investigations of the detoxication of benzene. Small doses were excreted, chiefly as the glucuronide and to a lesser extent as the ethereal sulphate conjugate. The glucuronide was isolated as the crystalline triacetyl methyl ester and shown to have the structure *p*-hydroxyphenyl-β:D-glucosiduronic acid. The ethereal sulphate could not be isolated from rabbit urine but their experiments showed that it is almost certainly the monosulphate of the compound—*i.e.*, it is *p*-hydroxyphenyl hydrogen sulphate. Some of the dose of quinol is excreted uncombined in the urine.

6. Metabolites of NDGA.

Nothing is known of the metabolism of this antioxidant.

There is very little known about other methods of excretion of the antioxidants in experimental animals. There is some excretion

in the faeces of animals but the evidence so far obtained shows little or no storage of them in organs and tissues. The further fact that recovery of these compounds in the urine is by no means completely accounted for (see Table 3) indicates the need for further studies. Other metabolic pathways may possibly be found.

SUMMARY

1. The metabolic pathways of the phenolic antioxidants in experimental animals have been outlined.

2. The studies have shown that these compounds are metabolized along well-known and recognized routes—*i.e.*, by conjugation with glucuronic acid, with sulphuric acid or with glycine.

3. In the case of BHT conjugation takes place only after the compound has undergone oxidation along two different pathways; in the case of PG only after it has undergone ester cleavage and *O*-methylation.

4. No evidence has so far been found which suggests that these antioxidants produce adverse biochemical or metabolic effects in the animal body. The studies provide additional evidence for establishing the safety for use of these food additives.

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PROFESSIONAL STATUS COMMITTEE REPORT

Letter to the Prime Minister

At the August Meeting of the Council the Professional Status Committee presented a report on a survey on the present employment of recent M.Sc. graduates in Chemistry. As a result of the facts brought to light in this survey the Committee, with the approval of the Executive Committee of Council, sent a letter summarizing the survey to the Prime Minister, the Minister of Agriculture, and the Minister of the Department of Scientific and Industrial Research. The text of this letter, sent on July 19, is as follows:

> The New Zealand Institute of Chemistry, which represents almost all professional chemists employed in research, analytical or teaching positions by Government, universities, industry or local bodies in New Zealand, has recently completed a survey of the present whereabouts of all those who graduated with Master of Science in Chemistry for the years 1955-6-7-8. The result proved very disturbing.
>
> Of the thirty-three First Class Honours graduates, more than 50% have already left New Zealand, and it is likely that another 15% now doing Ph.D. in New Zealand universities will also leave—*i.e.*, about two-thirds in total. It has been found that few of them propose to return to New Zealand unless salaries are brought up to overseas standards.
>
> Of the remaining First Class Honours graduates the Government scientific establishments employ four, teaching one, and industry only one.
>
> Considering all M.Sc. graduates in chemistry for the above years, nearly 50% have gone overseas or are likely to do so. Government scientific establishments and industry each employ about 10%, the remaining 30% being employed as teachers or in universities.
>
> The Honours graduates constitute New Zealand's investment in science, and provide the research leaders of the future for maintaining New Zealand's progress in primary and secondary industries. Their loss overseas in such numbers is a very serious one to New Zealand.
>
> It is essential that the salary adjustments now being considered for Government employed chemists and other scientists will be at least comparable with those now paid to approximately 720 members of the academic staff of the universities of New Zealand who received an average of £400

per annum immediate increase. Only in this way will it be possible to retain in New Zealand or attract back to New Zealand the best trained New Zealand scientists and to ensure their even distribution between universities and Government scientific establishments.

Below is set out the essential details of the survey.

PRESENT ACTIVITIES OF GRADUATES WITH MASTER OF SCIENCE DEGREE IN CHEMISTRY (FROM ALL NEW ZEALAND UNIVERSITIES) IN YEARS 1955-58.

Class of Honours	*1st*	*2nd*	*Pass*	*Total*
Graduates in each class	33	42	24	99
Overseas	17	10	6	33
Doing Ph.D. (N.Z.)	4	11	—	15
Teaching	1	11	11	23
Employed in University	6	1	—	7
Govt. Scientific	4	4	—	8
Industry	1	5	7	13

(These figures exclude Colombo Plan students)

AUCKLAND SECONDARY SCHOOLS SCIENCE EXHIBITION

Science fairs for high school students, in which boys and girls prepare displays representing some scientific principle or natural fact, are now an established feature of American life. Such displays must be self-contained and self-explanatory. In North America a very high standard has been achieved. Exhibits are judged for creative ability, scientific thought, thoroughness, technical skill, clarity, and dramatic value. Winners from local fairs take part in national exhibitions both in Canada and U.S.A. and the national prizewinners receive considerable publicity as well as substantial sums of money with which to purchase scientific books and apparatus. It is of interest to note that the Chemical Institute of Canada is represented on the National Council controlling fairs in that country.

Over the past three years Mr P. E. Kelly, an American schoolteacher resident in Auckland who has had experience of these exhibitions in the United States, and Mr F. Puch of the Auckland Industrial Development Laboratories (D.S.I.R.) had been considering ways and means of holding such an exhibition in Auckland. In the meantime Prof. L. H. Briggs saw one in California last year and was so impressed that he started making plans for such an exhibition as soon as he returned. A committee was set up with representatives

of the Science Teachers' Association (of which Professor Briggs is a Past-President) the Auckland Manufacturers' Association, the Auckland Industrial Development Laboratories and the War Memorial Museum, where the exhibition was held. Mr Kelly acted as secretary to this committee.

