CHEMISTRY IN NEW ZEALAND

JOURNAL OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY

Vol. 36, No. 2, April, 1972

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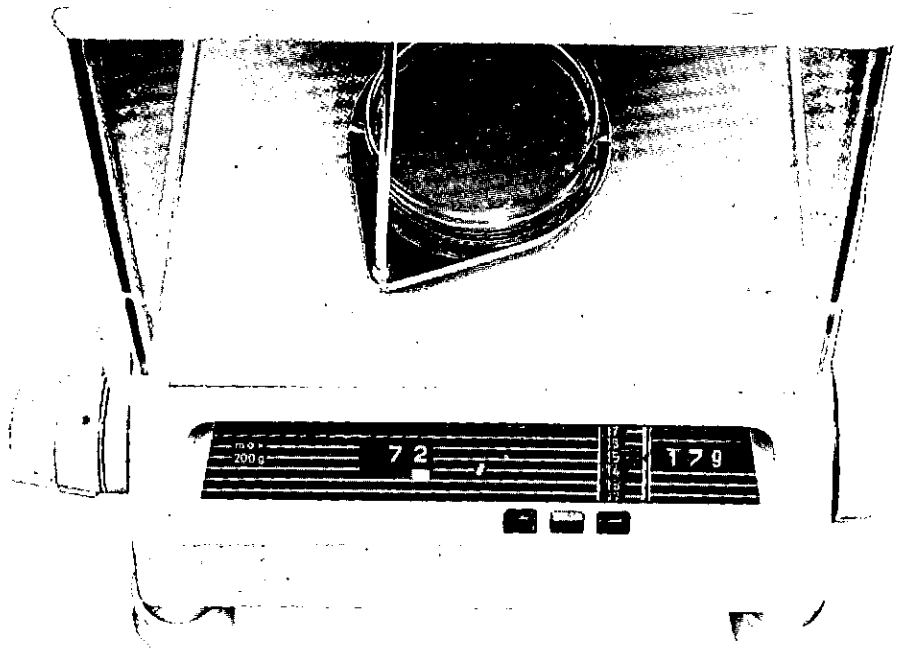

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CHEMISTRY IN NEW ZEALAND

Journal of The New Zealand Institute of Chemistry

Vol. 36, No. 2 April 1972

Published bi-monthly by the New Zealand Institute of Chemistry Inc. (P.O. Box 250, Wellington)

Contents

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P.O. Box 250, Wellington.

Printed by David F. Jones Ltd., Wellington.

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The Journal of the N.Z. Institute of Chemistry has an audit circulation Certificate of New Zealand Advertisers. Latest audited circulation (March 1969) 1150.

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INSECT HORMONES AND PHEROMONES — CORRELATION OF CHEMICAL STRUCTURE AND INSECT-PLANT RELATION *

by F. L. Warren

Senior Research Fellow, Ruakura Animal Research Centre, Hamilton.

INTRODUCTION

The title defines clearly the scope of this study as being limited to a discussion on the structure of the molecules in the new field of "chemical ecology", and is not directly concerned with the physiology and biochemistry of insects. The separate chemicals eliciting physiological and behavioural responses in the social insects, and the specific substances acting as attractants or repellants of particular plants to individual insects are similarly excluded unless these substances are associated with pheromone activity.

Hormones of both plants and animals are chemical substances which bring about *slow* physiological changes in the particular plant or animal. Pheromones are chemicals which elicit *immediate* response between members of the same or other species. These immediate behavioural responses are triggered by specific chemicals by way of the sense organs of insects. They may be grouped: (i) stimulants or deterrents to feeding, courtship, copulation and oviposition. (ii) attractants, including aggregation factors, and repellants.

The study of the isolation and structure of these active natural products has been made possible by the advent of techniques for separating and analysing small quantities. Even with these facilities the rearing of large numbers of insects has been necessary, and biological assay has to be superimposed on chemical analyses. As an appreciation of the number and quantities involved the following few examples may be cited:

Insect	No. of Insects $\times 10^6$	Quantity mg
Pink Boll worm	850	1.5
Fall Army worm	135	0.5
Red Banded Leaf Roller	40	0.2
False Codling Moth	1,706	<0.1

INSECT HORMONES

Insect hormones are concerned with moulting and metamorphoses and may be represented diagramatically in fig. 1. The unknown brain hormone activates the prothoracic gland to produce ecdysone which induces the next moult. The step-wise growing of the larvae is maintained by the presence of the juvenile hormone the disappearance of which results in the conversion of the larva to pupa and so to the adult.

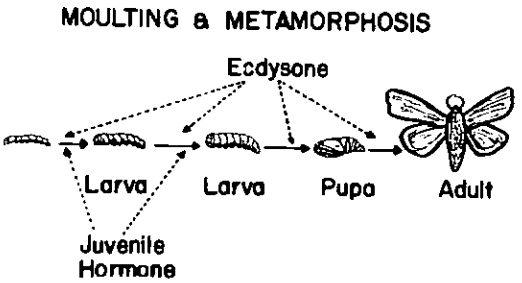
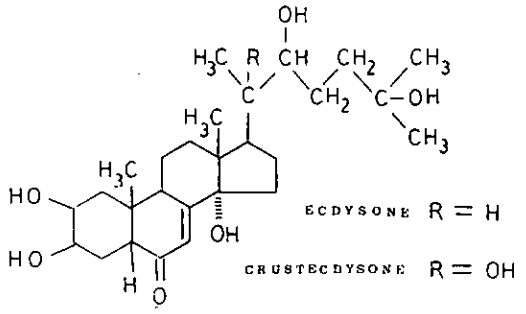


Fig. 1. The role of ecdysone and the juvenile hormone in the moulting and metamorphosis of insects.

Ecdysone

Butendant and Karlson (1954)[1] isolated ecdysone, and its structure was established in 1965. A related substance (20-Hydroxy-ecdysone, β-ecdysone) was later isolated from one of the Crustacea by Hampshire and

*Symposium lecture, Annual Conference of the New Zealand Institute of Chemistry, 1971.



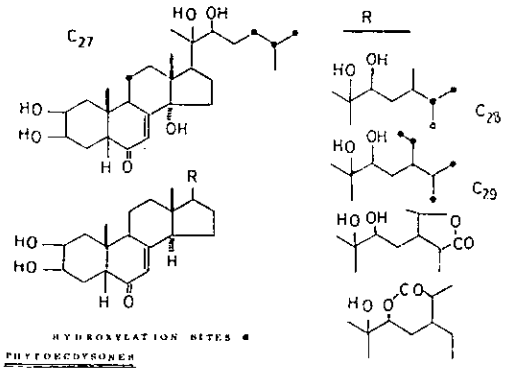


Fig. 2. The structure of the known phytoecdysones. The sites at which hydroxylation has been found are marked.

Horn[2] and its presence in small quantities detected in insects; and these and related compounds, phytoecdysones, first found by Nakanishi[3] and his co-workers, have been obtained from plants. They are hydroxylated forms of ecdysone and their structures are shown in fig. 2.

Ecdysone is the hormone common to all insects in the way that the steroid hormones are common to mammals. The stable structure for cholesterol has ring A/B *trans*, whilst the stable configuration for the ecdysones has A/B *cis* fused, which may be attributed to the 1.3-diaxial interaction between the 2-hydroxyl group and the 19-methyl group as shown in fig. 3. Ponasterone-B and C retains the *cis* A/B ring fusion although it is a 2α, 3α-dihydroxy form. α- and β-Ecdysone are C_{27}-sterols, the basic

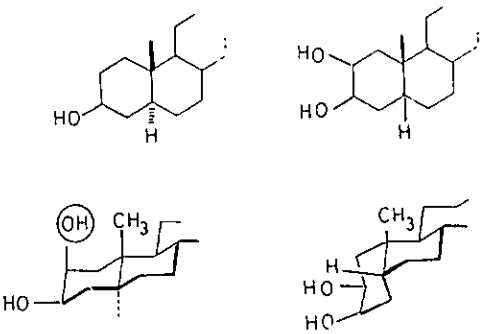


Fig. 3. The effect on configuration of ring A/B fusion in sterols of the 2β-hydroxyl group: 3β-cholestane (*trans* A/B) and 2β, 3β-coprostane (*cis* A/B).

Evolution of the INSECTA, MYRIAPODA, and CRUSTACEA in relation to FERNS, GYMNOSPERMS and FLOWERING PLANTS

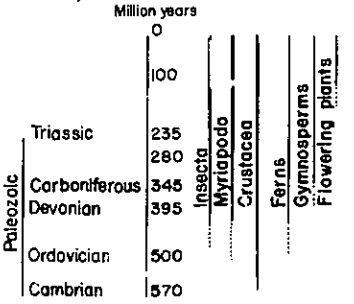


Table 1

skeleton of cholesterol, whereas the phytoecdysones are also C_{28}- and C_{29}-sterols which are those of β-sitosterol (the principal sterol of plants) and ergosterol (the principal sterol of the fungi). Until recently it was thought that insects, which can not synthesise cholesterol, had to obtain their sterols from the plants on which they feed. This necessitated the ability to dealyklate the $C_{(24)}$-alkyl group or to degrade and rebuild the side-chain. Recently, however, cholesterol has been detected in very small quantities in *Solanum tuberosum* and *Dioscorea spiculiflora*[5], and intermediates in the bioxidation of cholestane have been found.

The occurrence of phyto-ecdysones in the gymnosperms and ferns may not be unconnected with the simultaneous evolution of these with the Insects and Myripoda. By the carboniferous era the insects were so numer-

ous that this period has been called the age of the cockroach (Table 1).

"The fact that plants are capable of synthesising active analogues of both types of insect hormones known must be classed among the phenomenon of mutual interaction between two antagonistic kingdoms during their evolution[6]".

Insect control through the administration of ecdysone which plays a critical role in insects, does not at present offer many possibilities[4]. This moulting hormone has a short life in the insect itself. However, one of the phyto-ecdysones, namely ponasterone A, kills *Cecropia* moths larvae in concentrations of one part per billion. The *trans* series are antagonistic to ecdysone and inhibit post ecdysone moulting and scelerotization of the larvae cuticulae. Furthermore ecdysone is synthesised from cholesterol and feeding some cholesterol derivatives (cholestanone, cholesteryl chloride) can inhibit and kill insects.

It is of interest indeed that the water beetles use the steroids as defence substances and that these steroids have the structure of the sex-hormones of the higher animals, namely testosterone, 4-pregnen-20α-ol-3-one, estrone, estrol, and pregnadiendiolone. The milky fluid from *Dysticus marginalis* contains 10% cortexone[7]. The water beetles are an interesting group of insects which returned to the water from the land.

Finally, in relation to the role of steroids in insects there are the plant cardenolides. Eight orders of insects are known to feed on Asclepiadeae and Apocynaceae and contain in their body these toxic substances which protects them from carnivorous predators.

Juvenile Hormone

The juvenile hormone has the structure based on the elegant studies of Roller (1967)[8] and Meyer (1968)[9]. This hormone prevents adult development after which growth of the insect stops, and it is lethal to the egg. Its structure is closely related to that of the methyl of ester of farnesenic acid (See fig. 4).

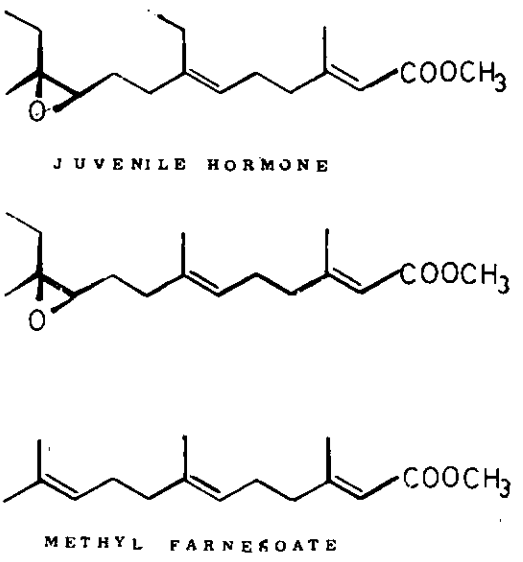


Fig. 4. The structure of the juvenile hormone in relation to that of methyl farnesenate.

Modification of Structure and Control

There is ample evidence that the structure of the juvenile hormone may be changed to effect control. The "paper factor" found in all American paper is caused by a substance in Balsam fir, *Abies balsamea*[10].

The active substances were juvabione (methyl todomatuate) and dehydro-juvabione. These have an activity on certain specific species, e.g. bugs of the Pyrrhocoridae family. Again we find the similarity between

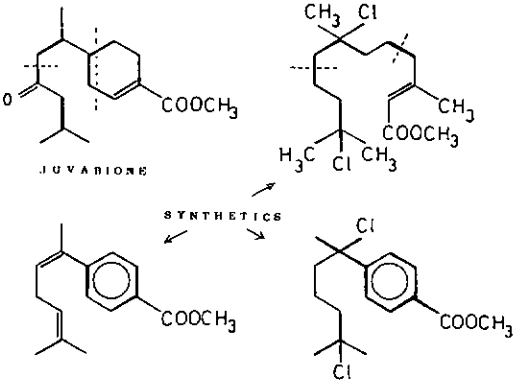


Fig. 5. The structure of juvabione and synthetic analogues.

insect hormonae compounds and plant natural products. We see the possibility of emulating the plant defence mechanism against insects. A few synthetic analogues of the youth hormone are shown on fig. 5.

