

# JOURNAL OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY

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VOL. XIX.

FEBRUARY, 1955.

No. 1.

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## EDITORIAL

The first volume of the Journal of the New Zealand Institute of Chemistry appeared in 1936. After being nursed through its teething troubles, and troubles there were in launching such an ambitious project so early in the history of the Institute, by a Wellington Committee with Mr. O. H. Keys as Editor, publication was taken over in 1940 by Professor H. E. Parton then at Canterbury University College. His sterling work in producing the Journal during the difficult war and immediate post-war years is well known to members of the Institute. In 1948 the Journal transferred to the Auckland branch. It is with pleasure that we at this stage pay a tribute to the work of the Auckland Journal Committees over the last seven years, in particular to Mr. S. G. Brooker for his six years editorship and Mr. G. M. Wallace who, after a number of years as assistant editor, served last year as Editor. The standard of the Journal over the past eighteen years is a measure of the debt the Institute owes to these four Editors and their associates who have served on Journal Editorial Committees.

And now this first number of Volume XIX sees another change with one of the youngest and numerically smallest branches of the Institute taking over the production of the Journal. We are grateful for the good wishes received from Council and members of the Institute as we take up our task. It is now the responsibility of the Manawatu Branch to maintain the standard previously set. But ours is not the only responsibility. The success of the Journal depends on the individual efforts of every member of the Institute. It serves an important function as mouthpiece for the Institute but it cannot, any more than any other activity of the Institute, be taken for granted. From time to time, the Journal and its format has evoked discussion amongst members and in particular has exercised the minds of Editorial Committees. Perhaps the problems can best be stated in the

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Edited by W. A. McGillivray, 178 Fitzherbert Avenue, Palmerston North.

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three questions which were placed before members in the form of a questionnaire when the Journal was first published:—

Are the best interests of our Institute served by the regular publication of a Journal?

Are members prepared to actively support such a publication, i.e. by contributing articles, etc.?

If so, what type of material is most desired?

As in 1936, these questions still merit serious consideration. If the answer to the first is still in the affirmative then we rely on members to supply articles and material for publication and to indicate the type of material they desire.

The success of many of our Conferences has been ascribed at least in part to the ready response from members to a general invitation to contribute papers, making specific requests to individual people or groups unnecessary. It is hoped that this general request now made by the Editorial Committee for active support of the Journal will meet with the same ready response.

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### CHANGE OF ADDRESSES

Please note the new addresses for future correspondence. It would be appreciated, and would facilitate early replies, if correspondence could be sent direct to the person concerned, as follows:

All Journal Copy, matters of Journal Policy, etc.

*The Editor:*

W. A. MCGILLIVRAY,

Massey College Post Office, Palmerston North.

All Advertising matters, rates, etc.,

*The Business Manager:*

D. G. HOWARD,

Shell Co. of N.Z., Box 2091, Wellington.

Distribution, Change of Address, etc.,

*The Registrar:*

V. J. WILSON,

Technical Publications Ltd.,

Box 1001, Wellington.

## WOOL AND SYNTHETIC FIBRES

BY J. MELVILLE

Director, Grasslands Division, D.S.I.R., Palmerston North.

*(Based on a paper presented at the Eighth Science Congress of the Royal Society, held in Auckland in May, 1954.)*

Man's utilisation of natural fibres, whether of vegetable or animal origin, goes back for many thousands of years; but only during this twentieth century has the realisation come to him that, in Astbury's words, "Biological fibres are of the nature of molecular yarns spun from long-chain molecules." The major animal fibres, silk, wool and hair are composed solely or largely of protein; the major vegetable fibres such as cotton, linen, jute and hemp are made up of cellulose. This basic dissimilarity in chemical composition between vegetable and animal fibres leads of course to their quite dissimilar properties and spheres of usefulness. But the tangible differences between them should not blind us to their one basic similarity. The actual molecules of which they are composed are very long in relation to their diameter. And the final fibre as used by man in a thousand different ways is merely the resultant of the aggregation and orientation of these molecules into a structure which is also very long in relation to its diameter.

But, as so frequently happens, this realisation came many years after the first artificial fibre, rayon, was produced. During the 70's and 80's various French and English investigators discovered quite empirically that cellulose could be dissolved by a number of reagents and brought out of solution in the form of a filament. Even in 1930, when the rayon industry became firmly established, the true nature of the process was quite imperfectly understood. It is really only within the last 25 years that chemists have learnt enough about the architecture of natural fibres and of rayon to make possible a systematic search for new kinds of chain molecules; and also to make possible the range of synthetic fibres which threaten wool today in the same way as cotton and silk were threatened by rayon 20 years ago.

If this threat is to be put into its correct perspective a brief consideration of the wool fibre and its molecular architecture is essential and this necessarily involves a brief description of some fundamentals of protein structure. Without exception proteins are built up from amino acids, some two dozen of which have been described, and all living cells have mechanisms whereby the amino acids are joined together to form peptides. The peptides may be of all degrees of complexity from dipeptides upwards and the peptide structure with its recurring — NH — CO — CH — groups is common to all proteins. The enormous variety of proteins found in nature derives from the infinity of ways in which the different amino acids may be arranged along the basic

chain. But it is the chain which is the important thing, and X-ray measurements on protein fibres provide experimental evidence that here we are dealing with molecules of great length in comparison with their diameter.

When we move from molecular dimensions measured in Angstrom units, to the actual fibre where we are talking, if not in terms of millimetres, at least in parts of a millimetre, it is obvious that in the wool fibre we must be dealing with a multiplicity of polypeptide chains. Here again the analogy with spun yarns is useful. A cotton thread is composed of millions of tiny fibres of native cotton which are first carded or combed so that they all lie parallel to the axis of the yarn, and are then bonded together by twist and friction into a coherent thread. Similarly, at the native fibre level, the chain molecules must be oriented parallel to the fibre axis and they must be bonded together by intra molecular forces. These three criteria, great length relative to diameter, orientation of individual molecules so that they lie parallel to the fibre axis, and adequate intramolecular bonding forces, are essential before any compound, whether natural or synthetic, can form a fibrous filament. And wool fulfils these three criteria admirably.