The Manufacturers' Association enthusiastically supported the proposal and met all expenses of the exhibition, including the provision of over 500 running feet of trestle tables and over £100 in prizes, as well as necessary incidentals such as printing and publicity. The expenses amounted to approximately £500 and an equal sum is already available for next year's fair.

Convenient accommodation was available in two unoccupied halls of the new additions to the Auckland Museum. A panel of judges was set up to decide the best exhibits in the various classes, which were as follows: Physical Sciences, senior and junior; Natural Sciences, senior and junior.

Entries were invited both from individual students and from groups, separate prizes being available for each. The area for each exhibit was limited to 4 ft by 2 ft 6 in. Electricity was the only service available and the work had to be the students' own unaided efforts.

The exhibition was held over the period August 18 to 23. There was an excellent response, 110 entries being received from 34 out of a total of 44 secondary schools in the Auckland metropolitan area. The public supported the exhibition very well, large crowds attending each day it was open, while the support given by the press was all that could be asked for. Indeed the *New Zealand Herald* devoted a leading article to the exhibition which it described as "magnificently conceived."

While some of the more spectacular physical exhibits, such as satellite tracking, Van de Graaff accelerator and a Wimshurst machine attracted most attention, a first prize was won by an elaborate display representing the periodic table and the atomic structure of the elements. Other chemical exhibits showed chromatography and "Science on a Sixpence"—apparatus cheaply made from light bulbs, tins, etc. An interesting feature was the large proportion of entries from girls' schools.

Although the committee can see many ways in which the exhibition could be improved, it so obviously succeeded in interesting school children and the general public in science that it is almost certain to be held on a bigger scale in 1961. There is also a distinct possibility of similar ventures in other parts of New Zealand.

S. G. BROOKER.

INSTITUTE PRIZE AWARDS

The following Institute Prize Awards for 1960 were announced by the President, Mr E. W. Hullett, at the Annual Meeting in Wellington on August 25.

CHEMICAL ESSAY PRIZE

Awarded to **Dr J. C. Dacre,** Toxicology Research Unit, Dunedin. Dr Dacre's entry *Metabolic Pathways of the Phenolic Antioxidants* is publishd in this issue of the *Journal.*

I.C.I. PRIZE

Awarded to **Professor H. Bloom,** formerly of the University of Auckland. The main research on which this prize was awarded is Professor Bloom's studies on the structure and properties of molten salts, presented in a series of 18 papers and articles which deal with techniques in this field and include measurements of vapour pressures, transport numbers, refractive index, compressibilities, heat of vaporization, surface tension, conductivity, ultrasonic velocities and other properties in molten salt systems.

MORCOM GREEN, EDWARDS PRIZE

Awarded to **Dr H. P. Rothbaum,** Dominion Laboratory, Wellington. The five papers on which this award was made deal mainly with investigations into the problem of heating of wool during storage, including the effect of moisture and the commercial control of the water content of wool and the heat output of thermophilic organisms occurring on wool. Dr Rothbaum has also published work on the aerial topdressing of sulphur deficient soils.

DR J. C. DACRE

The main article published in this issue is the review for which Dr J. C. Dacre was awarded the Institute's Chemical Essay Prize for 1960. Dr Dacre graduated M.Sc. with Honours in Chemistry from Auckland University in 1946, then studied under Professor H. Raistrick, F.R.S., at the London School of Hygiene and Tropical Medicine and obtained his Ph.D. (London) in 1950. His thesis involved the investigation of some metabolic products of *Penicillium* species. On returning to New Zealand he was employed as Biochemist at the Dairy Research Institute from 1951 to 1953. He then joined the newly formed Toxicology Research Unit of the Medical Research Council at the Medical School, Dunedin, and is now Senior Research Officer with the Unit. Dr Dacre was elected Fellow of the Institute in 1958, has served on the Manawatu and Otago Branch Committees, and was Secretary for the Conference in Dunedin in 1959. His research interests include the metabolism of micro-organisms, the toxicology and metabolism of food additives and pesticides and the application of isotopes in these studies.

BRANCH NEWS AND NOTES

AUCKLAND BRANCH

The September meeting of the Branch was addressed by the retiring Chairman, Professor H. Bloom, who spoke on the subject "Molten Salts". Professor Bloom was entertained at a farewell dinner by the Committee before his address and later was made a presentation on behalf of members for his services to the Auckland Branch. The Branch heartily congratulates Professor Bloom on his award of the I.C.I. prize of the Institute and wishes him well in his future position in Tasmania.

The Branch welcomes the return from England of Dr N. Waters and Mrs Waters, who have both been appointed as members of the staff of the University. While in England Dr Waters was engaged in research at the Atomic Energy Research Establishment, Harwell, while Mrs Waters worked with Dr J. Chatt at the I.C.I. Laboratory, Hertfordshire, and later also at Harwell.

MANAWATU BRANCH

Dr A. T. Johns, Director of the Plant Chemistry Division, D.S.I.R., has recently returned from a four months' overseas tour. He visited the U.S.A. and U.K., where he attended the Grassland Conference at Reading, and returned to New Zealand via Russia.

Dr G. W. Butler visited biochemistry laboratories in Australia in May and June, attending also a conference in Canberra.