Terpene and Sterol Synthesis

In the previous section it was mentioned that insects obtained their sterols, such as sitosterol and ergosterol, from plants and modified these to form the moulting hormones and defence steroids, although there was some evidence that cholesterol was also found in small quantities also in plants. The synthesis of sterols (fig. 6) is well established by way of mevalonic acid, farnesyl pyrophosphoric acid, squalene and lanosterol. It would seem to the author as reasonable to suggest that the insect can synthesise the stepwise addition of the C_5-units, but is unable to effect the union of the two C_{15}-units which occurs as a result off an acyloin condensation. There is additional support for this theory in that insects require in their diet carotene which is formed by a similar condensation of two C_{20}-units. The terpenoid compounds are significant in the language of insects.

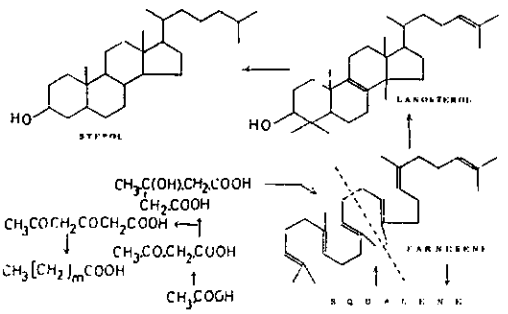


Fig. 6. The biosynthetic route to sterols and fatty acids from acetic acid.

PHEROMONES

Lepidoptera

Natural Sex-Pheromones and Attractants

The sex-pheromones and sex-attractants given off by the female moth to attract the male of the Lepidoptera species are shown in Table 2. It will be noted that in general these compounds are acetates of primary unsaturated long chain alcohols, which vary in the length of the carbon chain, amount of unsaturation and the geometry of the double band. The differences are illustrated in Table 2. (see over).

Table 3. Sex pheromones of the Lepidoptera species: non acetates.

GALLERIA MELLONELLA[24] Greater wax moth	$CH_3.[CH_2]_9.CHO$
HOLOMELINA AURANTICA[25] Tiger moth	$CH_3.[CH_2]_{14}.CH(CH_3)_2$
PORTHETRIA DISPAR[26] Gypsy moth	$CH_3.[CH_2]_9.CH\text{-}CH.[CH_2]_4.CH(CH_3)_2$ 

Table 2. The Sex-pheromones of the Lepidoptera species.
The acetates of straight chain alcohols
$C_nH_{2n+1}OAc$, $C_nH_{2n-1}OAc$ and $C_nH_{2n-3}OAc$

	n	*cis*	*trans*	date
TRICHOPLUSIA NI Hubner[11] Cabbage Looper moth	12	7	—	1966
CRYPTOPHLEBIA LEUCOTRETA Meyer[12] False codling moth	12	—	—	1968
GRAPHOLITHA MOLESTA Oriental fruit moth	12	8	—	1967
SPODOPTERA FRUGIPERDA J. E. Smith[14] Fall army worm	14	9	—	1967
BRYOTROPHA SIMILIS [15] Gelechid	14 14	9 —	— 9	1969
PRODENIA ERIDANIA[16] Southern army worm	14 14	9 9	— 12	1970
ARGYROTAENIA VELUTINANA Walker[17] Red banded leaf roller	14	11	—	1968
OSTRINIA NUBULIS Hubner[18] European corn borer	14	11	—	1970
CADRA CAUTELLA Walker[19, 20] Almond moth	14	9	12	1971
PLODIA NTERPUNCTELLA Hubner[19, 20] Indian meal moth	14	9	12	1971
BOMBYX MORI[21] Silkworm	16	12	10	1962
PECTINOPHORA GOSSYPIELLA Saunders[22] Pink boll worm	*	4	—	1966
LYCOREA CERES Cramer[23] Trinidad butterfly	18	11	—	

* $(C_3H_7)_2C = CH\ C_7H_{12}\ OAc$

Table 4. Lepidopterous species attracted to synthetic alkenyl acetates $C_nH_{2n-3}OAc$: Gelechüdae, Phaloniidae and Pyralidae.

	Species No.	n	cis	trans
(a) *MISCELLANEOUS*				
Gelechüdae	1	10	7	—
	2, 3	12	5	—
	4	12	7	—
	5	14	9	—
	6	14	—	9
	7	16	7	—
Phaloniidae	8	14	—	11
Pyralidae	9	12	—	9
	10	14	—	9
(b) *TORTRICIDAE*				
OLETHREUTINAE	11	12	5	—
	12	12	—	7
	13	12	7	—
	14	12	8	—
	15	12	—	8
TORTRICINAE	16, 17	14	11	—
	18	14	—	11
	19-21	14	11*	—
(c) *NOCTUIDAE*				
NOCTUINAE	22 (L)	14	7	—
	23 (S)	14	—	7
	24	16	7	—
HADENINAE	25-29	16	11	—
	30	14	—	9
AMPHIPYRINAE	31	14	11	—
	32, 33	14	9	—
PLUSIINAE	34-42	12	7	—

*Alcohols

(i) The same pheromone is given of by the following group:—

(a) the red banded leaf roller and the European corn borer.

(b) the almond moth and the Indian meal moth.

(ii) The pheromone differs only in the geometry of the double band in the following species:

(a) the cabbage looper moth and the false codling moth;

(b) the two gelechid species.

(iii) The same pheromone occurs in two species but one moth emits an additional substance;

gelechid moth (Compound A) and the southern army worm (Compound A + B).

In addition to these acetates the pheromones of three other moths are of interest and shown in Table 3.

The overlap of pheromones already observed in the limited number that have been fully investigated up to the present, and in fact mostly during the last four years, would indicate the non-specificity of the sex-pheromones. In an elegant paper on Lepidopterous sex attractants discovered by field screening by Roelofs and Comeau (1970)[27] new sex attractants were discovered for 37 Lepidopterous species by field screening tests using 36 monosubstituted long chain unsaturated alcohols and their acetates. These findings have been reassembled in Table 4 which shows again the same chemical substance being an attractant to males of different species.

Table 4 (Section b) sets out the Lepidopterous species (Tortricadae).

(i) It is immediately apparent that the entomological classification may be supplemented by chemical taxonomy in that the two sub families, the Olethreutinae and Tortricinae, have 12 and 14 carbon atoms respectively in the acetate chain.

(ii) The Tortricinae were all except one attracted to *cis*-C_{11} alcohols or acetates; but this cannot be regarded as characteristic of this subfamily "since live females or female extracts of nine Tortricinae were attractive to their respective males whilst the chemicals were inactive". Either the attractants for these nine species were not among the chemicals under test or a second (synergist) was required to stimulate attraction.

It is of considerable interest that Nos. 5 and 6 and Nos. 22 and 23 are sibling species but differ in that their pheromones are geometrical isomers. No. 22 is the larger and 23 the smaller modification and are isolated in nature by different sex-pheromones. The authors state "that this phenomenon would indicate caution in assuming that a definite species found in different parts of the world have the same pheromone." In another case reported by the same authors (1969) in which two sibling species of *Bryotropha similis* Stainton with similar seasonal and diurnal cycles were attracted to *cis*- and *trans*-9-tetradecenyl acetate and the wrong geometrical isomer was not only unattractive but inhibitory.

Table 5 sets out the attractants for the *Grapholitha* species. The attraction of *G. prunivora* for the *cis*-acetate but not for the female *G. molesta* itself would indicate that there was an additional synergistic factor.

Table 5. Response of male moths of the *Grapholitha* species to the natural pheromone of *G. molesta*, 8-dodecenyl acetate.

	Attractant	Note
G. molesta Busek	*cis*	inhibited by trans
G. prunivora Walsh	*cis*	not attracted to *G. molesta*
G. packardii Zeller	*trans*	—

We may account for some of the overlap phenomenon in the words of Roelofs and Comeau.[27] "Differing seasonal cycles, diurnal cycles, and habitat preferences can explain reproductive isolation of some species attracted to the same chemicals." For example a different diurnal cycle of two species having the same attractant, *cis*-11-tetradecenyl alcohol. *Nedra ramosula* guenée (Noctuidae), midnight, and *Choristoneura fractivitano* Clemens (Tortricidae), 8 p.m. (See Table 4, Nos. 31 and 17 respectively.) Secondary chemicals, inhibitors or synergists, may operate when the time of mating is the same.

The implication of these studies using synthetic chemicals in the field may lead to these same chemicals being found to be actual pheromones especially when a number of such chemicals are exposed and only one attracted a particular species. The simplicity of this method which necessitated the synthesis of a number of similarly constituted chemicals by standard methods, must be contrasted with the time and effort needed to rear large numbers of moths and the tedious processes of extraction and structural studies of small quantities of material.

Roelofs and Comeau state "The possibility of finding the sex attractant of important economic species would be greatly increased if more of these chemicals could be tested and if the whole series were screened in various geographical locations."

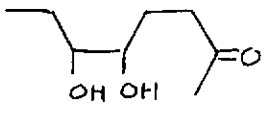
Coleoptera

The first isolation of an attractant from a member of the Coleoptera was reported only in 1966; but since then there have been several, including phenol from the grass beetle in New Zealand by the elegant work of Henzell and Lowe.[28]

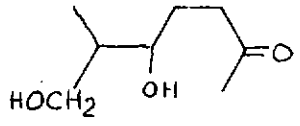
The attractants of the Coleoptera, the largest order of insects, show some correlation of structure within the species but not the close structural similarity associated with the Lepidoptera. In this order the effective attractants are not single substances, some are produced by and attract both male and female, and as such resemble assembly substances as well as sex-pheromones. This complexity is shown in Table 6. In the Ips species[29] the male beetles produce three substances: 3-methylene-7-methyl-oct-1-en-5-ol (1) the corresponding 1,6-dien-5-ol (2) and *cis*-(+)-verbenol (3). Both the male and female *I. latidens* are attracted by (1) and (1 + 2) and not by a combination of (1 + 2 + 3); but *I. confusus* is attracted by (1 + 2 + 3).

It is of interest that the two predators of these black beetles were similarly affected by the very same combination of substances. Put another way the predators use the attractants of the host to find the host.

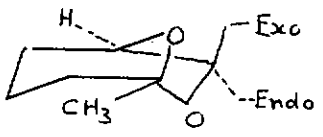
The Dendroctunus species show yet another phenomenon.[30] The male and female produce different groupings of compounds. It is to be noted that it is the *trans*-verbenol which is the active component and verbenene is not itself a significant attractant alone. The unique structures of the attractants brevicomin and frontalin may be rewritten as the open chain dihydroxy-keto form and thus show as the hydroxy forms of the alarm type substances of the ants.

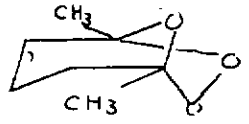


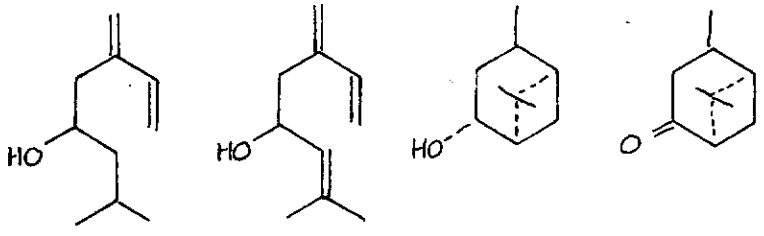
Brevicomin (5)



Frontalin (6)







(1) (2) (3) (4)

	Attractants to male and female	
male *Ips latidens*	1 and 1 + 2	
male *I. latidens*	1 + 2 + 3 (*cis*)	
	Produced by	
	males	females
Dendroctunus species		
D. frontalis Zimmerman Southern pine beetle	3-*trans*	4,6
D. brevicomis le Conte Western pine beetle	3-*trans*, 5,6	4,5,6
D. ponderosae Hopkins Mountain pine beetle	—	3-*trans*

Table 6. The structures of the attractants generated by *Ips* and *Dendroctunus* species.

In addition to these terpene-like substances there are a few alcohols, acids and their methyl esters and phenol from the grass grub recently isolated at Ruakura. There is at present little correlation of structures shown in Table 7.

Attagenus megatoma (Dermestidae), Black carpet beetle[31]

$CH_3.[CH_2]_7.CH{=}CH{-}CH{=}CH.CH_2.COOH$

c t

Trogoderma inclusum (Dermestidae)[32]

(—) $C_2H_5.CH(CH_3).[CH_2]_4.CH{=}CH.[CH_2]_6R$

$R{=}COOCH_3$ and CH_2OH

Limonius californicus (Elateridae), Sugar beet wire worm[33]

C_4H_9COOH

Acanthoseclides obtectus Say[34]

$CH_3.[CH_2]_7.CH{=}C{=}CH{-}CH{=}CH.COOCH_3$

t

Table 7. Miscellaneous pheromones of the Coleoptera.

Effect of Varying Structures

Pheromones of Lepidoptera

It is of interest to see how far a change of structure of a pheromone can affect the biological response. The several studies are set out in figs. 7 and 8 and Table 8.

Fig. 7 shows the variation of structure with pheromone activity for the cabbage looper moth whose natural pheromone is *cis*-7-dodecenyl acetate.[35] Some activity is retained provided that the double bond is in the C_7 or C_6 position, and there is a decrease in activity in changing the chain length of the molecule.