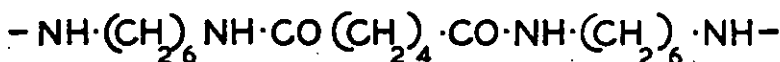
Some proteins on the other hand (egg albumin, haemoglobin, edestin, the cytoplasmic proteins of leaves, to mention only a few) have no fibrous properties whatever and although these so-called globular or corpuscular proteins are still composed of polypeptide chains, we cannot talk of a long or short dimension. In these globular proteins another form of intra-molecular bonding comes into play and the chains are bent over on themselves. Ways have been found of unfolding these chains, or orienting them parallel to an axis and of transforming a typically globular protein like egg albumin into a fibrous filament. One kind of competition to which wool is subjected arises from these findings. There is a surprisingly wide variety of cheap proteins on the markets of the world — blood proteins from slaughter houses, feathers, hair, the presscakes remaining after oil expression from seeds and so on. An enormous amount of research is going into the exploitation of these by-products as raw materials for protein fibres, and success has been already achieved in a number of cases. Thus I.C.I. has had considerable success with "Ardil," a fibre derived from peanut protein; the Germans, Italians and Japanese manufactured large quantities of fibre from the casein of milk during World War II; while substantial progress has been made with the proteins of feathers, soybeans and maize.

It is not intended to convey the impression that the spinning of waste protein into usable fibres is simple, since every step of the conversion is beset by technical difficulties, nor to suggest that the regenerated protein fibres represent at the moment a serious threat to wool, since they all have serious defects such

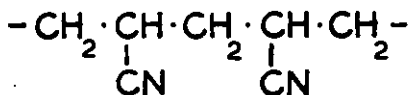
as low wet strength or poor abrasion resistance. But their extreme youth must be stressed. They were hardly laboratory curiosities twenty years ago, and their present status is largely the result of work since the end of World War II.

So far only those artificial fibres whose raw materials are complex biological products have been considered. Rayon, Ardil, Aralac and the rest start either from cellulose, or from plant or animal protein — molecules which are already of chain structure are merely rearranged so that the chains lie parallel, and are then bonded and set so securely that they will stand subsequent manipulation. The first true synthetic fibre, i.e., one which could be produced, if the chemist had sufficient patience, from its constituent elements, arose out of an investigation into the synthesis of high polymers by the Dupont Corporation. Starting in the early 80's the investigation was remarkably successful, and within a few years methods had been developed for synthesizing chainlike molecules which had the properties of the type found previously only in such natural polymers as cellulose, rubber and silk. Technological exploitation followed closely on the laboratory findings and in 1937 the first truly synthetic fibre, nylon, appeared on the world's markets.

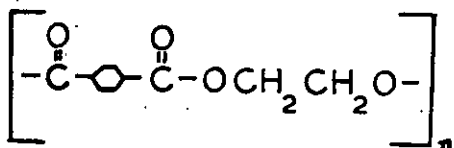
With adipic acid and hexamethylene diamine as its raw materials, nylon has the structure:



As a result of nylon's spectacular success, the hunt was on for other high linear polymers with different and perhaps more desirable properties. But the search was abruptly terminated by World War II, and not until 1947 were the big chemical organisations able to resume their investigations. From the tens of millions of dollars spent on research and development two new fibres are now at the stage of full commercial production. Duponts have produced orlon while I.C.I. have invented terylene or dacron. Orlon's chain is:



while terylene is remarkable for the recurrent benzene rings in its structure.



Referring now to the technology and production of the true synthetic fibres, the main problem is to define the conditions under which one or perhaps two different molecules can be condensed together to form not a simple compound, but a polymeric one in which hundreds of the molecules join end to end to form a chain. Once this is achieved the problem becomes practically the same as for the production of rayon or Ardil. In the latter cases the chain molecules have already been formed as a result of biological activity and the problem is to solubilize them so that the chains are re-arranged in the process of making a filament. In exactly the same way the synthetic polymer is heated above its melting point or brought into solution and then expressed through a fine orifice into a coagulating bath or atmosphere.

Again there are all sorts of technical difficulties to be overcome but in the case of nylon, orlon and terylene there can be no doubt that success has been achieved.

The sketchiness of this scientific background to the subject of natural and synthetic fibres is fully realised but it is hoped that it is sufficient to give an idea, both of the historical development of man-made fibres, and of the approach of the chemist who is achieving in chemical equipment, reactions which hitherto have been the monopoly of the plant or animal cell. The next section of this paper, namely an assessment of the threat of these newer fibres to wool, presents some real difficulties. Perhaps the best approach is to summarise what was said by the protagonists of wool and synthetic fibres respectively at a recent American Chemical Society Symposium on the subject.

Heckert of Dupont's summarises the qualities of the three commercial synthetics as follows: Nylon has provided strong and elastic fibres with unique permanent-setting characteristics, while its resistance to abrasion is many times greater than that of any other fibre. Orlon provides bulk and warmth, has attractive aesthetic properties and the great virtue of ease-of-care; that is, pleats can be formed in it which are washable. Dacron has exceptional liveliness, resilience and crease-resistance with ease-of-care features similar to orlon. Heckert also claims that the superficial wool-like properties of bulk and fuzziness can be built into fabrics from all three fibres by chopping into short lengths (staple fibre), suitably crimping them, and finally spinning them into yarns by traditional procedures. On the score of warmth he considers that warmth or coolness is a function of the construction of the fabric (this applies particularly to bulk and porosity) and of the nature of the environment in which it is worn. In other words, within quite wide limits, warmth is not a function of the properties of the fibre. Finally, he makes the statement

that one by one the principal functional properties of wool have been equalled or excelled by one or other of the newer synthetics until now only the felting and shrinkage properties remain to be matched.

In that same symposium von Bergen puts the case for wool, and what is most interesting is that he did not deny any of the claims made by the apostles of synthetic fibres. But he did put emphasis on one or two properties of which wool has still a monopoly. In particular he deals with the reaction of wool to moisture, which is directly connected with the architecture of the wool molecule and of the amino acids from which it is constructed. His most striking illustration is that of a person passing from a room at 70° F. and 45% Relative Humidity into an atmosphere of 40° F. and 95% Relative Humidity. Under these circumstances a woollen jacket weighing 2 pounds will produce 100,000 calories, or as much heat as normal body metabolism will produce in 1 hour. This property is one which no synthetic fibre has yet approached. Von Bergen summarises wool's virtues in terms of high moisture absorption, high resilience in both wet and dry states, its ability to felt, its good dyeability and its non-inflammability. He implies that although some of wool's desirable properties may be built in to a variety of synthetic fibres, wool will hold its own because it is highly unlikely that any single synthetic fibre will combine in itself all the desirable properties of wool.