WELLINGTON BRANCH

Mr A. L. Johnson, Assistant Master at Rongotai College, has been granted three years' leave of absence to study for his Ph.D. at the University of Rochester, U.S.A.

Mr D. S. Nicholson, of the Dominion Laboratory, Lower Hutt, has resigned to take up a post with Lime and Marble Ltd., Mapua, Nelson.

Mr C. C. Watson, of Dominion Laboratory, Wellington, has resigned and has taken up a position with N.Z. Breweries, Molesworth Street, Wellington.

Mr R. M. Golding, Dominion Laboratory, left in August to take up a National Research Fellowship award at Cambridge University.

CANTERBURY BRANCH

Dr B. R. Penfold, Senior Lecturer, has returned to the Chemistry Department, University of Canterbury, after two years in the United States on a National Academy of Sciences Fellowship.

Dr M. P. Hartshorn has joined the staff of the Chemistry Department as Lecturer in organic chemistry. His research interests have been in the field of steroidal synthesis.

Dr A. Fischer of the Chemistry Department has been awarded the Ph.D. degree, University of New Zealand. He left recently to work on reaction mechanisms with Professor G. Hammond at the California Institute of Technology.

Mr L. Wilkinson, Dominion Laboratory, Christchurch, has been appointed D.S.I.R. representative on the Pollution Advisory Council.

Mr M. S. Carrie, Canterbury Frozen Meat Co. Ltd., is now Chairman of the Management Committee of the N.Z. Leather and Shoe Research Association. Mr J. Vaughan, Reader in Chemistry, University of Canterbury, has been appointed Governor-General's representative on the same committee.

OTAGO BRANCH

Dr R. D. Batt has recently been promoted to Associate Professor of Biochemistry in the Otago Medical School.

Dr Muriel Bell of Otago Medical School is at present on an overseas tour. She has attended the 5th International Congress on Nutrition in Washington and will visit the United Kingdom and India.

THE I.U.P.A.C. SYMPOSIUM VISITORS

From all Branches come most favourable reports on the visits from distinguished chemists who were brought to this country under the scheme financed jointly by the universities, the D.S.I.R., and the Institute. The gratitude of members is due to Professor Slater for his work in organizing these tours. Throughout New Zealand, chemists in diverse fields have been stimulated and enlightened by outstanding lectures and discussions during the last three months. Apart from new vistas in specialized subjects that have been displayed to us, to those of us who enjoyed the company of the visitors in entertainment and travel Johnson, Birch, Djerassi, Lederer and Thompson are now much more than great names on publications; personal contacts have been made that the years will see renewed.

Institute members ensured that the visitors were well entertained and enabled to meet New Zealand chemists in an informal manner. Dunedin reports that Professors Johnson and Djerassi were entertained at Institute dinners (one by courtesy of Professor Soper) and that Professors Birch and Johnson saw some of the more spectacular scenery of the South Island around Mt. Cook. Professor and Mrs Djerassi were shown through Central Otago. Auckland, Waikato and Manawatu members co-operated to see that natural products of various sorts at Rotorua, Wairakei, Waitomo and the Waitakere Ranges were seen by the visitors. It is to be hoped that they also have profited. Perhaps a plant plucked on the roadside at Rotorua or an idea discussed on the shore at Te Anau may yet be instrumental in the development of a new chemical product or concept.

In addition to the "sponsored" visitors a number of other distinguished chemists have passed through New Zealand on their way to or from the Symposium. The Auckland Branch, for example, records that Institute Members have entertained the following visitors in recent weeks: Professor A. Adams, University of Illinois; Dr W. I. Taylor, CIBA Pharmaceutical Products Inc., New Jersey; Professor E. Lederer, Fondation Edmond de Rothschild, Paris; Professor F. Sandberg, Royal Pharmaceutical Institute, Stockholm; Professor P. J. Scheuer, University of Hawaii; Professor E. Wenkert, Iowa State University; Dr F. L. Weisenborn, Squibb Institute for Medical Research, New Jersey; Dr J. L. Hartwell, National Cancer Institute, Bethesda; Professor T. S. Wheeler, University College, Dublin; Dr P. R. Enslin, South African Council for Scientific and Industrial Research, Pretoria; Dr D. A. Cahall, Squibb Institute for Medical Research, London; Dr A. C. Santos, University of the Philippines; and Professor C. H. Stout, University of Washington.

Members of some of our Branches have also had the opportunity to meet and hear Professor Sir Alexander Todd who was President of the Symposium and who has recently travelled in New Zealand on behalf of the Nuffield Foundation.

It may be many a year before such a concentration of leading chemists is again seen in this country; but the stimulus of their coming has been so great that members will want the Institute to take any opportunity to encourage and facilitate such visits in the future.

THE REGISTRY

Fellow

(Elected August 25, 1960)

COOP, Ian Edward, M.Sc., D.Phil., Lincoln College, Christchurch (Assistant Director and Professor of Animal Husbandry).

Associates

(Elected August 25, 1960)

AGGETT, Frederic John Bernard, M.Sc., Chemistry Dept., University of Auckland (Lecturer).

CANDY, Bruce James, M.Sc., Kelston High School, New Lynn, Auckland (Science Master).

CORBAN, George Annis, B.Sc., R. & W. Hellaby Ltd., Auckland (Chemist).

COX, Gerald Stanley, B.Pharm., Ph.D., N.Z. School of Pharmacy, Petone (Director).