Fig. 8 gives the structure of the natural pheromone of the pink boll worm in relation to the very active synthetic and commercial compound "Hexalure" which is many times more active than the natural compound.[36]

Table 8 compares the structure of the natural pheromone of the fall army worm moth with synthetic compounds in so far as biological activity is concerned. Provided the *cis*- configuration was retained there was some activity.[35]

Any change in structure of the pheromone of the red-banded leaf roller gave not only no activity but the compounds showed inhibitory effects[37], the *trans* form masking (or inhibiting) the effect of the natural *cis* form of the pheromone. On the other hand in our laboratory the *cis* form did not inhibit the activity of the natural *trans*-dodecenyl acetate towards the male false codling moth.[12]

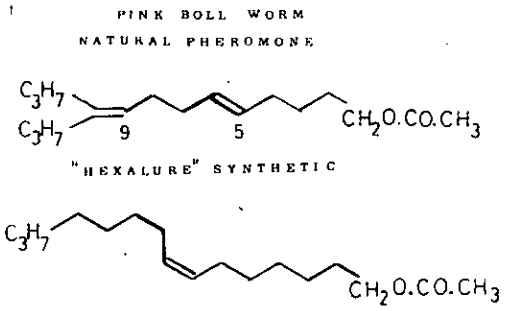


Fig. 7. Comparison of the activity of synthetic compounds with that of the natural sex-pheromone of the cabbage looper moth.

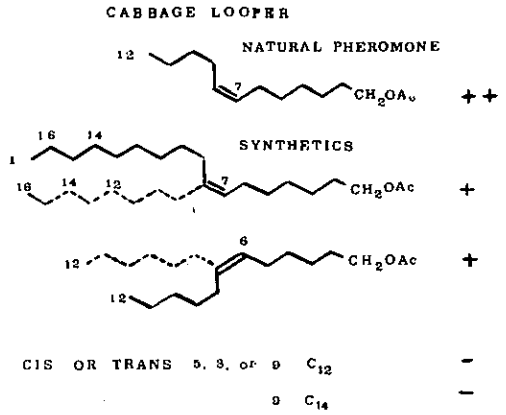


Fig. 8. The comparative structures of the synthetic hexalure with that of the less active natural pheromone.

Table 8. The effect of variation of structure with response from caged male fall army worm moths.

			Activity
Natural Pheromone	$C_{14}H_{27}OAc$	cis-9	+
Synthetics	$C_{14}H_{25}OAc$	cis-9, trans 5	+
	$C_{14}H_{25}OAc$	cis-9, cis-5	+
	$C_{14}H_{25}OAc$	trans-9, cis-5	—
	$C_{14}H_{25}OAc$	trans-9, trans-5	—

Table 9. Comparison of the activity of synthetic isomers with that of the natural pheromone of the black carpet beetle, *Attagenus megatoma*.

	Unsaturation		Concentration μg.			
	3	5	0.1	0.01	0.001	0.0001
$C_{13}H_{23}.COOH$	*trans*	*cis*	16	16	11	2
	cis	*cis*	16	16	5	0
	cis	*trans*	16	5	1	0
	trans	*cis*	12	2	0	0

Pheromones of the Coleoptera

The comparison of synthetics with the natural pheromone of the black carpet beetle[31] is shown in Table 9. The effect is less pronounced at high concentration but at concentration of 0.0001 *ug* only the natural pheromone is active.

Alarm Substances

The alarm substances of ants are ketones[38] and are set out in Chart 9. The activity is closely related to the geometry of the molecule as shown by a study of the effect on *Pogonomyrmex badius* of change of structure. It is of interest that all are saturated ketones.

The alarm substances of the termites are mono-terpenes (C_{10}), citronellal, citronellol, citral, geraniol and limonene the sespuiterpenes (C_{15}) farnesol and farnesene, dendrotasin, found also in wood oil, and perillen.

Defence Substances

The defence substances of the Coleoptera[39] are shown in fig. 10, and the following points are significant:

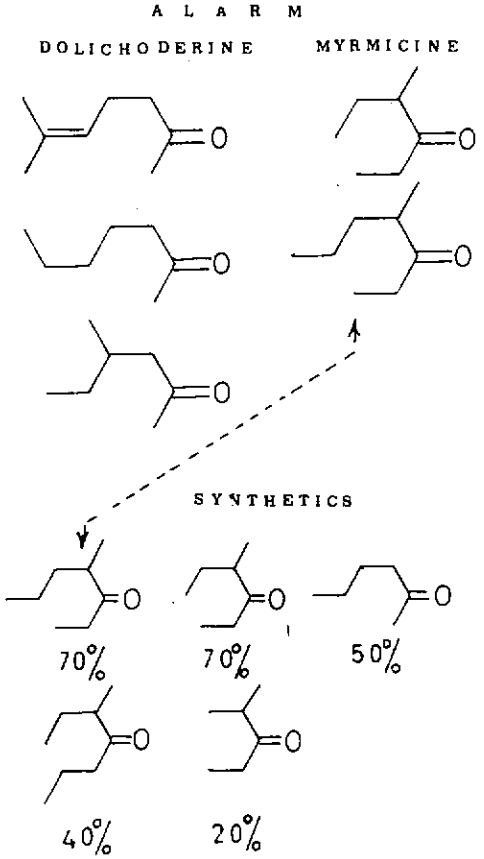
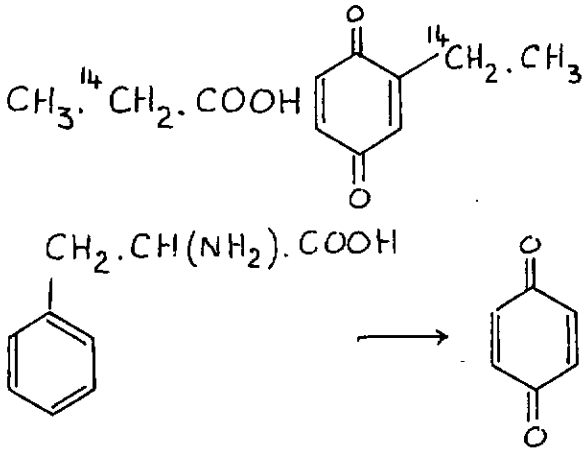


Fig. 9. Alarm substances and the effect of change of structure on the activity.

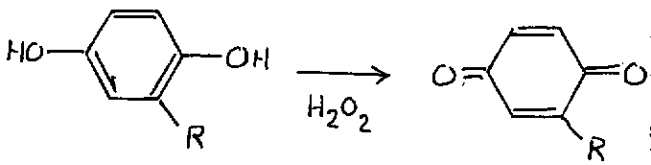
(i) There seems to be a family specificity.

(ii) The compounds are ejected in large amounts and act not only as defence substances but also as insect antibiotics.

(iii) There seems to be three classes of compounds: quinones, aromatic acids and unsaturated aliphatic aldehydes and esters. This diversity is partly revealed in the two biosynthetic pathways which occur even for the synthesis of the quinones:



(iv) The bombadier beetle (Brachyridae) actually stores the defence substance as 10 percent hydroquinone and separately 25 percent hydrogen peroxide.



Plant-Insect Relation

The plant-insect relation might be introduced by reference to the fractionation of the mulberry leaf into fractions necessary for the silkworm.[40] These fractions may be divided: attractant factors (A) which draws the silkworm to the leaf, a biting factor (B) and a swallowing factor (S). The combination (B + S) results in continuous feeding. The chemical fractionation and the chemical identity of the fractions are shown in fig. 11.

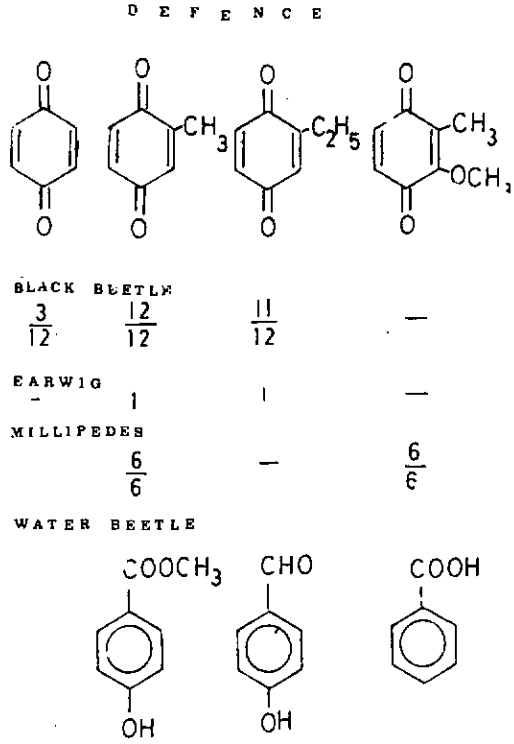
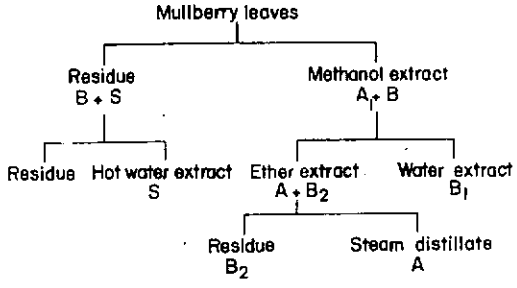


Fig. 10. Defence substances of the Coleoptera. The figures show the numbers of the particular family which have the particular substance.

The production of the sex pheromone of the boll weevil appears to be diet related since fresh cotton squares produce more attractive males and therefore there must be something in the plant which could be the biosynthetic starting material, e.g. myrcene which is a major terpene in the cotton buds and seeds. A biosynthetic pathway is shown in fig. 12. The proposed biosynthesis of the sex-pheromones (II) (III) (IV) and (V) of the boll weevil *Anthonomus grandis* from myrcene (I) in the cotton plant.[41] The rearing of large numbers of insects for pheromone studies has frequently necessitated using artificial media for food The addition of small quantities of natural food has frequently been found necessary.



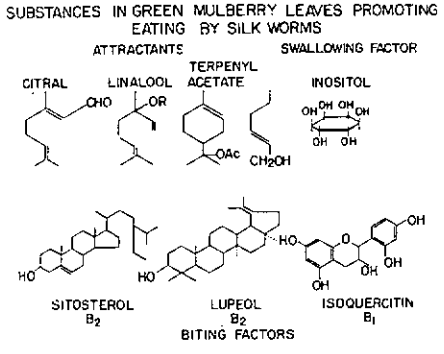


Fig. 11. The chemical fractionation of fresh mulberry leaves and the chemical identity of the fractions.

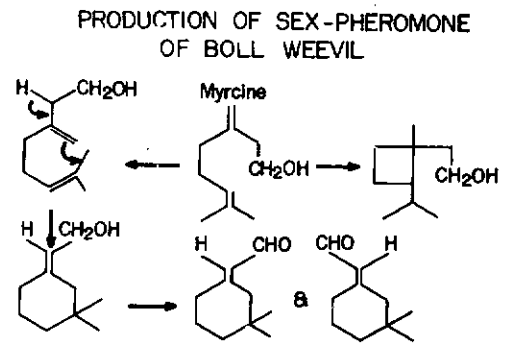


Fig. 12. The proposed biosynthetic route to the sex pheromones of the boll weevil from myrcene.

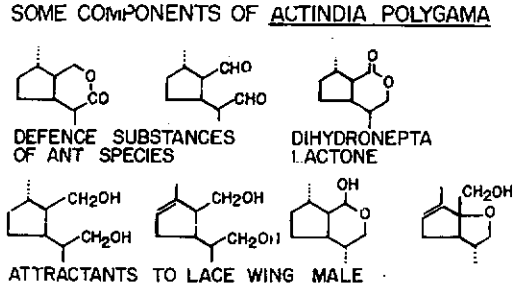
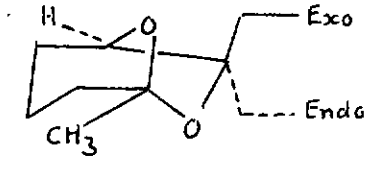


Fig. 13. The structures of the components of the creeper *Actinidia polygama* and their role as insect pheromones.



Brevicomin (B)

Myrcene (M)

Attractant	Male response
exo B	+++
exo B + M	++++
endo B	+
endo B+ M	+++

Table 10. The effect of myrcene on the attractive power of *exo*- and *endo*-brevicomin towards the male *Dendroctunus brevicomis*.

The creeper *Actinidia polygama* is known to attract the lace wing flies, *Chrysopa septempunctata* and cats. The structures of the several components of the creeper have been determined and those attractants to the lace wing flies have been identified.[42] This relationship is set out in fig. 13. It is of interest that four of the defence substances of the ants (*Iridomyrmex spp., Dolichoderus spp.* and *Anismorpha spp.)* are also found in the plant. Further the attractants of the male lace wing are the reduced, while the defence substances are the oxidised, forms. Incidentally, the attractant for the cat in catnip (*Nepeta cataria*) has the same carbon skeleton as nepetalactone.

Brevicomin, the sex pheromone generated by the female to attract the male *Dendroctunus brevicomis* has recently been found in hop oil. The attracting power of both the *exo-* and *endo-* forms of brevicomin is greatly enhanced by myrcene[43] which can be isolated from the tree on which *D. brevicomis* feeds.

This effect is qualitatively represented in Table 10.