If Heckert and von Bergen are adequate spokesmen for the two types of fibre, and there is no doubt they are, then there is only one possible conclusion. At the present stage of development nobody can predict the way in which fibre synthesis will be modified, and hence the degree to which synthetics will truly reproduce the properties of wool. World wool production is estimated at 2,400 million pounds. In 1951 the production of synthetic plus regenerated protein fibre was about 220 million pounds and it is estimated to reach 400 million pounds in 1954. On those figures it would appear that the synthetics, at one sixth of the volume of wool production, are already providing strenuous competition. Such a conclusion is, however, based on the assumption that all synthetic production is competing with wool, and this assumption is far from the truth. It is probable that less than 100 million pounds of synthetic fibres have been used in fabrics which, but for their advent, would have been woven from wool. Moreover, a striking feature in the use of synthetic staple fibre has been the degree to which it is used for blending with wool in order to confer certain desirable properties not possessed by an all-wool fabric. Such usage can hardly be looked on as competition, since some degree of benefit is obtained by both members of the partnership.

THE NEW ZEALAND INSTITUTE OF CHEMISTRY (Inc.)

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st OCTOBER, 1954.

EXPENDITURE				INCOME			
1953		£ s d	£ s d	1953		£ s d	£ s d
£	To Administration Expenses—			968	By Subscriptions .....	1007 12 4	
	Salary Registrar 1/11/53-				Less amounts written off and		
	31/12/53 .....	83 6 8			remitted .....	51 19 6	955 12 10
200	Salary Registrar 1/1/54-						
	31/10/54 .....	100 0 0			Interest—		
101	Travelling Expenses .....	73 8 2		4	Post Office Savings Bank ....	8 10 4	
40	Printing and Stationery .....	64 5 4		16	National Savings Account ....	16 10 10	20 1 2
26	Honorary Secretary .....	31 10 0					3 8 0
80	Branch Expenses Allowances .....	80 0 0		9	Donations .....		8 11 0
84	Postages and Sundries .....	25 6 6			Examinations Committee		
—	Legal Expenses .....	21 0 0			Entry Fees, etc. ....		
12	Audit Fees .....	12 12 0			Conference Committee Sur-		
62	Duplicating and Addressing				plus 1953 and 1954 .....	24 3 3	
	to 31/12/53 .....	10 18 8			Less amounts due to R.I.C.		
6	Depreciation .....	6 0 0			1953 and 1954 .....	6 14 10	17 8 5
511	Total		408 7 4		By Institute Journal—		
—	To Printing Rule Books .....		52 10 0	54	Subscriptions .....	48 19 3	
	Institute Journal—			145	Advertising .....	135 8 6	
396	Printing Blocks, etc. ....	402 16 6					
28	Postages, Honorary Editor			199	Total		179 2 9
	and Sundries .....	88 18 3					
424	Total		441 14 9				
—	To Provision for Overseas						
	Visitors' Trav. Fund ..		25 0 0				

80	To Provision for Taxation ....	4 12 10
	Excess of Income over	
	Expenditure Transferred	
145	to Accumulated Funds ..	251 14 3
		£1183 19 2

£1183 19 2

TRUST FUND

FOR THE YEAR ENDED 31st OCTOBER, 1954.

To Balance Carried Down .....	786 7 4	By Balance 1/11/53 .....	695 2 0
		Transfer from General Funds .....	75 0 0
		Interest on Deposit .....	16 5 4
			£786 7 4
	£786 7 4	By Balance 31/10/54	£786 7 4



THE NEW ZEALAND INSTITUTE OF CHEMISTRY (Inc.)

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st OCTOBER, 1954.

EXPENDITURE

	1953	£	s	d
200 To Administration Expenses—				
Salary Registrar 1/11/53-				
81/12/53		88	6	8
Salary Registrar 1/1/54-				
81/10/54		100	0	0
101 Travelling Expenses		73	8	2
40 Printing and Stationery		64	5	4
26 Honorarium Secretary		31	10	0
30 Branch Expenses Allowances		80	0	0
84 Postages and Sundries		25	6	6
— Legal Expenses		21	0	0
12 Audit Fees		12	12	0
62 Duplicating and Addressing		10	18	8
to 31/12/53		6	0	0
6 Depreciation				
511 Total		408	7	4
— To Printing Rule Books		52	10	0
Institute Journal—				
396 Printing Blocks, etc.		402	10	6
28 Postages, Honorarium Editor				
and Sundries		88	18	8
424 Total		441	14	9
— To Provision for Overseas				
Visitors' Trav. Fund		25	0	0

INCOME

	1953	£	s	d
908 By Subscriptions		1007	12	4
Less amounts written off and				
remitted		51	19	6
Interest—				
Post Office Savings Bank	4	8	10	4
National Savings Account	16	16	10	10
Donations				
9 Examinations Committee				
Entry Fees, etc.				
Conference Committee Sur-				
plus 1953 and 1954		24	8	8
Less amounts due to R.I.C.				
1953 and 1954		6	14	10
By Institute Journal—				
54 Subscriptions		48	19	8
145 Advertising		185	8	6
199 Total		179	2	9

## THE TWENTY-FOURTH ANNUAL REPORT (Abridged)

FOR THE YEAR ENDING 31st OCTOBER, 1954.

The Council has pleasure in presenting to members a record of activities for the year ending 31st October, 1954.

### REGISTRAR AND SECRETARIAL

During the year the office of the Institute in Wellington was transferred from Messrs. Watkins, Hull, Wheeler & Johnston to Technical Publications Ltd., Dominion Building, Wakefield Street, resulting in a substantial financial economy and increased efficiency and dispatch in the handling of the Institute's affairs.

Mr. A. P. Oliver relinquished the post of Assistant Hon. Gen. Secretary at the beginning of the year after four years of valuable service. Mr. B. G. Stanley was appointed to succeed him.