DONE, James, M.Sc., Ph.D.(Lond.), Ruakura A.R.S. (Research Fellow).

ENGLAND, Brian Daysh, M.Sc., Ph.D.(Lond.), Chemistry Dept., Victoria University of Wellington (Senior Lecturer).

GROOM, Philip Stanley, B.Sc., Dominion Laboratory, Wellington (Scientific Officer).

HILLS, Dennis Ashley, B.Sc., Empire Rubber Mills, Christchurch (Chemist).

HINDMARSH, William Ewan, B.Sc., Tasman Vaccine Laboratories Ltd., Upper Hutt (Chemist).

HITCHINGS, Terence Richard, M.Sc., Riccarton High School, Christchurch (Senior Science Master).

McMILLAN, Roger Maxwell, B.Sc., Buckley & Young Ltd., Wellington (Chemist).

McNAUGHTON, Graeme Stuart, M.Sc., Ph.D., Institute of Nuclear Sciences, Lower Hutt (Scientific Officer).

MATTHEWS, Richard Ellis Ford, M.Sc., Ph.D., Plant Diseases Division, Auckland (Senior Principal Scientific Officer).

MORRISON, Dan Alexander, M.Sc., Dominion Laboratory, Auckland (Scientific Officer).

NOBLE-CAMPBELL, Vincent Cedric, B.Sc., National Carbon Pty. Ltd., Wellington (Industrial Chemist).

PARKER, Rani Estelle (Mrs), B.Sc., Pathology Dept., Public Hospital, Wellington (Biochemist).

RUTLEDGE, Peter Stewart, M.Sc., Chemistry Dept., University of Auckland (Research Student).

RYBURN, Graham Middleton, B.Sc., Tasman Vaccine Laboratories Ltd., Upper Hutt (Industrial Chemist).

SLEEMAN, Geoffrey Russell, M.Sc., Chemistry Dept., Victoria University of Wellington (Lecturer).

Resignations

HOOPER, H. E. D. (Miss).

SMITH, Gavin.

Member Incommunicado

Would anyone knowing the present address of Mr C. M. ANDERSON, who left Lincoln College to go overseas in 1955, or other means of communication with him, please inform the Registrar.

THIRTIETH ANNUAL REPORT, 1959–1960

OFFICERS

President: Mr E. W. Hullett

Vice President: Prof. H. N. Parton

Delegates:

Auckland—Prof. H. Bloom
Waikato—Dr E. P. White
Manawatu—Dr G. W. Butler
Wellington—Mr J. R. Beck
Canterbury—Mr D. J. Hogan
Otago—Dr A. D. Campbell

Immediate Past President: Prof. L. H. Briggs

Editor: Dr W. A. McGillivray, then Mr N. T. Clare

Hon. General Secretary: Dr W. E. Harvey, Mr A. P. Oliver has been acting Hon. Gen. Sec. during Dr Harvey's absence overseas.

Registrar: Mr D. J. Hogan

INTRODUCTION

In conformity with the changed Institute year, this report covers the period 1st August, 1959, to 31st July, 1960.

MEETINGS OF COUNCIL

There have been four meetings of Council and two General Meetings.

Membership of the Institute has changed as follows, during the period of the Report.

	Associates	*Fellows*
New Members	51	6
Resignations	20	—
Leave	11	—

The deaths of the following members are recorded with regret:

C. Bagley (Wellington)
F. A. Denz (Otago)
C. Dibley (Auckland)
R. J. McIntyre (Otago)
F. E. Mason (Waikato)
E. F. J. Schwarz (Canterbury)

Mr L. P. Symes was elected to Honorary Fellowship.

Messrs C. L. Carter, G. A. Lawrence and Dr O. F. Nauen were elected to Honorary Life Membership.

Membership figures for the last three years are as follows:

	1958	*1959*	*1960*
Auckland	94	97	105
Waikato	37	33	29
Manawatu	42	45	51
Wellington	167	179	177
Canterbury	81	68	79
Otago	66	63	61
Overseas	52	62	52
TOTAL	539	547	554

HONOURS

Dr H. O. Askew and Dr F. H. McDowall were awarded the O.B.E. in the New Year Honours List.

SUBCOMMITTEES OF COUNCIL

The Subcommittees are listed below, with brief comments on their activities.

MEMBERSHIP SUBCOMMITTEE

Dr J. K. Dixon, Mr S. G. Brooker and Prof. S. R. Siemon have examined all applications for membership.

JOURNAL

The Editor, Mr N. T. Clare, and a committee from the Waikato Branch have taken over the *Journal*.

EMPLOYMENT

Mr J. L. Mandeno handles inquiries regarding employment, mostly from prospective immigrants. An Auckland Branch committee has circulated questionnaires to employers, first in the Auckland district, then over the whole country, to find the country's requirements for technicians and chemists up to 1965. When completed the information will be made available to the Education Department.

EXAMINATIONS

The L.A.C. examinations continue to be well supported. The Examinations Committee and an Auckland Branch Committee have played a significant part in framing the syllabus to be followed in training technicians for National Certificates in Chemistry. Drs A. Odell and R. Gardner represent the Institute on the controlling authority.

STANDARDS INSTITUTE

Mr G. A. Lawrence is on the N.Z. Standards Council; Mr C. L. Stonyer is Chief Representative for all Standards Institute affairs.