Antheraea polyphemus Cramer can only mate in the presence of leaves of the red oak, *Quercus rubra,* which contains *trans*-hexenal.[44]

Pieris species require mustard oil glycosides, which is the constituent of the host plant, *Brassica,* for feeding.[44]

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COMMENT ON INSTITUTE AFFAIRS

MEMBERSHIP QUALIFICATIONS

In common with all other professional bodies the question of membership qualifications is an important one for the Institute of Chemistry. The membership qualifications should be sufficiently wide so that all persons engaged in the science and practice of chemistry at a professional level can become members if they so wish. On the other hand the minimum level of qualification for entry should be strict enough to ensure that the Institute commands the confidence and respect of the community, and that the professional competence of its members is quaranteed. For this reason the normal qualification for entry is a university degree in chemistry or biochemistry (chemical engineering, pharmaceutical chemistry and food technology in special cases).

Chemists are engaged in a great variety of occupations, ranging from research, development, production, quality control and analysis through to administration, management, consulting and teaching. It happens occasionally that a non-graduate finds himself doing the work of a professional chemist, having been promoted from the ranks of the chemical technicians. In these cases it is possible for the person concerned to seek entry to the Institute by passing an examination as prescribed in the rules.[1] This examination route to membership of the Institute has been part of the Rules of Incorporation since the Institute was founded. Council appoints an examinations committee each year to supervise the examination formalities, and the present practice is to require candidates to gain a pass in both the theoretical and practical sections of the Chemistry III examination at one of the universities in New Zealand. The examination route to membership has worked well in the past, and the Institute has gained some first-rate members in this way.

In 1969 Council amended the rules to include a new class of membership, the Graduate Member,[2] and at the same time Council announced[3] its intention to abolish the examination route to membership by the end of 1974. During the last three years there has been some controversy within the Institute on the wisdom of Council's proposal. The Auckland Branch came out strongly in favour of retaining the examination rule.[4] The main arguments put forward were that the Institute must seek to include in its membership all persons practising chemistry at a professional level in New Zealand and that the examination route has yielded members whose standard of attainment is fully equivalent to the normal BSc qualification. A survey of Auckland Branch members last June showed that 93 percent of the members who replied favoured retention of the examination rule.[5]

The Canterbury Branch took the view that the examination rule should be abolished because they felt that automatic admission of candidates who had passed Chemistry III only was permitting a lower standard of entry that a full degree.[5] They proposed that any candidate not holding a degree should be considered under rule 9.3 which provides that the Membership Committee must be satisfied in each case that the candidates' training, knowledge and experience are *fully equivalent* to the required standard of attainment (BSc degree). Other branches supported the Canterbury view, although a survey of Manawatu members is believed to show majority support for retaining the examination route.

In the light of this debate, Council has now reconsidered the question, and a compromise amendment to the Rules has been drafted as follows.[6]

> "*Rule 9.24* (examination route) delete. *Rule 9.3* Amended to become: Any applicant not complying with Rule 9.2 shall be deemed to have complied with the required standard of attainment only if

a majority of members of the Membership Committee shall have certified that in their opinion the training, knowledge and experience of the applicant are fully equivalent to the required standard of attainment, *or* the applicant has passed an examination prescribed in the Regulations issued by Council from time to time, and has been subject to a professional interview by the Membership Committee, which must be satisfied that the applicant has reached the required standard of attainment and professional competence."

This draft amendment is being considered by Branches at the present time; it will be formally moved as a constitutional amendment at a Council meeting later this year.

The effect of this amendment is to combine into a single rule the two possible means of entry for a non-graduate. Either he must prove that he has reached the required standard of attainment by his experience (type of work, responsibilities, publications, etc.) or, in the case of an applicant with less experience, he must demonstrate his competence through an examination and interview. The only new feature in the amendment is the additional requirement of a professional interview by the Membership Committee for an applicant who chooses the examination route. This represents a stiffening of the entry qualification, which will be welcomed by most members. It appears that the proposed amendment will gain the support of all Branches, and Council is to be congratulated on reaching a satisfactory solution to the controversy.

G. A. Wright.

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6. Council of N.Z.I.C., 15 February 1972. The precise wording is subject to confirmation.

IUPAC NEWS

Comptes Rendus XXVI Conference

Washington, DC: 15-24 July 1971

The biennial Conference of the International Union of Pure and Applied Chemistry (IUPAC) provides the occasion for its Council to assemble. Delegations are in attendance from the 43 member countries, thus providing a truly international gathering. Council is responsible for the policy of the Union and receives reports on all major activities undertaken in the name of IUPAC. These reports and the deliberations of Council in Washington are recorded in the *Comptes Rendus.* In particular, the "Report of the President on the State of the Union" constitutes an excellent summary of progress achieved, at the international level, to solving those problems of mankind in which the discipline of chemistry figures in a major or minor role.

In addition to Council, several standing committees (on Teaching of Chemistry, Clinical Chemistry, Machine Documentation, etc.) and some 30 specialist committees attached to the six IUPAC Divisions (on Physical, Inorganic, Organic, Macromolecular, Analytical and Applied Chemistry) met in Washington. The reports of their meetings cover the many topics, currently under study within the Union, of international importance to pure and applied chemistry which need regulation, standardisation, or codification.

The *Comptes Rendus* concludes with a comprehensive listing of all IUPAC Committees, including the names and full addresses of over six hundred members who belong to them.

This invaluable reference work is available from: IUPAC Secretariat, Bank Court Chambers, 2-3 Pound Way, Cowley Centre, Oxford OX4 3YF, UK. viii 380 pages. US $9 (£3), cash with order, postage free.

EASTERFIELD MEDAL Regulations Governing the Award

The following information regarding the Easterfield Award has been circulated to universities, government departments, etc. The regulations are printed here to serve as a reminder to younger Institute Members that they could be working towards submitting applications for future awards.

Introduction

The medal has been donated by the Royal Institute of Chemistry in honour of the late Sir Thomas Hill Easterfield, K.B.E., M.A. (Cantab), Ph.D. Wurzburg), F.R.S.N.Z., F.R.I.C., F.N.Z.I.C.) who was well known for his contribution in the field of chemistry and will be remembered particularly for the inspiration and encouragement he gave his students during the many years he was Professor of Chemistry at Victoria University College, and for his infectious enthusiasm for chemical research.

Sir Thomas was the first Chairman of the New Zealand Section of the Royal Institute of Chemistry and it is appropriate therefore that the authority to make the award of the medal should be vested in the committee of that section.

He was also one of the early Presidents of the New Zealand Institute of Chemistry and it is fitting, and in accordance with the wishes of the Council of the Royal Institute of Chemistry, that the two institutes should act in association.

Conditions of the Award

(1) The medal shall be awarded to chemists within New Zealand in recognition of the quality and originality of their research work.

(2) Candidates must be under the age of 35 years at the 30th April 1971.

(3) The award will be open to all chemists whether or not they are members of the Royal Institute of Chemistry or the New Zealand Institute of Chemistry.

(4) The major portion of the candidate's research work submitted must have been carried out in New Zealand.

(5) No person may be awarded the Easterfield Medal more than once.

(6) The successful candidate will be required to deliver a lecture on the subject of his research at the Annual Conference of the N.Z. Institute of Chemistry, or on some other suitable occasion.

(7) The medal shall be awarded biennially and presented to the successful candidate on the occasion of his lecture.

(8) The Selection Committee reserves the right to make no award in any year if the standard of work submitted is not of sufficient merit.

(9) Travelling expenses necessarily incurred by the Medallist in connection with the delivery of his lecture will be defrayed.

(10) Application by or on behalf of candidates for the award must be in the hands of the New Zealand Corresponding Secretary of the Royal Institute of Chemistry not later than 15th April 1972 and must be fully supported by all relevant papers (either published or unpublished).

(11) The award will be made by the President of the Royal Institute of Chemistry on the recommendation of a selection committee comprising the New Zealand Corresponding Secretary of the Royal Institute of Chemistry (Convenor), the President of the New Zealand Institute of Chemistry or his personally nominated representative, and a Professor of Chemistry from one of the New Zealand Universities. This Committee will have the right to co-opt any suitable person in an advisory capacity.

I. R. C. McDonald,
Corresponding Secretary,
The Royal Institute of Chemistry,
Chemistry Division,
D.S.I.R., Private Bag, Petone.

The change from the old imperial system of measurement to the metric system will require considerable adjustment on the part of many people. Members of the scientific community, such as the members of the Institute, should be least affected by such change. Nevertheless, even they, in some aspects of their community life, will have to make some changes. It is important too, that scientists should be aware of the changes which the non-scientific community are being asked to make. We reproduce here information on 'metrication' from the Metric Advisory Board.

METRICATION

AN OUTLINE OF NEW ZEALAND'S PLANNED CONVERSION TO THE METRIC SYSTEM

Background

The imperial system of weights and measures which evolved over the centuries in Britain is an inheritance that is currently being displaced in Britain and her former colonies by the metric system of weights and measures.

Since 1955 there has been a world-wide change towards the exclusive use of the metric system and 131 countries are now either metric or going metric. Countries currently in the process of change include the United Kingdom, Australia, South Africa, Canada and Singapore.

New Zealand's decision to change to the metric system is based almost entirely on the necessity to keep in step with her overseas trading partners; and it is for this reason that planning is for the metric conversion in New Zealand to be substantially completed by the end of 1976.

The metric system

The metric system is not only simpler and more efficient than the imperial system, but also has the benefits of internationally agreed definition and standardisation.

The modern version of the metric system known as the "International System" (also called SI—"Systeme International d'Unites") has been adopted for use in New Zealand. This system is also being adopted by all those other countries that have recently changed, or are in the process of changing, to the metric system.

There are seven base units in the International System (SI) and it is from these units that the complete system (which includes the supplementary SI units, the derived SI units, and the decimal multiples and sub-multiples of SI units formed by prefixes) is evolved.

The seven base SI units are:

Physical Quantity	Unit	Symbol
length	metre	m
mass	kilogram	kg
time	second	s
electric current	ampere	A
thermodynamic temperature	kelvin	K
luminous intensity	candela	cd
amount of substance	mole	mol

For everyday use, however, only a small proportion of the total units of the SI system are required and these are:

QUANTITY	UNIT	SYMBOL		
temperature	degree Celsius	°C		
length	millimetre	mm		
	centimetre	cm	1 cm	= 10 mm
	metre	m	1 m	= 100 cm
	kilometre	km	1 km	= 1000 m
area	square centimetre	cm^2		
	square metre	m^2	1 m^2	= 10 000 cm^2
	decare	daa	1 daa	= 1000 m^2
	hectare	ha	1 ha	10 daa
volume	centimetre	cm^3		
	cubic metre	m^3	1 m^3	= 100 000 cm^3
capacity	millilitre	ml		
	litre	l	1 l	= 1000 ml
weight or mass	gram	g		
	kilogram	kg	1 kg	1000 g
	tonne	t	1 t	1000 kg
speed on land	kilometre per hour	km/h		
pressure in tyres	kilopascal	kPa		

In addition to the above 18 units, the decimetre (dm) will be taught to children as a convenient unit of length.

1 dm = 10 cm

General information on the everyday units of weight, length and capacity is in the Appendix.

The Metric Advisory Board

The Metric Advisory Board was set up by Government in 1969 to encourage, advise and assist the progressive voluntary adoption

of the metric system of weights and measures.

The Board has established a number of sector committees to plan for the conversion. These sector committees cover all the main groups in the economy, viz:

Agriculture
Building and Construction
Central and Local Government
Education
Engineering and Engineering Servicing
Food and Consumer Goods and Services
Fuel and Power
Manufacturing and Processing
Public Relations
Recreation, Health and Sport
Science and Technology
Standardisation
Transport and Communication
Weighing Machines

The role of the sector committees is to identify problems, prepare timetables and co-ordinate the metric conversion in their respective sectors of the economy. Where appropriate, divisional committees are established to operate in relation to specific areas within sectors. Wherever possible, sector committees and divisional committees negotiate with National Associations and Organisations rather than with local interests or individuals.

Time-scale of Conversion

The changeover from imperial to metric units for weights and measures is a far more extensive change than that made to decimal currency. Consequently, instead of an M-Day the conversion will be spread over a period of years—with substantial conversion planned for the end of 1976. However, there will be some areas in which the conversion will extend well beyond this date, depending on normal replacement cycles for major items of industrial plant or machinery.

Government policy is that the costs of conversion generally should be borne by those incurring them.

Implementation of Conversion

The first major steps in metrication were taken on 1 July 1971 when meteorological reporting of temperature and rainfall changed from degrees Fahrenheit and inches to degrees Celsius and millimetres respectively; and when the wool industry started conducting all trading transactions for unprocessed wool in metric weights.

From then on there will be a series of planned and co-ordinated conversions, to be introduced with a minimum of inconvenience to the community. Some of these conversions will affect only specialised sections of the community and will be promulgated through the respective national associations or organisations. Other conversions will affect everybody and these will be publicised on a national basis.

Conversion factors

Conversions from imperial to metric units will be based on the following internationally agreed equivalents:

1 yard = 0.914 4 metres
1 pound = 0.453 592 37 kilograms.

Full details of individual conversion factors will be publicised in ample time for public assimilation. The Metric Advisory Board has not produced any detailed conversion tables because these are being produced by the Standards Association of New Zealand—from whom a number of aids to metrication are already available.