### MEMBERSHIP

The membership has continued to increase during the year with a net gain of twelve members. Thirty new Associates were elected and one resignation was rescinded, while eleven resignations were accepted, seven names removed from the roll for non-payment of outstanding subscriptions, and the death of a member occurred. Leave of absence with remission of subscription was granted to five members.

Membership figures for the past three years are as follows:—

	1952	1953	1954
AUCKLAND - - -	89	90	99
WAIKATO - - -	29	34	31
MANAWATU - - -	37	34	32
WELLINGTON - - -	142	137	141
CANTERBURY - - -	68	76	78
OTAGO - - -	54	55	61
OVERSEAS - - -	37	42	43
	455	468	480

### SUB-COMMITTEES OF COUNCIL

The smooth functioning of many phases of the Institute's activities is due to the work of the various sub-committees and the Council is very grateful to the members for the time and effort involved. A brief summary of the various reports of the sub-committees is recorded here.

### CONFERENCE

The 1954 Conference was held at Nelson from August 24th to 27th inclusive. Though the attendance at 87 members was somewhat smaller than at recent conferences it was considered that the Royal Society Congress at Auckland in May had little influence and the maintenance of continuity of the Institute Conferences was fully justified. The slightly smaller attendance facilitated personal contacts and a very happy atmosphere resulted. A highlight of the Conference was the presentation of the first Easterfield award by Dr. J. K. Dixon, President of the N.Z. Section R.I.C. to Mr. J. Rogers of the School of Mines, University of Otago and the recipient's address. It was particularly pleasing that members of the Easterfield family were present at the function.

The Wellington Branch Committee, including Nelson members, is to be congratulated on organising the 1954 Conference in the best traditions of the Institute.

Palmerston North has been selected as the venue of Conference, 1955.

**EXAMINATIONS COMMITTEE**

The Otago Committee has continued its excellent work not only in carrying out the examining functions of the Institute, but also in framing and amending the regulations governing the examinations. During the year fourteen candidates for the Laboratory Assistants Certificate sat a total of 25 papers. Three candidates completed the examinations and the necessary practical experience and were duly awarded their certificates.

**JOURNAL**

Mr. S. G. Brooker, of Auckland, retired from the position of Editor at the end of 1958. At the May meeting of the Council Mr. Brooker was presented with a bound set of four volumes of the Journal from 1936 to 1958 suitably inscribed in appreciation of his six years of outstanding service as Editor. The Auckland Journal Committee has carried on during 1954 and Mr. G. Wallace has ably filled the office of Editor. In accordance with the Institute's policy of rotating responsibilities, arrangements for transferring the publication of the Journal to Manawatu Branch are well advanced. Dr. McGillivray has accepted nomination as Editor for 1955.

The members of the Auckland Journal Committee have earned the deepest gratitude of the Institute for the very fine standard of publication which has been achieved while the Journal has been in their hands.

**EMPLOYMENT OFFICER**

Mr. E. S. Borthwick has again rendered valuable service in handling a number of enquiries, both local and overseas, concerning vacancies in the profession in New Zealand during the year.

**MEMBERSHIP COMMITTEE**

Professor Briggs, Dr. Gardner and Mr. Joiner have again earned the appreciation of the Institute for their sterling service in safeguarding the standard of membership to the Institute. Twenty-nine new members were admitted as Associates during the year. Mr. Joiner has also to be thanked for inscribing all the Certificates for new members.

**PATENTS OFFICER**

Mr. E. S. Borthwick has again carried out this office.

**STANDARDS COUNCIL**

Our thanks are due to Mr. G. A. Lawrence for representing our Institute on the Standards Council.

**STANDARDS INSTITUTE**

Under Mr. C. L. Stonyer, representatives on a number of committees of the Standards Institute have been active during the year.

**SALARIES**

No salary survey was carried out in the year under review. An article by Dr. Bottomley in the Journal proved of considerable interest and 200 reprints have been distributed to Members of Parliament, University Colleges and Industry.

**ADDRESS BY H.R.H. THE DUKE OF EDINBURGH**

The highlight of the Royal Tour for members of the Institute was attendance at the address given by H.R.H. The Duke of Edinburgh to a gathering of scientific personnel at the Dominion Museum, Wellington, on January 18th. The distribution of the Institute's allocation of seats was made by ballot and it was a matter for regret that a greater number could not be obtained.

**INSTITUTE PRIZES**

The I.C.I. Prize for 1954 was awarded to Dr. W. S. Metcalf, of Victoria University College, Wellington, for his work on the quenching of fluorescence.

The Morcom Green, Edwards Prize was awarded to Mr. C. F. Denmead for his paper on bacon curing. No entry was received for the Industrial Essay Prize and the general lack of interest is a cause for concern. Methods of popularising this Prize are being investigated.

**SCIENTIFIC SOCIETIES**

Little progress has been made toward the objective of closer liaison between scientific societies though the matter is being pursued.

Institute members took a prominent part in the Eighth Science Congress of the Royal Society at Auckland in May of this year. Professor Briggs was chairman and Mr. S. G. Brooker one of the Joint Secretaries.

**FINANCIAL**

The Balance Sheet shows that the Institute's finances are in a healthy position although a considerable sum is outstanding in overdue subscriptions. The Income and Expenditure Account shows a satisfactory surplus of income for the year, and further sums will be able to be transferred to the Trust Fund and special reserve accounts.

**BRANCH MEETINGS**

A list of all papers read before Branches during the year is attached.

**RULES AND REGULATIONS**

Considerable work has been devoted during the year to bringing the Rules and Regulations of the Institute up-to-date and printing is now completed.

**LIST OF MEMBERS**

We are glad to be able to announce that a list of members as at October 31, 1954, has now been printed and will be distributed to members shortly.

For and on behalf of Council,

H. O. ASKEW, President.

B. G. STANLEY, Asst. Hon. Gen. Secretary.



## LIST OF OFFICERS

FOR THE YEAR NOVEMBER 1st, 1954 — OCTOBER 31st, 1955

*President:* K. M. Griffin, Government Analyst,  
Durham Street West, AUCKLAND.

*Vice-President:* Dr. M. M. Burns, Lincoln College,  
P.B., CHRISTCHURCH.

*Hon. Gen. Secretary:* G. W. Hughson, P.O. Box 250, WELLINGTON.