PROFESSIONAL STATUS COMMITTEE

This Wellington Committee is preparing a Salary Survey which is to be completed this year. They are also preparing a case on Chemists' salaries for submission to Cabinet. The rapidly changing salary scene makes both matters urgent.

HONORARY LIBRARIAN

Mr S. G. Brooker has been appointed Librarian to care for the Institute Library. This has been housed as a separate section by the Auckland Institute and Museum. A subscription to *Science* has been taken out.

CONFERENCES

The Institute has had two conferences during the period under review, the first in Dunedin in August, 1959, the second as a participating body in the Ninth N.Z. Science Congress, held in Wellington in May, 1960. Wellington Branch arranged the Chemistry Section on behalf of the Institute.

PRIZES

Entries for the prizes in 1960 were as follows:

Morcom Green, Edwards	3	Chemical Essay	3	I.C.I.	4

OVERSEAS VISITORS

It has been possible to arrange for five prominent visitors to give lecture tours before or after they attend the International Symposium *Chemistry of Natural Products* in Australia in August, 1960. The tours are financed jointly by the D.S.I.R., the Universities, the Chemical Society (London), and the N.Z.I.C.

EDUCATIONAL FUND

In February, 1960, the Acting Secretary sent a circular to 26 companies which are major employers of chemists, seeking their assistance in

the establishment of a permanent fund to help finance tours by prominent overseas chemists. The two companies which donate Institute prizes were, of course, not approached. The response was £75 from four companies.

ADDRESSOGRAPH PLATES

It has been decided to allow the plates to be hired for purposes and rates to be decided by Council.

RULES

All amendments made since the last printing in 1954 will be printed as a loose sheet for insertion in the printed Rules.

LIST OF MEMBERS

A list of members as at March, 1960, was produced during the year. Council has since agreed to the principle of annual publication and Dr McGillivray's suggestion that this be made a sixth or December issue of the *Journal* has been accepted. This should commence with the 1961 volume of the *Journal* and Canterbury Branch has agreed to set up a permanent committee to take care of the list.

During the preparation of the list an attempt was made, by registered letters or otherwise, to contact members with long overdue subscription accounts and members with whom contact had been lost. As a result some members resigned, some became active members again and a large number were struck off. This has brought a "book" loss on the year's working, but has produced a far more accurate picture of the membership.

"CHEMISTRY IN ACTION — 1959"

A series of three lectures given to Secondary School pupils in Christchurch by Professor H. N. Parton, Dr E. B. Kidson and Mr N. W. Vere-Jones was reprinted from the October, 1959, issue of the *Journal*. Two thousand copies were offered to secondary schools throughout the country at the rate of £1 per class set of 40. This represented a 50:50 subsidy by the Institute. No difficulty was experienced in selling the 2,000 copies and the venture must be regarded as a success.

R.I.C. MONOGRAPHS FOR TEACHERS

Council approved the purchase of 100 copies of each of the first three in the R.I.C. series *Monographs for Teachers*. The intention is to sell these, in sets, to secondary schools. Orders for about 60 sets have been received, although very little publicity has so far been given to the project. It is clear that the 100 copies will be quickly disposed of and the favourable rates offered by the R.I.C. mean that there will be no cost to the N.Z.I.C.

The two preceding paragraphs are an indication of recent trends in publicizing to secondary school pupils the value of chemistry as a career and of stimulating and improving the teaching of chemistry in the schools. These activities, initiated by branches, have received the full support of Council. It is clear that they will grow in importance as Institute activities. An outstanding example of branch work in this field is Manawatu's production of a set of colour slides with accompanying tape-recorded commentary under the title *Chemists in Action*. It is understood that when polished up these will be available for use by other branches.

FINANCIAL

The balance sheet shows an excess of expenditure over income of about £350. This has mostly been brought about by the writing off of a large amount of overdue subscriptions during the purging of the roll mentioned above. The Institute remains in a very sound financial position.

E. W. HULLETT, *President.*
A. P. OLIVER, *Acting Hon. Gen. Secretary.*

THE NEW ZEALAND INSTITUTE OF CHEMISTRY (INC.)

INCOME AND EXPENDITURE ACCOUNT FOR YEAR ENDED APRIL 30, 1950

1959 (18 months)							*1959* (18 months)						
	ADMINISTRATION EXPENSES:							SUBSCRIPTIONS:	911	1	8		
345	Travelling Expenses	302	10	9				Proportion Compounded					
	Printing, Stationery and Post-						1222	Subscriptions	4	5	9		
167	ages	230	19	9								915	7 5
375	Salary, Registrar	200	0	0				INTEREST RECEIVED:					
90	Branch Expenses Allowance	150	0	0			31	National Savings Account	24	17	5		
84	Honorarium to Secretary	50	0	0			—	Bank of New Zealand	9	1	0		
—	Registrar's Transfer Expenses	20	0	0			8	Post Office Savings Bank	7	14	5		
—	General Expenses	19	8	5								41	12 10
15	Audit Fee	15	15	0				EXAMINATION COMMITTEE					
9	Depreciation	9	0	0			35	FEES:				38	1 9
					997	13 11		COMMISSION ON JOURNAL					
	Cost of *Journal*	230	17	6			—	SUBSCRIPTIONS:				13	10 4
420	Editor's Honorarium	35	0	0				CONFERENCE SURPLUS:	11	7	5		
					265	17 6	1	*Less* R.I.C. Share	2	16	3		
69	*Chemistry in Action*				56	12 4						8	11 2
—	Chemical Essay Prize				25	0 0		Excess of Expenditure over					
—	Cost of Salary Survey				18	1 0		Income for year trans-					
	Examination Committee Ex-							ferred to Accumulated					
20	penses				12	13 10	314	Funds				366	0 9
17	Provision for Taxation				7	5 8							
1611					£1,383	4 3	1611					£1,383	4 3

THE NEW ZEALAND INSTITUTE OF CHEMISTRY (INC.)