Metric Symbol

The metric symbol, which was introduced in March 1971 following a competition for the design, is the copyright of the New Zealand Metric Advisory Board and is in-

tended for use nationally in symbolising the metric system in New Zealand.

The Metric Advisory Board will use the symbol for all purposes related to the introduction of metric units. Further entitlement to the use of the symbol, which must be faithfully and accurately reproduced with one of the above three captions in the (Churchward) typeface illustrated is as follows:

On all papers used for education and training in the use of the metric system.

By news media in all matters relating to metrication in New Zealand.

In catalogues and trade advertising of goods designed and produced in metric units; and it may be displayed on such goods.

The symbol must not be used to suggest by direct reference or implication that products are approved by the Metric Advisory Board.

APPENDIX

Everyday Metric units of weight

The kilogram is to replace the pound. One kilogram is about 2.2lbs and therefore a half kilogram is about the same measure as 1lb. In metric countries a kilogram is often referred to as a "kilo". The symbol for kilogram is kg both in the singular and the plural.

Almost everything which is now measured, packed or sold by the pound will eventually be measured, packed or sold by the kilogram as New Zealand's conversion to the metric system proceeds. For example, all wool from sheep farms has been sold in kilograms since 1 July 1971. Other commodities will follow in a sequence extending over several years. If you fly by Air New Zealand economy class you will find your ticket shows you are allowed 20 kg of luggage. For first class you are allowed 30 kg.

For everyday use in trading it is convenient to have a unit smaller than the kilogram and also a unit larger than the kilogram.

The small unit is the gram, the symbol for which is g and, as with other metric symbols, there is no full stop after g unless it is at the end of a sentence. It is either singular or plural: 1000 g equals 1 kg. A teaspoonful of sugar weights about 5 g.

The large unit is the tonne, pronounced to rhyme with John. One tonne equals 1000 kg or 1,000,000 g and it is about 2205lbs. A tonne is thus only about 35lbs less than a long ton (2240lbs). On the rare occasions when the scientist uses this unit, he refers to it as a megagram. The tonne is the unit for trade. The symbol for tonne is t, but to avoid possible confusion during the transition period to the metric system it is recommended that the work tonne be used, both in speech and writing.

The ton, the hundredweight, the quarter, the stone, the pound, and the ounce, will cease to be used.

Strictly speaking the gram, kilogram and tonne are units of mass. The mass of an article means the amount of substance it contains. The weight of an article is the force with which the article and the earth attract each other due to gravitation. This force differs very slightly at different parts of the earth's surface. For all ordinary purposes, however, these small differences can be ignored and mass and weight may be considered to be the same.

Everyday Metric units of length or distance

The metre, which is about 39.4 inches, is the base metric unit for length. As well as the metre, the everyday units of length or distance are the kilometre, the centimetre and the millimetre.

For distances where the metre unit is too small, the kilometre will be used. A kilometre is 1000 metres. The word kilometre is pronounced with the emphasis on the first syllable. That is, as you would say the two words, gas meter, not as you would say gasometer.

For distances or lengths where the metre unit is too large, either the millimetre or the centimetre will be used. A millimetre is one thousandth part of a metre. A centimetre is one hundredth part of a metre.

The abbreviation or symbol for kilometre is km, for millimetre mm, and for centimetre cm; in each case small letters written together with no punctuation marks. The symbol is both singular and plural; for example, 1 km or 5 km.

The millimetre is a convenient unit for most handicrafts, because you can measure accurately with a tape or rule to the nearest millimetre and you are not involved with divisions of a millimetre in the same way you are involved with divisions of an inch. One millimetre is less than 1/16in and more than 1/32in.

A centimetre equals 10 mm. Centimetres have been in regular use in scientific work for many years. Furthermore the centimetre is a conveniently sized unit for introducing the metric system to young children. One inch is 2.54cm. It has been internationally agreed that the centimetre is the unit to be used for body measurements, which also involve clothing.

With the imperial system a quantity may be expressed using several units; for example an object may measure 6ft 3½in. Under the metric system only one unit is used in stating such a quantity. An object measuring 1.918 m could also be described as measuring 191.8 cm or even 1918 mm, but never as 1 m 91.8 cm, nor ever 1 m 918 mm.

Everyday units for capacity or liquid measure

The everyday units of the metric system for capacity or liquid measure will be the litre (l) and the millilitre (ml). The litre will replace the gallon, the quart and the pint as an everyday unit, and the millilitre will replace the fluid ounce.

One litre equals 1000 millilitres, just over 1¾ pints or 35 fluid ounces. This is also approximately the amount contained in an ordinary household preserving jar. A litre of fresh water weighs a kilogram.

It is customary in trading to use the litre and the millilitre as the units of capacity for liquids. In design work and precise measurements the cubic metre and the cubic centimetre would be used for volume measurement, whether liquid, solid or gaseous.

A seven ounce drinking glass holds a fifth of a litre or 200 ml. As the metric milk bottle is to hold 600 ml, then the seven ounce or 200 ml glass will be filled three times from a 600 ml bottle of milk. A 44 gallon drum holds 200 litres.

A cube with each edge equal to 10 cm or one decimetre has a volume of one litre or 1000 cubic centimetres. Thus a cubic centimetre and a millilitre have the same volume.

It is worth remembering that:

1 cm^3 equals 1 millilitre and this much fresh water weighs 1g.

1 dm^3 equals 1 litre and this much fresh water weighs 1kg.

1 m^3 equals 1000 litres and this much fresh water weighs 1 tonne.

Correction: The book review of the RIC Teachers Monograph *The Molecular Basis of Entropy* and Chemical *Equilibrium* was wrongly attributed to G. A. Wright (Feb. issue 1972, Chemistry in New Zealand). The reviewer was A. Williamson.

BRANCH NOTES

Auckland

On 16 February the Branch held another most successful luncheon meeting. Owing to the recent Cabinet changes we had the honour and pleasure of hearing the Hon. Mr L. Gandar, Minister of Science, give his first public address since his appointment. In his speech he surveyed the contribution government departments were making to the field of science and especially to chemistry. He impressed the eighty-eight members and guests present with his warm personality and real interest in his new portfolio.

New Zealand President, Mr K. Seal, thanked the Minister for addressing the Branch, assuring him of the Institute's interest in matters of national concern and put the Institute at his service where matters concerning members were being discussed.

Enrolment figures in Chemistry at Auckland University are decreasing. This year 650 have entered chemistry, 25 for honours and 35 for Ph.D.

The Auckland Science Teachers' Association Newsletter reveals that in 1971 the School Certificate Examinations had:

Total Numbers of Candidates	60,622
Science	24,307
Biology	17,311
Chemistry	6,021
Physics	4,190
Maths	34,315

University Extension courses of interest to chemists in 1972 are:

Air Pollution—Dr D. J. Spedding.

Spectroscopic Methods of Inorganic Analysis—Dr J. Aggett.

S.I. Units in Chemistry—Dr G. A. Wright.

Chemistry enrolments at the Auckland Technical Institute are up overall on last year. Chemistry I is down, probably signifying that more students are passing Science at School Certificate level thus exempting them from this subject. Chemistry III, at 175, is stretching the present accommodation, but of these only about 45 are doing the Chemistry option. Employers are advised to make sure that their employees are embarking on a course which will be satisfactory to all. There is an increasing tendency to become interested in Biology rather than Chemistry, Microbiology and Biochemistry.

N.Z.F.M.R.A.

N.Z.F.M.R.A. headed by Dr J. Rogers, has recently been accredited as an Australasian Research Association which gives recognition to the grand work being done at this establishment.

Mr J. Prowse has returned from the United Kingdom where he received an M.Sc. Degree.

Personal

Professor M. N. and Dr J. Waters returned in February from nine months spent working in Oxford with Professor Dorothy Hodgkins on enzyme structures. They returned via United States of America where they worked in research laboratories.

Waikato

Ruakura Agricultural Research Centre

Dr M. C. Middleton, a Birmingham graduate in biochemistry, has been a Facial Eczema Research Fellow at Ruakura working with Dr D. E. Wright on the effects of sporodesmin on mitochondria. He has shown an effect of this toxin on membrane permeability in these organelles and now he returns to Great Britain in March, hopefully to the Fisheries Research Institute, Aberdeen.

Dr F. J. Stutzenberger, also a Facial Eczema Research Fellow, is working with Dr J. N. Parle. He has shown that fungicides active against *Pithomyces chartarum* are strongly absorbed on to spores, and this

may be a first stage in germination inhibition. Before coming here Dr Stutzenberger was with the U.S. Public Health Service, Cincinnati and at Weber State College, Utah where he was interested mainly in microbial degradation of cellulose.

Dr J. E. Wolff has returned to the Biochemistry Section at Ruakura after completing his doctorate at Cornell. He will continue to work on amino acid metabolism in ruminants.

Professor F. L. Warren has returned to Capetown University after ten months at Ruakura where he has worked principally with Dr E. P. White on alkaloids, with Mr R. F. Henzell on pheromones and Mr J. W. Ronaldson on natural products. Professor Warren was very active in Institute affairs during an all too brief visit.

In response to an invitation from the International Atomic Energy Agency Dr D. E. Wright left Ruakura in February to work at the National Dairy Research Institute, Karnal, India for a year. Here he will help to expand the use of isotopic techniques in studies on the utilisation and assimilation of urea and amino nitrogen by lactating cows and buffalos. The demand for milk and milk products is increasing rapidly in India and since the buffalo provides 60-80 percent of this milk, an urgent need exists for improved nutrition of these animals. Dr Wright plans to visit Australian, British and American Research Centres while he is away.

Waikato University

A recent appointment is Dr L. Main, a graduate of Victoria University who gained his Ph.D. at Auckland and has returned from a Post Doctoral Fellowship at the University of California, Santa Barbara. His interests are in reaction mechanisms with special reference to enzyme models.

Professor A. Wilson has returned from leave with the U.S. Geological Survey with whom he has been determining past climatic data from isotopic ratio measurements in the annual rings of trees.

Dr M. Carr is at present on sabbatical leave with Professor Whiting at Bristol University.

Waikato Technical Institute

The head of the new Science Department is Dr W. P. Judd.

Manawatu

New Zealand Dairy Research Institute

Mr R. McDonald of the Casein Section of the Applied Division resigned recently. Miss Gillian Berry who has recently completed her M.Sc degree at Victoria University has joined the Protein Section of the Fundamental Divison. She will be investigating the protein-protein interactions that lead to the formation of casein miscelles, their structure and their stability.

Miss Louise Stewart has recently completed an honours degree in Biochemistry at Victoria University and has joined the Biochemistry Section of the Fundamental Division. She will be working on aspects of the metabolism of lactic streptococci.

Dr P. S. Robertson, Assistant Director of the Institute, is to visit Canada and the United Kingdom during the next two months on behalf of the Dairy Factory Mechanisation Committee of the New Zealand Dairy Board.

Mr F. P. Dunlop, a former graduate trainee has been appointed Cheese Technologists in the mechanised cheese making section of the Servicing Division.

Massey University

Dr T. M. Kitson has arrived to take up a postdoctoral fellowship in the Department of Chemistry, Biochemistry and Biophysics. He recently completed a D.Phil. at Oxford University.

Wellington

National Committee for Chemistry

The annual meeting of the National Committee for Chemistry, affiliated to the International Union of Pure and Applied Chemistry, was held in Wellington in March with Dr T. A. Rafter, Director of the Institute of Nuclear Sciences, in the Chair.

Chemistry Division, D.S.I.R.

Dr R. J. Weston, who recently completed his Ph.D. at the University of Oxford, has rejoined the Organic Section. At Oxford Dr Weston investigated the reactions of various triterpenes under the supervision of Dr T. G. Halsall.

Dr K. L. Brown has recently returned from Auckland University where he completed a number of X-ray crystallographic determinations during study for his Ph.D. under the supervision of Professor D. Hall.

Dr N. K. McCallum has transferred from the Auckland branch laboratory of Chemistry Division to the Toxicology Section of the Gracefield laboratory.

Messrs J. G. Kelsey, R. S. Jordan, D. Smith and G. Hooper, who last year completed their B.E. (Chem) degrees at Canterbury University are now working for the Chemical Engineering Section.

Dr W. F. Giggenbach who was attached to the Wairakei branch of Chemistry Division during 1971 has rejoined the Geochemical Section at Gracefield.

Mr L. Sibley has left the Physical Chemistry Section in order to study for his MSc. at the University of Auckland. His wife Mrs J. Sibley transferred from the Wellington laboratory to the Auckland branch of Chemistry Division.

Mr D. G. McGavin has also left the Physical Chemistry Section in order to study for his Ph.D. at Monash University under the supervision of Professor R. D. Brown. At Monash he will investigate various aspects of Photo Electron Spectroscopy.

Mr G. L. Dick has rejoined the Pesticides Section after studying for a Ph.D. at Victoria University. At Victoria he studied enzyme kinetics under the supervision of Professor J. N. Smith.

Institute of Nuclear Sciences, D.S.I.R.

Dr T. A. Rafter attended the 12th Science Congress organised by the Royal Society of New Zealand at Massey University, and delivered two lectures on "Radioisotopes and their Place in Research and Industry", and "Does New Zealand need a Research Reactor?"

Dr C. H. Hendy has resigned from his position at the Institute and will shortly take up a position as lecturer at Waikato University.

Chemistry Department, V.U.W.