*Auckland Delegate:* J. Ricketts, 118 Valley Road, Auckland, S.2.

*Waikato Delegate:* N. T. Clare, Ruakura Animal Res. Station,  
P.B. Hamilton.

*Manawatu Delegate:* Dr. F. H. McDowall, Dairy Research Inst.,  
Massey College.

*Wellington Delegate:* T. A. Rafter, Dominion Laboratory,  
P.B., Lower Hutt.

*Canterbury Delegate:* F. H. G. Johnstone, P.O. Box 825, Christchurch.

*Otago Delegate:* Dr. G. A. Bottomley, Chemistry Dept.,  
University of Otago.

*Editor of Journal:* Dr. W. A. McGillivray, Massey College P.O.,  
Palmerston North.

*Past President:* Dr. H. O. Askew, Cawthron Institute, Nelson.

*Registrar:* V. J. Wilson, Technical Publications Ltd., Box 1001,  
Wellington.

*Asst. Secretary:* B. G. Stanley, c/o Shell Co. of N.Z. Ltd., Box 2091,  
Wellington.

## AUCKLAND BRANCH

*Chairman:* J. Ricketts, 118 Valley Road, Auckland, S.2.

*Secretary:* Dr. H. C. Clark, c/- Chemistry Dept., Auck. Univ. College.

*Treasurer:* P. J. Gallagher, 110 Mays Road, Auckland, S.E., 5.

*Committee:* H. R. Gapper, L. Jagger, H. A. L. Morris, R. C. Selkirk.

## WAIKATO BRANCH

*Chairman:* N. T. Clare, Ruakura Animal Research Stn., P.B., Hamilton.

*Secretary-Treasurer:* E. P. White, Ruakura Animal Research Stn.,  
P.B., Hamilton.

*Committee:* J. E. Allan, K. F. Hoy, K. J. McNaught, Mrs. D. R. Perrin.

## MANAWATU BRANCH

*Chairman:* Dr. F. H. McDowall, Dairy Research Inst., Massey Coll. P.O.

*Secretary-Treasurer:* Dr. J. W. Lyttleton, Grasslands Division,  
Box 628, Palmerston North.

*Committee:* Dr. G. Butler, Dr. R. M. Dolby, C. V. Fife,  
Dr. W. A. McGillivray.

WELLINGTON BRANCH

*Chairman:* T. A. Rafter, Dominion Laboratory, P.B., Lower Hutt.

*Secretary:* Miss H. E. Barr, Dominion Laboratory, Wellington.

*Treasurer:* Dr. W. E. Harvey, Victoria University College, Box 196, Wellington.

*Committee:* Miss M. M. Malcolm, Dr. W. S. Metcalf, G. F. L. Martin, J. A. D. Nash.

CANTERBURY BRANCH

*Chairman:* M S. Carrie, Box 2, Belfast, Christchurch, N.2.

*Secretary-Treasurer:* D. J. Hogan, Dominion Laboratory, Box 1290, Christchurch.

*Committee:* J. M. Austin, S. M. Betty, F. H. G. Johnstone, Dr. P. R. Penfold.

OTAGO BRANCH

*Chairman:* Prof. H. N. Parson, University of Otago, Dunedin.

*Secretary-Treasurer:* Dr. G. A. Bottomley, University of Otago, Dunedin.

*Committee:* Dr. F. N. Fastier, O. H. Keys, N. P. Lino, H. M. D. Wilson, G. W. Broughton, J. Rogers.

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SUB-COMMITTEES 1/11/54 - 31/10/55

1. CONFERENCE COMMITTEE 1955

Dr. G. W. Butler (secretary), Grasslands Division, Box 623, Palmerston North.

2. EMPLOYMENT COMMITTEE

E. S. Borthwick, c/- Shell Co. of N.Z. Ltd., Box 2091, Wellington.

3. EXAMINATION COMMITTEE

O. H. Keys (chairman), Dominion Laboratory, Box 562, Dunedin.

C. R. Edmond (secretary), c/- Dr. R. Gardner, 41 Dowling Street, Dunedin.

Dr. G. A. Bottomley, J. W. McChesney and H. G. Woolman.

4. JOURNAL EDITORIAL COMMITTEE

Dr. W. A. McGillivray (editor), Massey College P.O., Palmerston North.

D. G. Howard (business manager), Shell Co. of N.Z., Box 2091, Wellington.

Prof. C. R. Barnicoat, C. V. Fife, Dr. R. M. Dolby, Dr. J. W. Lyttleton.

5. MEMBERSHIP COMMITTEE

Dr. L. H. Briggs, 63 Brighton Road, Parnell, Auckland.

Dr. R. Gardner, 41 Dowling Street, Dunedin.

W. A. Joiner, Dept. of S. and I.R., Box 8018, Wellington.

6. PATENTS OFFICE

E. S. Borthwick, c/- Shell Co. of N.Z. Ltd., Box 2091, Wellington.

7. PROFESSIONAL STATUS COMMITTEE

Dr. J. C. Andrews, 68 Onslow Avenue, Auckland, S.E.3.

J. Ricketts (secretary), 118 Valley Road, Auckland, S.2.

F. H. V. Fielder, 29 Adam Street, Greenlane, Auckland, S.E.4.

D. Whillans, Pathological Lab., Public Hospital, Park Rd., Auckland.

## 8. STANDARDS INSTITUTE OF N.Z.

8.1. *Representative on N.Z. Standards Institute Council:*

G. A. Lawrence, Johnsonville.

8.2. *Chief Representative for all Standards Institute Affairs:*

C. L. H. Stonyer, 47 Mandalay Tce., Wellington, N.5.

8.8. *Representatives on Special Standards Institute Committees:*(a) *Chemical, Insecticides, Domestic Refrigeration and General:*

C. L. H. Stonyer, 47 Mandalay Tce., Wellington, N.5.

(b) *Roadmaking Materials and Methods—Road Testing Material:*

J. B. Hyatt, Dominion Laboratory, Wellington.

(c) *Electro-Plating and Protective Metal Finishes:*

Dr. R. Gardner, 41 Dowling Street, Dunedin, C.1.