BALANCE SHEET AS AT APRIL 30, 1960

1959							1959						
60	SUNDRY CREDITORS:	69	13	11				CASH BALANCES:					
24	Provision for Taxation	14	13	1			1	Petty Cash Funds	28	15	8		
	Subscriptions Received in						140	Bank of New Zealand	374	16	1		
77	Advance	118	1	1			215	Post Office Savings Bank	252	6	7		
					202	8 1	656	National Savings Account	681	1	2		
												1336	19 6
	PROVISIONS AND SPECIAL FUNDS:							SUBSCRIPTIONS IN ARREARS:	143	17	0		
150	Provision for Printing	150	0	0				Less Provision for Overdue					
75	Provision for Overseas						607	Subscriptions	50	0	0		
	Visitors' Travelling	125	0	0								93	17 0
—	Education Fund	75	0	0				SUNDRY DEBTORS:					
30	Provision for Essay Prize ..	30	0	0				Morcom Green, Edwards					
28	Compounded Subscriptions	29	9	3			26	Prize				25	0 0
					409	9 3		OFFICE EQUIPMENT AT					
	TRUST FUND:							COST:	66	3	0		
1144	As per Statement attached				1183	9 6	60	*Less* Depreciation	12	3	0		
												54	0 0
	ACCUMULATED FUNDS:							ADDRESSOGRAPH PLATES,					
	Balance as at 30/4/59	1285	19	11				AT COST	31	3	6		
	Less Excess of Expenditure						5	*Less* Depreciation	29	3	6		
1286	over Income for Year	336	0	9								2	0 0
					919	19 2		TRUST FUND INVESTMENTS:					
								Post Office Savings Bank	633	10	6		
								Hutt County Council De-					
								bentures	500	0	0		
							1144	Cash in General Account	49	19	0		
												1183	9 6
							20	ADVANCE, CONFERENCE:				20	0 0
2874					£2,715	6 0	2874					£2,715	6 0

THE NEW ZEALAND INSTITUTE OF CHEMISTRY (INC.)

TRUST FUND ACCOUNT

Balance 30/4/60			1,183	9	6	Balance 30/4/59			1,143	11	2
						Interest:					
						Post Office Savings Bank	19	19	4		
						Hutt County Council Debentures	19	19	0		
									39	18	4
			£1,183	9	6				£1,183	9	6

AUDITOR'S REPORT

I have audited the books of the New Zealand Institute of Chemistry (Inc.) for the year ended April 30, 1960, and have received all the information and explanations I have required. I desire to report on the following matters: 1. Some payments, mainly in respect of travelling expenses, have not been passed for payment by the Council as provided for in Rule 14, 1., and vouchers for these payments were not available. 2. A direction by the Council to the Trustees on February 20, 1959, to invest £500 of Trust Funds in Lyttelton Harbour Board securities has not been carried out. Subject to these matters, in my opinion, according to the best of my information and the explanations given to me and as shown by the books of account, the Balance Sheet, Income and Expenditure Account, and Trust Fund Account are properly drawn up so as to give a true and fair view of the state of the Institute's affairs as at April 30, 1960.

J. W. SHANAHAN, A.P.A.N.Z.,
Auditor.

GENERAL MEETING MINUTES

ABRIDGED MINUTES OF A GENERAL MEETING OF MEMBERS HELD IN THE SEMINAR ROOM, CHEMISTRY DEPARTMENT, VICTORIA UNIVERSITY, ON THURSDAY, AUGUST 25, 1960, AT 8 P.M.

PRESENT

Mr E. W. Hullett (President, in the Chair), and fourteen members.

PRESIDENTIAL REMARKS

The President asked members to stand in memory of six members who had died during the year, namely:

G. Bagley	C. Dibley	F. E. Mason
F. A. Denz	R. J. McIntyre	E. F. J. Schwarz

Mr Hullett thanked Branches for their invitations to visit them for lectures. He expressed his gratification at the large number of members who had attended the Symposium on Natural Products held in Australia under the auspices of the International Union of Chemistry.

Another highlight of the year was the visit of several distinguished chemists who were attending the Symposium.

Resolved (President/Hughson): That Professor Slater and the Overseas Visitors Committee be thanked for organizing the visits.

OFFICERS FOR 1960-61

Prof. H. N. Parton, University of Otago, was elected unopposed as President.

Dr F. B. Shorland, Director, Fats Research Lab., was elected as Vice President.

Dr W. E. Harvey, University of Wellington, was elected unopposed as Hon. General Secretary-Treasurer.

Mr A. P. Oliver was appointed Acting Hon. General Secretary until Dr Harvey's return from overseas.

ANNUAL REPORT

The Annual Report was received and adopted.

Under the heading "Professional Status Committee" the letter sent to the Prime Minister about the numbers of M.Sc. graduates going overseas was read. Mr Stonyer mentioned his recent experience with several employers who were not clear exactly what was meant by a chemist. They did not know the meaning of the various qualifications, or the advantages to be gained by employing a member of the N.Z.I.C., rather than a person calling himself a chemist, but without adequate qualifications.