We extend our congratulations to Mr W. E. Dasent, previously Reader in the Chemistry Department, who has been appointed Registrar of Victoria University of Wellington, and to Dr G. R. Burns who has been promoted to a Senior Lectureship with special responsibility for first year Chemistry.

Professor J. W. Tomlinson and Dr A. F. M. Barton of the Chemistry Department recently attended the Third Australian Electrochemistry Conference at Terrigal in New South Wales. The Conference, which was sponsored by the Royal Australian Chemical Institute, covered electrochemical mineral processing and the electrochemistry of surfaces and liquids. Delegates attended from Britain, Europe, North America and India as well as from Australia. A paper "Electrical conductance of molten organic salts as a function of volume and temperature" was presented by Dr Barton.

Canterbury

Canterbury University

Dr R. A. G. MacLagan has taken up his appointment as Visiting Lecturer in the Chemistry Department after post-doctoral appointments at Oxford and John Hopkins Universities.

Dr Jane Browning has taken up her appointment as Post-Doctoral Fellow to work with Professor B. R. Penfold in X-ray crystallographic studies.

Dr. J. M. Coxon is spending a year's study leave with Professor Battiste at the University of Florida, Gainsville, U.S.A.

Professor James Collman of Stanford University, California will be Visiting Erskine Fellow in the Chemistry Department from mid-March until the end of May.

Dr M. H. G. Munro recently attended the eighth I.U.P.A.C. Natural Products Symposium in New Delhi. He visited Australian Universities on the return trip.

Dr W. T. Robinson spent the period from November to February working at the Australian National University, Canberra.

Dr M. P. Hartshorn was recently promoted to a personal chair in the Chemistry Department. Other promotions have been: Dr R. F. C. Claridge to Reader, Drs J. M. Coxon, M. J. McEwan and H. K. J. Powell to Senior Lecturer.

Congratulations are extended to Dr Hartshorn also for being awarded the Research Medal of the New Zealand Association of Scientists.

Professors B. R. Penfold and L. F. Phillips presented papers at the Royal Society Congress held at Massey University, Palmerston North.

The Branch congratulates Dr J. E. Fergusson on the award of the 1971 I.C.I. Prize.

Personal

Mr M. A. McMillan has transferred from Middleton Grange School, Christchurch to be Head of Science at Southland Girls' High School, Invercargill.

Mrs Heather Mohi has transferred from Otago Branch to study at Christchurch Secondary Teachers' College.

Miss C. E. Neal has transferred from Chemistry Division D.S.I.R., Christchurch to Chemistry Division Gracefield where she will work on computer applications.

Mr K. J. Dalzell has completed his M.Sc. at Canterbury and after working at Chemistry Division, Christchurch has transferred to Chemistry Division, Gracefield.

The February meeting of the Branch took the form of a buffet meal for members and wives at the National Radiation Laboratory, followed by a lecture and an inspection of the radio-chemistry section.

In February Mr J. A. Peters of the Forest and Range Experiment Station, Rangiora left for the United States to attend the Vertebrate Pest Conference in Fresno, California. As New Zealand Forest Service delegate he presented a paper; Wildlife Research in New Zealand.

He then went on a three-months tour of wildlife research centres in United States, United Kingdom, the Continent and Japan to evaluate aspects of chemical and biological control of wildlife, intoxication and detoxication phenomena, and biocide-wildlife interactions.

Lecture course for secondary school teachers

With the approval of the Department of Education the Chemistry Department, University of Canterbury is running a series of refresher type lectures for secondary school chemistry teachers. Lectures are given at 8am every Wednesday during the academic year which enables teachers to attend with a minimum of adjustment to school time tables.

The course consists of 22 lectures, and 12 lecturers will take part. Subjects include: Substitution reactions, reactive intermediates, conformational analysis, transition metal organometallic chemistry, biological aspects of organic chemistry, origin of the elements, structural methods, electronic spectroscopy, photochemistry, modern chemical kinetics, and modern electrochemistry. The course started on 1 March with an introduction and first lecture by Professor J. Vaughan.

Otago

Special Branch Meeting—Retirement of Professor Parton

A special meeting of the Otago Branch marked the retirement of Professor H. N. Parton from the University. At this meeting Professor A. E. Musgrove of the Philosophy Department of the University of Otago gave an address entitled "The Role of Experiment in the Chemical Revolution", in which he discussed the "phlogiston" theory and the exchanges between Priestly and Lavoisier which preceded the downfall of that theory. Professor Musgrove was a student of Professor Karl Popper. It is hoped to publish his lecture in the N.Z.I.C. Journal in the near future.

Following the lecture Emeritus Professor F. G. Soper spoke briefly on Professor Parton's outstanding contribution to chemical education in New Zealand, and a small presentation was made on behalf of Branch members. In reply Professor Parton described the early days of the N.Z.I.C., and his service as editor of the journal.

Professor and Mrs Parton left for the United Kingdom at the end of February. They plan to spend about three months in the Exeter and London areas, followed by extensive sightseeing in the U.K. and Europe. They return to New Zealand in September of this year.

Chemistry Department, O.U.

The first year roll for the Chemistry Department for 1972 now stands at 800. This comprises 660 students enrolled for Chemistry Intermediate, and 140 Diploma students. Last years figures were 570 Chemistry Intermediate and 150 Diploma.

Several staff members have returned from overseas. Dr R. M. Carr spent the first five months of 1971 in the Pedology Department of the Rothamsted Experimental Station, Hertfordshire, and the rest of 1971 in the Geology Department of Manchester University. Part of his work included a study of the solubility of corundum in acid solutions.

Dr M. R. Grimmett has recently returned from England where he spent a year in the Chemistry Department, University of Exeter. In collaboration with Drs K. Schofield and S. R. Hartshorn an examination was made of the kinetics of nitration of pyrazoles and imidazoles, as well as some synthetic studies of imidazole N-oxides. During 1971 Dr Grimmett attended the second International Symposium on Organic Synthesis (at Cambridge) and Chemical Society Symposia on Heterocyclic Chemistry and Reaction Mechanisms (at York).

Dr C. G. Pope spent 1971 in the Department of Physical Chemistry, Bristol University, where he participated in a research project in collaboration with Professor F. S. Stone involving catalysts made from solid solutions of chromia in alumina. Dr Pope was invited to attend the Rideal Conference on surface chemistry at Glasgow, and also gave colloquia at the University of East Anglia, at the Queens University of Belfast, and at Bristol University.

Dr B. M. Peake has taken up his lectureship in physical chemistry. On completion of his Ph.D. at the University of Canterbury Dr Peake worked with Dr F. Gerson at the Physikalisch Chemishes Institute der Universtat Basel, Switzerland. His work in-

volved E.S.R. studies of radical ions of some substituted naphthalene derivatives and spirobifluoroenes.

Food Chemistry

Recent developments in the Faculty of Home Science at the University of Otago are of importance to those interested in Food Chemistry. Since 1971 Human Nutrition has been offered as a subject for the B.Sc. (Hons) degree and there are now students at both the Part I and Part II stages, as well as others doing the intermediate prerequisite.

Dr R. B. H. Wills has joined the staff of the Nutrition Department as a lecturer in Food Chemistry. Dr Wills has worked for some years at the C.S.I.R.O. Division of Food Research in Australia, and he has special interests in cool storage disorders of apples and pears. He gained his Ph.D. at Macquarie University.

Research work underway includes: the effect of processing conditions on the nutritive value of milk proteins (Dr N. A. Cave), the nutritional importance of trace elements (Dr Marion F. Robinson), and energy expenditure in relation to body weight (Dr Y. E. Swindells).

Biochemistry News

The shift to the new Biochemistry building was completed by the first week in February. All biochemistry laboratory classes for medical and dental students as well as science and home science are held there. One laboratory on the ground floor is being used for the new Biology Intermediate unit which is a required subject for Medical and Dental Intermediate and a prerequisite for Advanced Biochemistry, Zoology, Physiology and Microbiology.

Dr R. T. M. Poulter, a graduate of University College, London, and Leicester University has taken up an appointment as lecturer in Biochemistry. His major responsibility will include the Genetics half unit which will be offered for the first time in 1972.

Dr G. S. Bailey, graduate of the University of California, Berkely, is also a new lecturer in the Biochemistry Dept., O.U. While at Berkely Dr Bailey worked with Professor Allan Wilson, an aluminus of Otago University. Dr Bailey has also undertaken post doctoral work at the University of British Columbia.

Otago Textile Society

Of interest to local chemists has been the formation of the Otago Textile Society. Open to all with an interest in textiles, the Society has about 50 members. The secretary is Mr B. Richmond, of Mosgiel Woollens, Mosgiel.

SI UNITS IN CHEMISTRY

The Centre for Continuing Education, University of Auckland (formerly University Extension) will hold a one-day course on the SI system of units and its application in the various branches of chemistry:

Wednesday 10 May 1972.
9am to 5pm.
Chemistry Department, Auckland University.

All chemists, technicians, biochemists, chemical engineers, teachers, technical managers and administrators are invited to take part.

The course will comprise four lectures, plus seminars and a laboratory demonstration.

A booklet of notes and background information will be issued to participants.

Brochure and application forms from:
Centre for Continuing Education,
University of Auckland,
Private Bag, Auckland.

THE REGISTRY

The following were elected on 15 February 1972.

Fellows:

BARTON, Allan Francis Murray, M.Sc., Ph.D. (Auck.) Chemistry Dept., Victoria University of Wellington (Senior Lecturer).

FERRIER, Robert John Ph.D.(Edin.) D.Sc. (Lond.), Chemistry Dept., Victoria University of Wellington (Professor of Organic Chemistry).

KINGSFORD, Michael, M.Sc., Ph.D. (Auck.), Chemistry Division, D.S.I.R., P.B., Petone (Leader, Food and Drug Section).

LAWRENCE, Robert Charles, B.Sc(Hons.) (Lond.), Ph.D. (Massey), N.Z. Dairy Research Institute, Palmerston North (Supervisor, Fundamental Research).

SCOTT, Gordon Randall, M.Sc. Chemistry Division, D.S.I.R., Dunedin (Government Analyst).

Associates:

AYERS, John S., B.Sc(Hons.), Ph.D. (Cantuar.), Chemistry Dept., Massey University, Palmerston North.

EARDLEY, Richard Pope, B.Sc., Chemistry Division, D.S.I.R., P.B., Petone (Scientist).

The following Graduate Members were elected as Associates:

JORDAN, Stuart Andrew, M.Sc. (Auck.), Formica (N.Z.) Ltd., P.B., Papakura (Industrial Chemist).

PARNELL, David Lawrence, M.Sc.(Auck.) Formica (N.Z.) Ltd., P.B., Papakura (Industrial Chemist).

The following were elected as Graduate Members:

ALISON, Mary Louise, B.Sc., U.E.B. Research and Development Centre, Auckland(Industrial Chemist).

BURNS, David Lawson, B.E.(Chem.), Unilever (N.Z.) Ltd., Petone (Product Development Officer).

LAING, Robert Francis, B.Sc., Kempthorne Prossers & Co. Ltd., Hornby, Christchurch (Asst. Production Supt.).

LEE, Yu Chong, M.Sc.(Cantuar.), Christchurch Gas Co. Ltd. (Chemical Superintendent).

Resignation:

The resignation of A. J. Thomas was accepted.

Honorary Membership:

Mr S. L. Tompsett, F.R.I.C. who has retired to New Zealand was granted Honorary Membership.

Deaths:

The following deaths were noted with regret. K. M. Griffin, F. H. G. Johnstone.

Exemption from further subs was granted to K. F. Hoy.

Honorary Fellowship:

Professor H. N. Parton was elected to Honorary Fellowship.

BOOK REVIEW

"*An Introduction to Biochemistry*", by E. G. Brown. Published by The Royal Institute of Chemistry (Monographs for Teachers No. 17), London, 1971. 112 pages. Price 70p. 52p. to R.I.C. members).

To take a complex subject like biochemistry and to distil it into a form that seeks in a mere one hundred-odd pages to "introduce chemists, both teachers and students, to the fascination of biochemistry—the chemistry of life—in the hope that they will want to browse further into the subject" must be a daunting task. The author must balance his approach within very fine limits, taking care on the one hand to give a stimulating picture of a vital, growing, quantitative science that is heavily dependent upon chemistry yet central to biology without, on the other hand, overloading his text with formulae or assuming an advanced knowledge of organic chemistry in his reader. To my mind, Dr Brown has succeeded admirably on all counts. This is not a book for the chemically uninformed, but it is not intended to be. Yet it does not assume a knowledge of chemistry past first year university level at the most, and should appeal to the scientifically minded schoolboy. It is not a text book, but it covers a remarkably wide range of ground and would be valuable to a school teacher as a source of supplementary material for a course in biological science. The subject matter is dealt with in a logical manner. A brief discussion of the structures of some biologically important molecules is followed by a chapter on chemical evolution and the origin of life. Subsequent chapters dela with enzyme catalysis, bioenergetics and metabolism, and this discussion is nicely rounded off with a section of biochemical control and integration. The last two chapters comprise a brief account of approaches and techniques used by the biochemist and a short discussion on the future of biochemistry. Appendices on nomenclature of enzymes and common abbreviations are followed by a list of suggestions for further reading, arranged under the chapter headings.

This little book represents excellent value for money. The author displays a deep understanding of his subject and presents his factual material in a lucid and compact way. At the same time the reader is left with a clear impression of the relevance of biochemistry and of the directions in which future advances will be made. It can be recommended to the chemist who wants to know what biochemistry is all about.