(d) *Rodent Poisons, Refrigeration and Timber Preservation:*

C. G. Mason, P.O. Box 682, Wellington.

(e) *Metal Containers—Paints:*

J. M. C. Tingey, 20 Cavendish Square, Wellington, E.5.

(f) *Textiles:*

Dr. L. F. Story, Woollen Research Assn., University of Otago, Dunedin.

## 9. U.N.E.S.C.O. REPRESENTATIVE:

J. A. D. Nash, Dept. Scientific and Industrial Research, Wellington.

## 11. SALARIES COMMITTEE:

Dr. J. K. Dixon, Soil Bureau, Molesworth Street, Wellington.

J. L. Mandeno, 1 Pine Terrace, Wellington, W.3.

Dr. G. A. Bottomley, University of Otago, Dunedin.

## LIST OF PAPERS READ BEFORE BRANCHES, 1953-1954

## AUCKLAND:

International Science with Particular Refer-  
ence to the Food Industry

Dr. Lampitt

Developments in Spectrochemical Analysis

Dr. A. C. Menzies

The Chemist in Sewage Treatment

Dr. H. Wilson

Pioneering Chemical Pulping in New Zealand

D. L. Stacey

Persia and Oil

Mr. Hepburn

Technical Emulsions

J. H. Goodey

## WAIKATO:

Chemistry and Food Production

R. E. R. Grimmett

Rumen Function and Ruminant Metabolism

V. J. Williams

The Alchemy of Metals

G. S. Lambert

Some Biochemical Aspects of Meat Research

Dr. R. A. Lawrie

Recent Advances in Spectrochemical Analysis

Dr. A. C. Menzies

Some Aspects of Blood Analysis

R. R. White

Some Nutritional and Physiological Problems  
of Glasshouse Tomatoes

K. J. McNaught

Symposium on "Paper Chromatography"

N. T. Clare, J. Lambourne, R. Rose, Dr. D. G. Edgar,

R. R. White, E. P. White, J. W. Ronaldson,

Miss M. P. Bartrum.

The Chemistry of Modern Weedkillers

F. B. Thompson

Some Aspects of Milk Chemistry

Mrs. D. R. Perrin

**MANAWATU:**

Polymers of Hydro-cyanic Acid	P. Robertson
Prominent Scandinavian Schools of Research	Dr. G. Butler
Work of the Division of Food Preservation and Transport C.S.I.R.O.	Dr. R. N. Robertson
Some Activities of the National Institute of Research in Dairying	Dr. W. A. McGillivray
Some Aspects of Protein Hydrolysis	Dr. P. Nottingham
Inorganic Soil Phosphorus and its Fraction- ation	C. V. Fife

**WELLINGTON:**

Progress of Fats Research Overseas	Dr. F. B. Shorland
Applied Research in the U.S.A.	Dr. V. Armstrong
Fractionation of Protein Mixtures	Dr. J. W. Lyttleton
The Machinery of Muscle	Dr. R. H. Locker
Kinetics of Halogenation in Aqueous Solutions	Dr. F. G. Soper
Current Research at the Plant Chemistry Laboratory	Dr. A. T. Johns
The Chemistry of Weed Control	E. C. S. Little
Current Research at Victoria University College	
Contributions to Fluorescence	Dr. W. S. Metcalf
Equilibria in Solutions of Nitrous Acid	T. A. Turney
Ironsands	W. R. B. Martin

**CANTERBURY:**

Recent Developments in Animal Production	Prof. I. E. Coop
Chemistry of Drying Oils	A. J. D. Robb
Process Development	Dr. T. Hagyard
The Speed of Chemical Change in the Brain	Dr. H. McIlwain (London University)
The Calorimeter as a Research Tool	J. M. Austin
The Toxic Hazards of Certain Pesticides to Man and How they are Assessed	Dr. F. A. Denz
Fundamental Particles	Dr. C. D. Ellyett

**OTAGO:**

The Chemist, in Fiction, in Fact and in the Future	A. G. Woolman
Chemical Developments in Metallurgy	J. Rogers
Trends in Surface Coatings	H. M. D. Wilson
Chemistry and Modern Textiles	Dr. H. Thomson and Dr. L. F. Story
On Some Agricultural Chemicals	Dr. F. Denz



## COUNCIL MINUTES

ABRIDGED MINUTES OF THE ANNUAL MEETING  
OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY  
HELD IN THE CONFERENCE ROOM OF THE D.S.I.R.,  
WELLINGTON, ON FRIDAY, 26th NOVEMBER, 1954,  
AT 10 A.M.

**PRESENT:**

Dr. H. O. Askew (President), in the chair; K. M. Griffin (Vice-President); J. Ricketts (Auckland Delegate); A. J. Metson (Waikato Proxy); C. V. Fife (Manawatu Delegate); Dr. L. G. Neubauer (Wellington Delegate); F. H. G. Johnstone (Canterbury Delegate); O. H. Keys (Otago Delegate); B. G. Stanley (Asst. Hon. Gen. Sec.); V. J. Wilson (Registrar). Apologies were received from F. E. Mason (Waikato Delegate), and W. G. Hughson (Hon. Gen. Secretary).

**CONFERENCES:**

*Conference, 1954:* Resolved.—That the report of the 1954 Conference Committee be received and adopted and the Committee be congratulated on the excellence of the Nelson Conference.

*Conference, 1955:* Manawatu reported that it is hoped to house the entire Conference on the campus of Massey College. The College hostel will probably be available during the August vacation and 200 persons can be accommodated, including any wives of members wishing to attend. August 23rd-26th have been tentatively set as dates for the Conference. Dr. Butler has been appointed Conference secretary.

*Future Conferences:* Canterbury reported that they are prepared to act on the tentative list set out, but would prefer not to hold the 1956 or 1957 Conferences at Christchurch owing to the proximity of the A.N.Z.A.A.S. Conference in Dunedin February 1957. Resolved.—That the secretary circulate the tentative schedule of Conferences to Branches for consideration and delegates be requested to come to the February Council Meeting with the firm decisions of their respective Branch Committees.

**A.N.Z.A.A.S.:**

A letter was received from Sir Theodore Rigg stating that the Government has issued an official invitation to A.N.Z.A.A.S. to hold the 1957 Conference in Dunedin and has guaranteed financial support. Dr. Soper has been appointed Chairman and Dr. Williams Secretary of the Conference Committee. Resolved.—That this Institute continue its affiliation with A.N.Z.A.A.S.