Under the heading of "Conference" it was announced that at the next General Meeting there would be a discussion on future participation in Science Congress.

INCOME AND EXPENDITURE ACCOUNT AND BALANCE SHEET for the year ended April 30, 1960, was adopted. Points raised during discussion included:

Subscriptions: About £350 have been written off.

Trust Fund: The purpose of the Fund was discussed. The conclusion was that no specific aim was in the mind of Council when the Fund was started, other than the normal desire to establish reserves. It appeared to be the feeling of the meeting that the Fund should not increase indefinitely without an aim.

Resolved (Stonyer/Beck): That the objects of the Trust Fund be reviewed by Council, and a recommendation prepared.

A. P. Oliver, *Acting Hon. General Secretary.*

COUNCIL MINUTES

ABRIDGED MINUTES OF A MEETING OF THE COUNCIL OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY (INC.) HELD IN THE D.S.I.R. CONFERENCE ROOM, WELLINGTON, ON THURSDAY, AUGUST 25, 1960, AT 10 A.M.

PRESENT

Mr E. W. Hullett (President, in the Chair), Prof. H. N. Parton (Vice President and Otago Proxy), Mr P. Gallaher (Auckland Proxy), Mr N. T. Clare (Editor and Waikato Proxy), Dr W. A. McGillivray (Manawatu Proxy), Mr J. R. Beck (Wellington), Mr D. J. Hogan (Registrar and Canterbury Proxy), Mr A. P. Oliver (Acting Hon. General Secretary). Apologies for absence were received from Prof. H. Bloom (Auckland), Dr G. W. Butler (Manawatu), Dr A. D. Campbell (Otago), and Dr E. P. White (Waikato).

EMPLOYMENT SUBCOMMITTEE

Auckland presented a draft of the results and conclusions arising from the questionnaire sent to employers of chemists and technicians. The report will be cyclostyled and circulated to members of Council and Branches.

Resolved (Otago/Auckland): That a summary of the Report be published in the *Journal* as soon as possible.

Resolved (Wellington/Vice President): That the Auckland Subcommittee be thanked for their valuable work.

It was noted during discussion that some employers would appreciate a salary scale to give them more idea of the correct salary they should pay.

EXAMINATIONS COMMITTEE

Resolved (Vice President/Wellington): That the N.Z.I.C. take no action in setting up provision for a Research Diploma.

PROFESSIONAL STATUS COMMITTEE

A report was received from the Committee advising that a Salary Survey should not be conducted until the impending salary increases for Government scientists had been made. It was resolved that this advice be followed. The Committee's letter to the Prime Minister re numbers of M.Sc. Graduates leaving the country was cleared for publication in the *Journal* and Press.

The Vice President commented that the N.Z.I.C. was not invited to participate in the recent Industrial Development Conference.

JOURNAL

Resolved (Canterbury/Wellington): That 2,000 reprints of *Chemistry in Action* be printed.

MEMBERSHIP

Resolved: That the acceptance by Council of the resignation of R. W. Bailey be rescinded he having returned to New Zealand and paid all subscriptions which would have been due if he had remained a member.

Resolved: That Council revoke the removal from the membership list of Dr R. M. Milburn, it having been established that he was not receiving accounts, and has since paid all arrears.

Resolved: That Council revoke the removal from the membership list of Dr Sheet, it having been established that he had not been receiving advices of the granting of leave of absence.

Resolved: That the resignation of Miss Hooper and Mr G. Smith be accepted with regret.

Resolved: That Mr P. R. Parr be given permission to compound his subscription.

Resolved: That Mr L. W. Ruddle be elected an Honorary Life Member.

Resolved: That the following members be granted leave of absence for the periods stated, with remission of subscription: B. J. Welch—2 2 years; A. Fisher—1 year; R. N. Golding—2 years; A. L. Johnson—3 years; D. W. Wright—2 years.

FINANCIAL

Resolved (Wellington/Waikato): That the balance sheet as at April 30, 1960, and the income and expenditure account for the years ended April 30, 1960, be approved.

A letter was received from the Auditor, Mr J. W. Shanahan, dated July 28, recommending certain changes in procedure which will make the financial position clearer.

ROYAL CHARTER

Resolved (Manawatu/Wellington): That the Hon. Gen. Secretary ask the Internal Affairs Department if they would support an application by the N.Z.I.C. for a Royal Charter.

Note: It appears that with Internal Affairs Department support the cost would be about £200.

CONFERENCE, 1961

A letter was received from Manawatu Branch stating that Massey College accommodation would not be available for the 1961 Conference.

Resolved (Wellington/Vice President): That the Auckland Branch be asked to organize the 1961 Conference.

INSTITUTE PRIZES:

Resolved (Vice President/Auckland): That the 1960 I.C.I. Prize be awarded to Prof. H. Bloom.

Resolved (Manawatu/Wellington): That the 1960 Chemical Essay Prize be awarded to Dr J. C. Dacre.

Resolved (President/Vice President): That the 1960 Morcom Green, Edwards Prize be awarded to Dr H. P. Rothbaum.

Resolved (Waikato/Hon. Gen. Sec.): That the Editor be asked to redraft the Regulations for the Chemical Essay prize so as to clarify the position of *Journal* articles as entrants for the Prize.