G. B. PETERSEN

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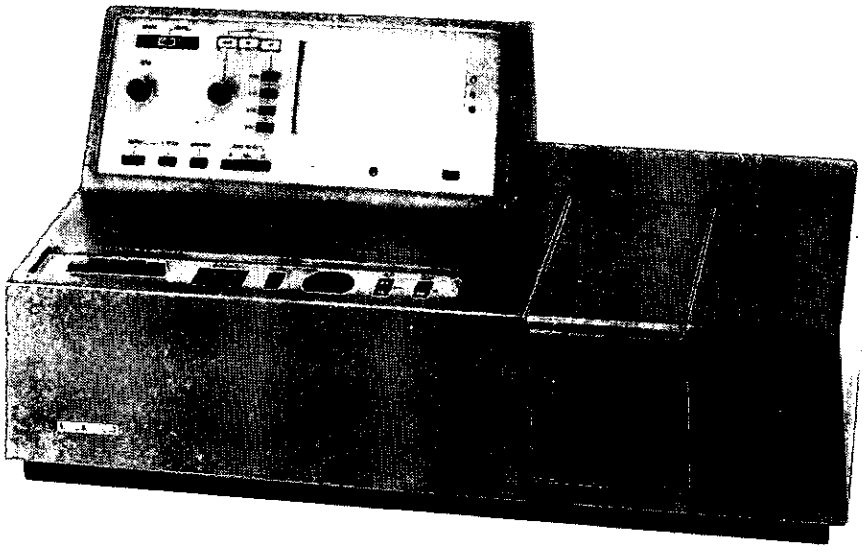

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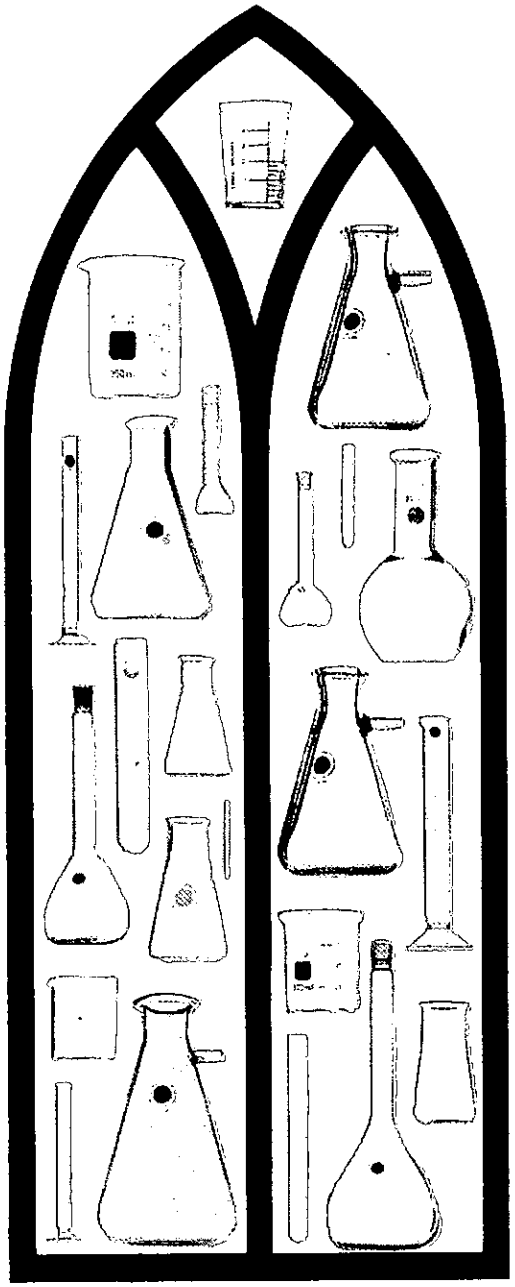

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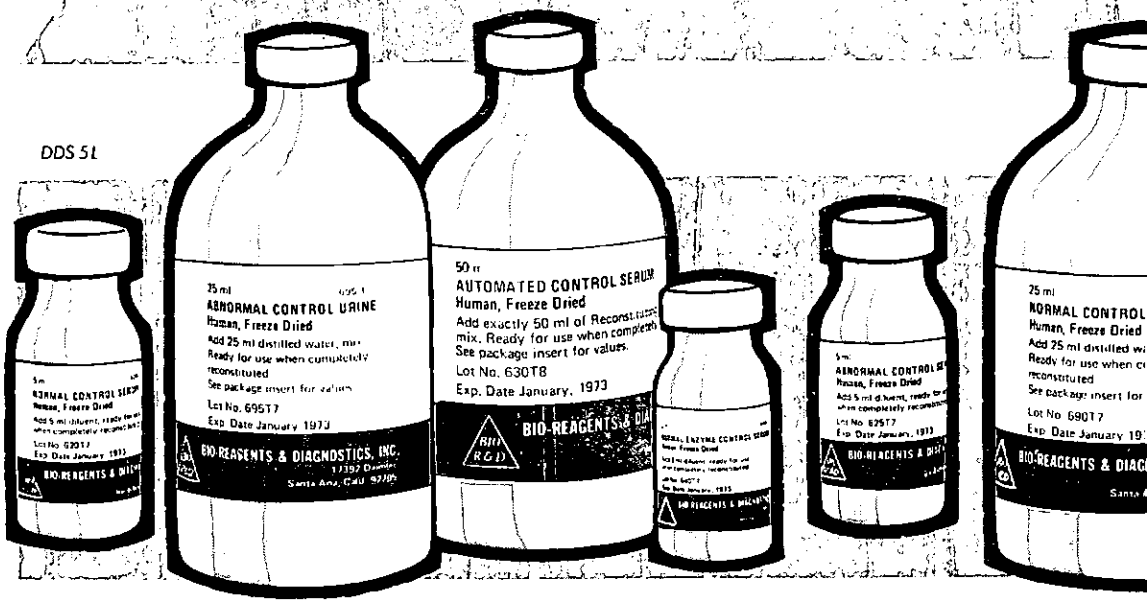
CLINICAL CHEMISTRY CONTROL PRODUCTS

the
essentials for

QUALITY CONTROL
PROCEDURE MONITORING
RELIABILITY CHECKING

confidence



DDS 5L

GENERAL DESCRIPTION AND USE.

All Bio – R & D control products are of human origin carefully processed and freeze-dried (lyophilized) for maximum stability during shipment and storage. Reconstitution must be with distilled or de-ionized water except for the Automated Control Serum where a special reconstituting fluid accompanies the serum. After reconstitution, the stability of the various constituents of the controls is the same as if in a laboratory specimen.

Assays have been performed by at least three reference clinical laboratories. Methods of assay and assay results are supplied in the form of a direction insert in each package. After reconstitution, the control products are to be tested in the same manner as unknown specimens. If results obtained are the same as the direction insert values (within normal limits of variation), test procedures are considered "in control", and thus, specimen values may be reported with confidence. Significantly different values from those reported in the direction insert indicate "out of control" conditions exist, and immediate efforts to discover the source of difference are necessary to produce reportable results.

NORMAL CONTROL SERUM, HUMAN, DRIED. (Catalogue No. 620) 6 x 5 mls

Serum derived from healthy humans containing all constituents usually found in serum at "normal" concentrations.

ABNORMAL CONTROL SERUM, HUMAN, DRIED. (Catalogue No. 625) 6 x 5 mls

Human serum similar to NORMAL CONTROL SERUM except constituents are present in concentrations usually considered "abnormal" or clinically significant.

AUTOMATED CONTROL SERUM, HUMAN, DRIED. (Catalogue No. 630) 10 x 50 mls

Human serum processed in same manner as all other Bio – R & D control products. Assays have been performed using automated equipment and methods of the Technicon Instruments Corporation (Chauncey, New York). To be used for the control of automated procedures as opposed to manual methods.

NORMAL ENZYME CONTROL SERUM, HUMAN, DRIED. (Catalogue No. 640) 6 x 3 mls

Human serum carefully processed and freeze-dried so as to preserve the most delicate enzymes normally found in serum. Assayed by the reference laboratories using a variety of methods and reported in various popular enzyme units.

ELEVATED ENZYME CONTROL SERUM, HUMAN, DRIED. (Catalogue No. 645) 6 x 3 mls

Human serum similar to NORMAL ENZYME CONTROL SERUM except enzymes present in concentrations usually considered abnormal or elevated. In conjunction with NORMAL ENZYME CONTROL SERUM, may be used to establish standard or reference curves for enzyme assays.

ELEVATED CHOLESTEROL CONTROL SERUM, HUMAN, DRIED. (Catalogue No. 650) 6 x 5 mls.

Serum derived from humans whose serum possesses high concentrations of cholesterol. Particularly applicable to the control of all cholesterol assay methods since the cholesterol occurs in its natural state (i.e., physiologically bound to protein).

ELEVATED BILIRUBIN CONTROL SERUM, HUMAN, DRIED. (Catalogue No. 660) 6 x 3 mls.

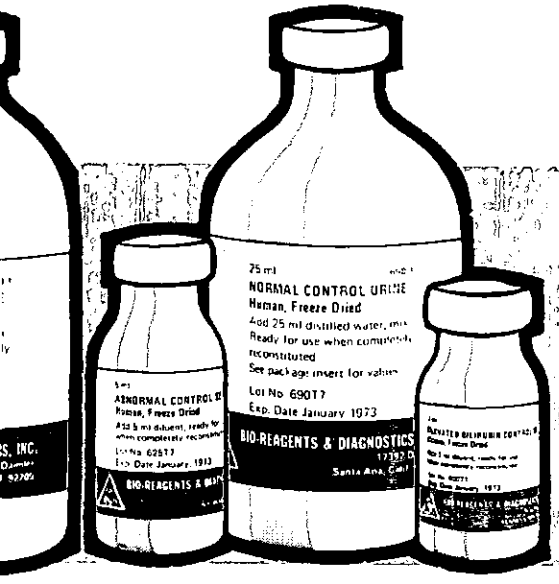
Human serum processed in same manner as all other Bio – R & D control products. Supplemented with bilirubin meeting nationally – established criteria of purity. Therefore, may be used as a secondary reference as well as a control serum.

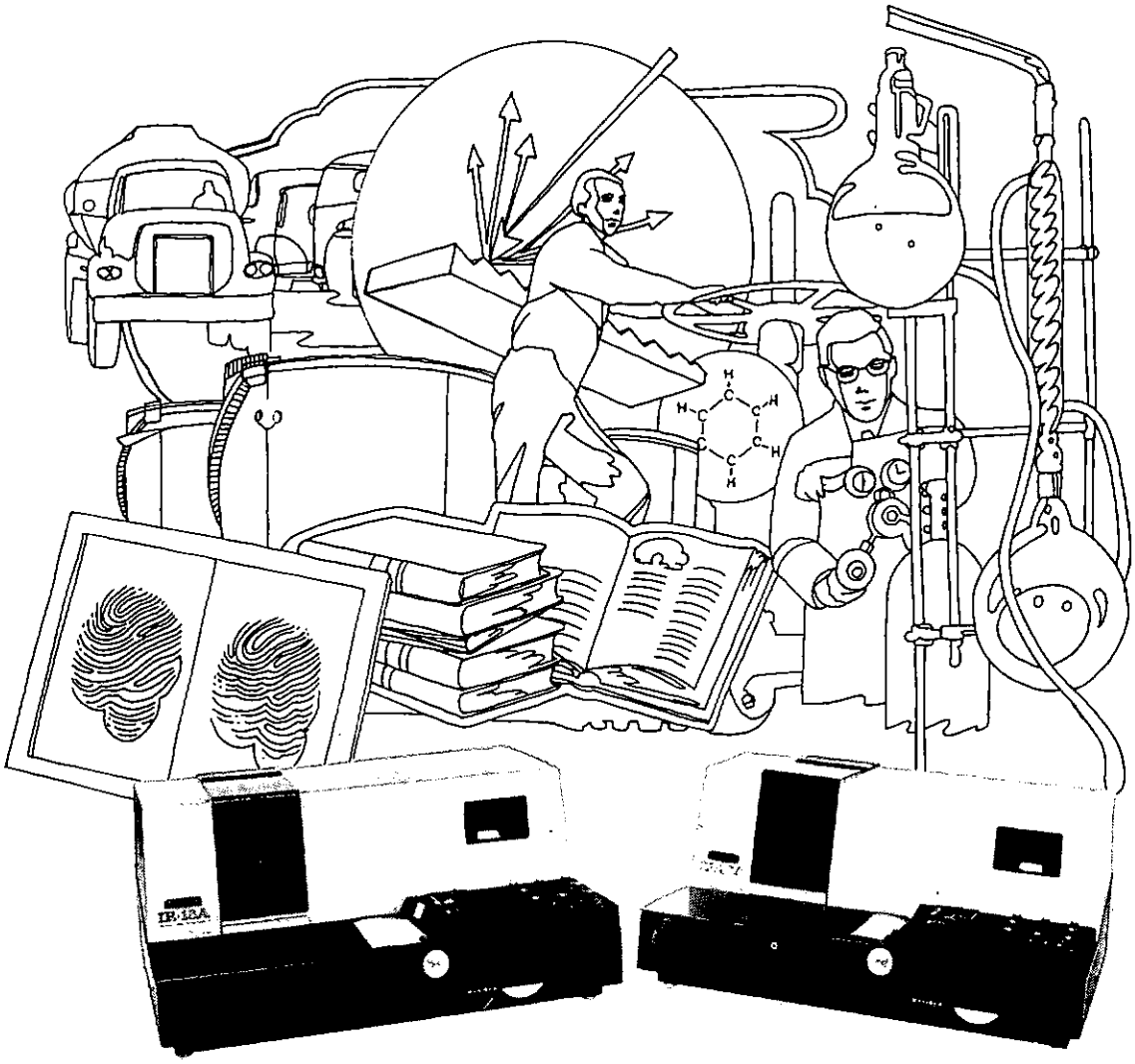
NORMAL CONTROL URINE, HUMAN, DRIED. (Catalogue No. 690) 4 x 25 mls.