**EXAMINATIONS:**

Resolved.—That the Examinations Committee be asked to report on the extent to which French is being used as an option under Regulation 2, Clause 5, Section III, and to submit its recommendations. And—That the Examinations Committee be empowered to issue unofficial notification of results subject to confirmation by the Council to candidates for the Institute Examinations.

**PRIZES:**

*Industrial Chemical Essay Competition:* Resolved.—That the Industrial Chemical Essay Competition be called the Chemical Essay Prize, the age limitation on entrants be removed and Regulation 8.1 be amended accordingly. And—That the Chemical Essay Prize be offered for competition in 1956.

*Closing Dates:* Resolved.—That the attention of the Branches and the Editor of the Journal be drawn to the fact that the closing date for the I.C.I. and Morcom Green, Edwards Prizes is 30th April, 1955.

**JOURNAL:**

*Resolved.*—That the Editor's report be received. And—That a letter be sent to the Editor and the Auckland Journal Committee expressing the appreciation of the Council for the excellent work done in publishing the Journal during the seven years it has been domiciled in Auckland.

The Editor-elect, Dr. McGillivray and Business Manager-elect, Mr. D. Howard, were welcomed by the President and future policy discussed.

*Resolved.*—That the Editor be permitted to print and supply authors with 25 copies of each contributed article in the form of a reprint or a full copy of the Journal at his discretion. And—That a full list of exchange journals be printed annually in the Journal, including additions and deletions during the year. Auckland reported that Mr. Brooker is prepared to carry on handling exchange journals housed in the Auckland War Memorial Museum Library.

**MEMBERSHIP:**

G. F. Davis and R. Holden were elected Associates and W. E. Russell was re-elected Associate. The resignation of L. D. Calvert was accepted.

**ELECTION OF OFFICERS AND SUB-COMMITTEES  
FOR THE YEAR ENDING 30th OCTOBER, 1955.**

Officers and sub-committees as listed separately in this issue of the Journal were elected.

**HONORARIA:**

*Resolved.*—That honoraria on the same scale as last year, namely, 12 guineas and 80 guineas, be granted to the Journal Editor and Hon. General Secretary/Treasurer respectively.

**NOMINATION OF VICE-PRESIDENT:**

*Resolved.*—That Branch Committees be requested to consider the existing procedure of nominating a candidate for the Vice-Presidency by agreement and report to the May meeting of this Council.

**BENEVOLENT FUND:**

*Resolved.*—That there appears to be little need for the establishment of a Benevolent Fund and that no action be taken at this time.

**ENTRANCE FEES:**

*Resolved.*—That the time is not opportune to introduce the payment of Entrance Fees. Auckland requested their negative vote to be recorded.

**BUILDING:**

Mr. Keys reported that the standing committee of the Royal Society is investigating the erection of a Science building for use by all scientific societies.

**CHEMISTRY IN SCHOOLS:**

*Resolved.*—That Branch Committees be requested to consider methods of promoting the teaching of chemistry in secondary schools and to report to the February meeting.

**GENERAL:**

*Retiring Delegates.*—A vote of thanks for services rendered by the retiring delegates, Dr. Neubauer and Mr. O. H. Keys, was proposed by the Chair and passed with acclamation.

*Retiring President.*—The Vice-President congratulated Dr. Askew on the continued success of the Institute under his guidance and a vote of appreciation for his untiring efforts over the past two years was passed with acclamation.

## NEWS AND NOTES

Dr. L. G. Neubauer, recent Chairman of the Wellington Branch, is resigning from his position of senior chemist in the Wood Chemistry Section of the Dominion Laboratory, Wellington. Early in 1955 he is to take up a position in the Technical Department of the Tasman Pulp and Paper Company at Kawerau.

Dr. W. B. Healy, of the Soil Bureau, D.S.I.R., Wellington, has just returned after three years in the United States. A Fulbright scholar, Dr. Healy spent two years at Rutgers University on an American Food Council scholarship and was awarded a Ph.D. for his thesis on "Zinc Nutrition in Plants and Soil." His third year was spent at John Hopkins University where he held the McCollum-Pratt Postdoctoral Fellowship. Here he investigated the effects of iron deficiency and heavy metal toxicity on enzyme systems in fungi. Dr. Healy is now continuing his work on trace elements at the Soil Bureau.



*Mr. A. T. Rafter, Chairman of the Wellington Branch, presenting the I.C.I. medal to Dr. W. S. Metcalf at a recent Branch meeting.*

Mr. Howard Clark, Secretary of the Auckland Branch, has been notified by the University of New Zealand that he has been granted his Doctorate of Philosophy. For his thesis Dr. Clark investigated the Bond Character of Nickel Complex Salts. At present a Junior

Lecturer at Auckland University College, he graduated M.Sc. with 1st Class Honours in 1951. Dr. Clark has also been awarded a National Research Fellowship and has elected to carry our research at Cambridge University.

The degree of Ph.D. of the University of New Zealand has also been granted to Mr. A. L. Thompson of the Canterbury Branch. Dr. Thompson's research was on the effect of alkyl substituent groups on the hydrolysis of amides.

Another recipient of a National Research Fellowship is Mr. H. V. Brewerton who is a chemist at the Dominion Laboratory, Wellington. A graduate of Victoria University College, he obtained his M.Sc. with 1st Class Honours in Chemistry in 1951. Mr. Brewerton has elected to carry out research on the chemistry of the extractives of New Zealand timbers at Nottingham University.

Mr. J. Rogers, Senior Lecturer in Mineral Engineering at the Otago University School of Mines and Metallurgy, has been granted leave of absence from August, 1955. He will be studying with Dr. J. H. Schulman, Reader in Colloid Science at the Ernest Oppenheimer Laboratory, University of Cambridge. Mr. Rogers expects to be overseas approximately one year.

Dr. R. E. Corbett has been appointed Senior Lecturer in Chemistry, University of Otago.

Dr. J. C. Dacre has taken up his position in the Toxicology Research Department of the Medical Research Council, University of Otago. He is working with Dr. F. A. Denz.

The interests of many chemists now extend into the field of nutrition. To publicise its activities more widely, the British Nutrition Society has recently appointed Honorary Correspondents to represent it in each of the Commonwealth Countries. The New Zealand representative is Dr. W. A. McGillivray, Massey Agricultural College, Palmerston North, and interested members, particularly those proceeding overseas, may obtain from him advance information regarding forthcoming meetings, etc.