TRUST FUND

It was pointed out that, through an oversight, the sum of £500 which was to have been invested in 1959 was not invested.

Resolved (President/Wellington): That the Registrar consult the Trustees asking for their advice on the investment of £500.

EDUCATIONAL FUND

A letter was received from Mr A. W. Mackney pointing out that industry should not be asked for contributions while the subscriptions were kept low. He drew attention to the recent 50% increase in R.A.C.I. subscriptions. It was agreed by Council that there should be no increase in subscriptions while Trust Funds are accumulating. Canterbury was of the opinion that the Institute should in addition continue to keep up pressure on industry to contribute.

Resolved (Wellington/Hon. Gen. Sec.): That Mr Mackney be thanked for his letter.

OVERSEAS VISITORS

Resolved: That the Overseas Visitors Committee be asked to advise on apportioning the total cost between D.S.I.R., the universities and the N.Z.I.C.

RULES

Resolved: That the present system of naming two referees on the application form be continued, and that Rule 5 be changed accordingly.

Rule 8.2.3: It appears that Associateship in the Chemical Institute of Canada is equivalent to the N.Z.I.C. Local Membership. This point will be clarified by the Hon. Gen. Sec.

9TH SCIENCE CONGRESS

A report was received from Messrs J. R. Beck and H. Penhale on behalf of the Wellington Branch.

Resolved: That the report be received and the Wellington Committee be thanked for its efforts.

Resolved: That the report be distributed to Branches for comment on the desirability of future participation in Congresses, these comments to be presented to the General Meeting during Conference 1961.

R.I.C. MONOGRAPHS

The R.I.C. has granted a discount of 1/6th of the cost of the Monographs, and has also paid postage.

ADDRESSOGRAPH PLATES

Resolved: That the hire charge for the N.Z.I.C. addressograph plates be £12, Council to approve the nature of the material to be advertised in each case. The above sum includes cost of stationery and other costs of Editorial Services Ltd.

JOINT CONFERENCES WITH N.Z. SECTION OF R.I.C.

Immediately prior to the Council meeting the President, Wellington delegate, Vice President and Acting Hon. Gen. Secretary met the R.I.C. representatives Dr Moir and Messrs Law and Wood. The meeting was called to discuss principally the resolution of Council in November, 1958, that the August Conferences would be run solely by the N.Z.I.C., R.I.C. members who were not members of the N.Z.I.C. to be invited to take part. This decision was conveyed to the N.Z. Section of the R.I.C. in a letter from the Hon. Gen. Secretary dated February 16, 1959, in which it stated that time would be allotted if possible for R.I.C. General Meetings. Mr Hullett explained that Council's intention is to provide time for the meeting, that the N.Z.I.C. would continue to co-operate in selecting the winners of the Easterfield Medal, that the President of the R.I.C. would be

invited to present the Medal at Conference, and that the recipient would be given time to present his address. The above matters were later reported to Council.

Resolved: That Branches be advised that it is Council's policy to provide time at Conferences for the R.I.C. General Meeting, and that this is to take place before the N.Z.I.C. General Meeting whenever possible.

Resolved: That it is the policy of Council to invite the President of the N.Z. Section of the R.I.C. to present the Easterfield Medal, and to invite the recipient to deliver his lecture at Conference.

FESTIVAL OF WELLINGTON, 1961

A letter from the Festival Committee asking for an exhibit or a lecture was handed to the Wellington Branch for action.

ELECTION OF OFFICERS

There being only one nomination for each position, no elections were necessary.

Resolved (Canterbury/Wellington): That Prof. H. N. Parton be elected President.

Resolved (Otago/Wellington): That Dr F. B. Shorland be elected Vice President.

Resolved (Wellington/Auckland): That Dr W. E. Harvey be elected Honorary General Secretary and that A. P. Oliver be appointed Acting Honorary General Secretary until Dr Harvey's return from overseas.

TIMBER PRESERVATION

Six specifications for timber treatment methods were received from the Chairman of the Timber Preservation Authority.

A. P. OLIVER, *Acting Hon. Gen. Secretary.*

MONOGRAPHS FOR TEACHERS

MONOGRAPHS FOR TEACHERS. Published by the Royal Institute of Chemistry. Copies of the three Monographs reviewed here are available from the Registrar, N.Z.I.C.

Principles of Electrolysis, by C. W. Davies, Professor of Chemistry, University College of Wales. 30 pages. 3s.6d.

Principles of Oxidation and Reduction, by A. G. Sharpe, Lecturer in Chemistry, Cambridge. 30 pages. 3s. 6d.

Principles of the Extraction of Metals, by D. J. G. Ives, Reader in Chemistry, University of London. 57 pages. 6s.

These monographs are designed to provide authoritative accounts and up-to-date information for those who teach chemistry at the G.C.E. Advanced Level and above. As the treatment is academic and presumes a sound basic knowledge, particularly of physical chemistry, they would not be suitable as class sets for the use of pupils in our upper sixth forms. However, teachers who are preparing pupils for our scholarship examinations should find them most useful in bringing their own knowledge up to date and in ensuring that these topics are presented in such a way that pupils going on to more advanced studies will not have to unlearn what has been taught at a more elementary stage.

Although they are designed specifically for teachers, no attempt has been made to suggest teaching techniques or methods of presentation, and it is in these fields that teachers frequently need help.

S.I.L.

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