Urine derived from healthy humans and containing constituents usually found in urine specimens in "normal" concentrations including hormones associated with pregnancy. Processed in the same manner as all other Bio – R & D control products. Designed specifically for the control of assay procedures using urine as the specimen.

ABNORMAL CONTROL URINE, HUMAN, DRIED. (Catalogue No. 695) 4 x 25 mls.

Human urine similar to NORMAL CONTROL URINE except constituents are present in concentrations usually considered abnormal. In addition, assays are supplied for some constituents which would not normally occur in measurable amounts in urine.





Beckman brings down the high cost of IR accuracy: IR-18A, IR-20A.

Now every laboratory can afford accurate infrared spectrophotometry with rapid, reliable, and detailed spectra. Both the Beckman IR-20A and the IR-18A offer high resolution and advanced capabilities previously available only in research-priced instruments. These two instruments differ only in wavenumber range. They share such features as seven slit programmes, wide choice of scanning speeds, automatic scan and reset, and flat bed strip-chart recorder.

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ROYAL SOCIETY OF NEW ZEALAND SCIENTIFIC CALENDAR

APRIL 1st, 1972 - MARCH 31st, 1973

SEMINARS

Date	*Place*	*Subject*	*Sponsors*
May 8th - 12th	University of Otago	Electronic Distance Measurement and Computers in Surveying	University of Otago
May 8th - 13th	Victoria University of Wellington	Biological Taxonomy	University Extension, Victoria University
May 15th - 17th	University of Otago	Dentistry for the New Generation (post-graduate)	University of Otago
July - August	University of Auckland	Fuel Technology	Institute of Fuel (N.Z. Group) and University Extension, University of Auckland
July 3rd - 5th	Wellington Hospital	3rd Course for Tutor Radiographers	Education Council, N.Z. Society of Radiographers
August 21st - 25th	University of Waikato	Numerical Analysis Computing and Statistics for Teachers	University Extension, University of Waikato
October	University of Otago	3-day Course in General Pathology Principal Speaker: Pro. B. Castleman, Boston, USA	Faculty of Medicine, University of Otago
February - March, 1973	University of Otago	3-day Course in Clinical Biochemistry Principal Contributor, Prof. Charles R. Park, Vanderbilt University, U.S.A.	Faculty of Medicine, University of Otago

SYMPOSIA

April 8th, 15th, 22nd	Victoria University of Wellington	"Population, Resources and Environment in New Zealand"	University Extension, Victoria University
November 21st - 23rd	Hamilton	"Water Resources"	N.Z. Hydrological Society

MEMORIAL LECTURES

Date	*Lecture*	*Place*	*Lecturer*	*Subject*	*Sponsors*
July 26th	Hudson Lecture	Dominion Museum, Wellington	Professor A. M. O. Veale Dept. of Medicine, University of Otago	"Genetic Counselling"	R.S.N.Z., Wellington Branch
August 24th or 25th	T. H. Pullar Memorial Address	Tauranga	Professor P. Herdson, Professor of Pathology, University of Auckland		N.Z. Institute of Medical Laboratory Technology

PUBLIC LECTURES OTHER THAN MEMORIAL LECTURES

April 12th		University of Otago	Dr C. D. Darlington, F.R.S. Formerly School of Botany, Univ. of Oxford	"The History of Society"	Dept. of Botany, University of Otago
May 3rd		School of Engineering, University of Canterbury	Professor M. G. Marcus, Department of Geography, Univ. of Michigan	"Changing Perspectives of Geographic Education in the U.S.A."	N.Z. Geographical Society, Canterbury Branch
May 18th		University of Otago	Dr A. Beacham, Professor of Applied Economics, Univ. of Liverpool		Dept. of Economies, University of Otago
July		University of Otago	Dr G. W. Series, F.R.S., University of Reading	"Hydrogen—the Spectroscopist's Playground"	Dept. of Physics, University of Otago
June or July	Archey Lecture	Auckland Museum			Auckland Institute

CONFERENCES

Date	*Place*	*Sponsors etc.*
April 15th - 16th	Wairakei	Pharmaceutical Society of N.Z.
May 1st - 4th	Hokitika	N.Z. Institute of Foresters (AGM)
	Theme "Management of Indigenous Forest Land"	
May 11th - 13th	Turangi	N.Z. Limnological Society
May 13th - 14th	YWCA, Dunedin	The Soil Association of N.Z.
May 23rd - 25th	Massey University, Palmerston North	N.Z. Society of Electron Microscopy
May 24th - 26th	Massey University, Palmerston North	The N.Z. Society of Pathologists
May 27th - 28th	Massey University, Palmerston North	N.Z. Public Health Association Inaugural Conference
June 3rd - 5th	Wellington	N.Z. Archaeological Assoc. (AGM)
August		N.Z. Association of Economists
August 7th - 11th	Massey University Palmerston North	N.Z. Society of Soil Science
August 7th - 11th	Massey University, Palmerston North	N.Z. Institute of Agricultural Science
August 8th - 10th	Avon Motor Iodge, Christchurch	N.Z. Weed and Pest Control Conference
August 16th - 19th	Massey University Palmerston North	N.Z. Computer Society
August 18th - 22nd	Massey University, Palmerston North	N.Z. Psychological Society 25th Jubilee
August 18th - 19th	Victoria University of Wellington	The N.Z. Institute of Engineers Conveners National Conference
	Theme "Resources and Population"	
August 21st - 25th	Rotorua	N.Z. Dental Association
August 21st - 25th	University of Waikato, Hamilton	N.Z. Geographical Society
August 22nd - 25th	Massey University, Palmerston North	The N.Z. Electronics Institute
	Theme "Electronics in Science"	

CONFERENCES—Continued

Date	*Place*	*Sponsors, etc.*
August 22nd - 24th	Victoria University of Wellington	The N.Z. Institute of Chemistry
August 23rd - 25th	University of Otago, Dunedin	Institute of Physics, N.Z. Branch, Otago Division
	Theme "Physics in New Zealand"	
August 24th - 25th	Tauranga	The N.Z. Institute of Medical Laboratory Technology
August 24th - 26th	Massey University, Palmerston North	N.Z. Ecological Society
August 30th - 31st	Christchurch Hospital	The N.Z. Association of Clinical Biochemists
September 6th - 8th	Lincoln College, Christchurch	The Entomological Society of N.Z. 21st Annual Conference and Celebration
October 25th - 27th	Timaru	The N.Z. Society of Radiographers
November 10th - 12th	Massey University, Palmerston North	N.Z. Institute of Medical and Biological Illustration
December 1st - 3rd		Royal Astronomical Society of N.Z. (AGM)
February 1st - 5th, 1973	Gisborne	N.Z. Veterinary Association
February	Wellington	N.Z. Association of Economists
February	Hamilton	The N.Z. Institution of Engineers Annual Conference

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Additional information may be printed in the next Newsletter.

Further information for this calendar should be sent to Dr. E. Kidson, 13 Charlotte Street, Nelson, as soon as possible.

SUCCESSOR TO THE NEW ZEALAND INSTITUTE 1867-1933

Newsletter

THE ROYAL SOCIETY OF NEW ZEALAND

SCIENTIFIC CALENDAR No. 13 1972

ROYAL SOCIETY HAS MOVED TO ITS OWN PREMISES

On January 27, 1972 the Royal Society moved its offices from Victoria University of Wellington to its own premises.
The new address is:

6 Halswell Street,
Wellington 1.
P.O. Box 12249.
Telephones 45-516 and 45-215.

This is one of the Society's properties on the site of the future Science Centre.

ECOLOGICAL SOCIETY

A Register of Ecological Consultants

The Council of the Ecological Society is compiling a register of those members of the Society who are prepared to act as consultants to anyone seeking advice on ecological problems. Each applicant before he is registered must satisfy the Council of his competence in the general field of ecology, indicate his own specialist sphere of competence, and agree to abide by the "Rules for the Registration of Ecological Consultants" set out by the Council of the Ecological Society.

This register will ensure that when advice is solicited from the Society the Council can offer the names of consultants of known competence. Each consultant would then deal directly with his client in setting his fee and conducting the work. The Society would not be responsible for any recommendations which might be made.

Further information is available from the Hon. Secretary, The Ecological Society of New Zealand, P.O. Box 1887, Wellington.

Conservation sub-committee

The Council of the Society has a permanent sub-committee to consider problems of the environment. Royal Society members knowing of local conservation

problems to which they would like to draw the attention of the Ecological Society should write to the convenor, Dr D. Scott, DSIR Grasslands Division, Private Bag, Christchurch.

Population sub-committee

This committee has recently been formed to advise Council of the Ecological Society on problems of human populations. Those interested should contact the convenor, Dr R. A. Fordham, Dept of Botany and Zoology, Massey University, Palmerston North.

CONFERENCES

Seventh New Zealand Geography Conference
Hamilton, 21-25 August 1972

Papers will be offered in all fields of geography, including the teaching of geography and simulation techniques. The programme will include displays, workshops, field excursions and working demonstrations of equipment and models. All participants will receive a published collection of papers on the Waikato Basin, and will later receive the printed conference proceedings.

Accommodation will be available on the University of Waikato campus in the new Student Village.

For further information or enrolment forms write to:

The Secretary,
Seventh Geography Conference,
C/o University of Waikato,
Hamilton, New Zealand.

Thermodynamics Conference—December, 1972

The Institution of Engineers, Australia

Announcement and call for papers

The Technical Committee for Thermodynamics and Fluid Mechanics of The Institution of Engineers, Australia is organising a Conference under the title: "Thermal Discharge—Engineering and Ecology".

This will be held at the University of Sydney from 4th to 7th December, 1972, and will be open to all interested persons who have registered to attend.

Topic Areas:

Emphasis will be placed on present and future problems caused by waste heat, on quantitative ecological data concerning thermal effects in waterways and on

methods of disposal or utilisation of waste heat. Papers are being sought on relevant topics.

Deadline for receipt of abstracts—1st June, 1972.

All correspondence should be addressed to:

The Secretary,
The Institute of Engineers, Australia,
157 Gloucester Street,
Sydney, N.S.W. 2000.

TRAVEL AWARD

The Canterbury Branch of the Royal Society of New Zealand has set aside up to $300 for a travel award in 1972.

The purpose of the award is to contribute to the cost of travel in connection with research, study, surveys, or visits to institutions, or to facilitate visits to Canterbury by experts to deliver lectures and or to conduct research.

Graduates or those with other recognised professional qualifications in science or in disciplines using the methods of science are invited to apply for this award.

Applications with full details of qualifications, professional career and proposed travel programme should reach the Secretary, Canterbury Branch, Royal Society of New Zealand, C/- Canterbury Museum, Rolleston Avenue, Christchurch by **April 30, 1972.**

NEW ZEALAND CONVERSION TO METRIC SYSTEM

Time-scale of Conversion

The changeover from imperial to metric units for weights and measures is a far more extensive change than that made to decimal currency. Consequently, instead of an M-Day the conversion will be spread over a period of years—with substantial conversion planned for the end of 1976. However, there will be some areas in which the conversion will extend well beyond this date—depending on normal replacement cycles for major items of industrial plant or machinery.

Government policy is that the costs of conversion generally should be borne by those incurring them.

Implementation of Conversion

The first major steps in metrication were taken on 1 July, 1971. Meteorological reporting of temperature and rainfall changed from degrees Fahrenheit and inches to degrees Celsius and millimetres respectively; the wool industry started conducting all trading transactions for unprocessed wool in metric weights.

There will be a series of planned and co-ordinated conversions to be introduced with a minimum of inconvenience to the community. Some of these conversions will affect only specialised sections of the community and will be published through the respective national associations or organisations. Other conversions will affect everybody and these will be publicised on a national basis.

INTERNATIONAL AFFAIRS

$16,125 was provided by the Royal Society for international activities in 1971. This comprised:—

Annual dues to ICSU and Scientific Unions	7,500
Travel of Representatives to Union meetings	2,250
Travel grants to scientists attending Pacific Science Congress and ANZAAS Congress	1,875
Travel grants to overseas scientists attending Rutherford Centenary Symposium	2,000
Annual dues to International Seismological Centre	2,500
	$16,125

RECENT PUBLICATIONS

Coronary Heart Disease—
Report of a Committee of the Society $3.00

Cook Bicentenary Expedition—
Bulletin 8 ..... $4.00

Recent Crustal Movements—
Bulletin 9 ..... $8.00

Obtainable from the General Secretary of the Royal Society P.O. Box 12249 Wellington.

This newsletter has been compiled by members of the Member Bodies Committee of the Royal Society of New Zealand.

DAVID F. JONES LTD.