Dr. E. L. Richards, Captain, New Zealand Defence Scientific Corps, recently returned to New Zealand after spending three years in Gt. Britain. After completing his Ph.D. at the University of Bristol under Dr. J. K. N. Jones, he spent a further year at the Low Temperature Research Station, Cambridge, investigating the browning reaction in fruit and vegetable dehydration. He is now at the Dairy Research Institute, Palmerston North, continuing investigation on the browning reaction.

Dr. H. R. Whitehead, Assistant Director and Chief Bacteriologist of the Dairy Research Institute, Palmerston North, is to spend about ten months investigating recent development in dairy research work in the United States of America, Canada, Gt. Britain and the Continent. In addition to visiting workers engaged on fundamental aspects of bacteriophage, he will see something of American and Canadian cheese manufacturing industries and cheese factories in Britain. He will also, of course, be particularly interested in New Zealand dairy produce as it arrives in the United Kingdom.

## CONFERENCE, 1955 — PRELIMINARY NOTE



A VIEW OF MASSEY AGRICULTURAL COLLEGE WHERE THE 1955 CONFERENCE IS TO BE HELD.

This year the Annual Conference of the Institute will be held at Palmerston North. The arrangements are in the hands of the Manawatu Branch, and the proposed dates are Tuesday 23rd to Friday 26th, August.

The various addresses and the presentation of papers will be held at Massey College, just outside Palmerston North. A certain amount of hostel accommodation will be available at the College during the Conference, and as was the case when similar accommodation was available in Dunedin 1953, this should add considerably to the convenience of Conference members.

## BOOK REVIEWS

*MOLECULAR THEORY OF GASES AND LIQUIDS*, by J. O. Hirschfelder, C. F. Curtiss and R. B. Bird. Published by John Wiley, Inc. (New York), 1954, 1219 pages. 20 dollars. It is most unfortunate that only a small portion of the magnificently produced book will be of interest to Chemists: It is likely to be of greater interest to Chemical Physicists and Theoretical Physicists. The subject matter is treated from an essentially modern and advanced point of view. After a preliminary chapter on notation and fundamental concepts of the molecular theory of gases and liquids, their equilibrium properties are discussed from the point of view of statistical mechanics. A careful analysis is made of equations of state and the virial co-efficients in gases at both low and high densities, and also liquids. The principle of corresponding states is discussed in detail. It is the first part of the book which will be of most interest to Physical Chemists. In the second part, Non-Equilibrium Properties are discussed, including a detailed examination of transport phenomena and hydrodynamic applications. The third section of the book deals with inter-molecular forces.

The book is lavish in its use of diagrams and references to original literature and its format is a credit to the publishers. It is undoubtedly a book which would have a certain value as a reference book in a university library but it is unlikely that its utility would justify its expense as far as the individual Physical Chemist is concerned. —H.B.

*PHYSICO-CHEMICAL METHODS*, Vol. I and II. Fifth Edition. By J. Reilly and W. N. Rae. Published by Methuen & Co., Ltd., London 1954. £7/10/- for the two volumes.

In this edition Reilly has revised the whole work, some chapters extensively. In these volumes "an attempt has been made to provide an orderly presentation of those border-line practical problems of interest to both the chemist and physicist." In the quarter century since "Physico-Chemical Methods" was first published these volumes have become the reference to which chemists have looked for information on the physical aspects of the chemical manipulation in which they were involved. It is almost impertinent to remark that the new edition will continue to prove just as useful for besides the ample but not too involved theoretical discussion the information on the practical application of methods and description of techniques and apparatus makes the manual of such value that copies should be available in every laboratory. One is justified in saying, "If in doubt over a physico-chemical problem look in Reilly & Rae first." —G.M.W.

*AN INTRODUCTION TO INDUSTRIAL MYCOLOGY*. 4th Edn. By G. Smith. Published by Edward Arnold (Publishers) Ltd., London. May, 1954. 30/-. Having found the 3rd Edition of this manual very useful on many occasions, the reviewer was pleased to have the opportunity of perusing this new edition. "The text has been completely revised and in parts rewritten and the illustrations have now been put as far as possible, on the same pages with, or facing, the appropriate text." 22 new illustrations have been included and 6 of the old illustrations replaced with better ones. Some new genera have been described and illustrated whilst the section on nomenclature has been extended to a short chapter; an appendix on microscopy with a very useful description of the author's personal set-up has been included. This new, expanded edition will be of even greater value than previous ones, for the author, in altering the layout of the book to some extent and including a key to the commonly occurring *Penicillia*, has achieved his objective of improving the ease of reference. The older editions have proved very useful to those

involved in Industrial Mycological problems and this new edition should be of even greater value. As it is a comprehensive text it will supply the needs of those who are involved with only occasional enquiries in mycology whilst for those making a more extensive study of mycological problems there is incorporated excellent and adequate references. At the price of 80/- the author and publishers are to be congratulated on producing a well printed book of such value. —G.M.W.

**SHELL CHEMICAL SOLVENTS.** 2nd Edn., 1954. Our copy from Shell Co. of New Zealand. In this well prepared booklet Shell solvents that are commercially available are discussed. After an introduction outlining the production of the solvents the book is divided into three main parts; firstly, a full description of the properties of each solvent and a note on its chief uses, then, a chapter "Applications of Solvents in Surface Coatings" and finally tables giving general data on solvents. For those interested in chemical solvents and their commercial application this booklet would be a useful addition to their technical literature. Limited supplies are available. —G.M.W.

### BOOKS RECEIVED

**CHEMICAL ENGINEERING MATERIALS.** By Frank Rumford (Glasgow). 880 pages. 1954. London, Constable and Co. 82/6. This book is uniform with the author's "Chemical Engineering Operations" reviewed in this Journal in June, 1952. The opening chapters discuss the theory of corrosion and testing of constructional materials, which are then discussed in order. Chapters are included on inorganic cements and protective coatings and the book concludes with appendices on the resistance of common metals to various chemicals, and mechanical properties of the different chemical engineering materials, followed by a full index. The book is well produced, with many illustrations, and should prove useful both as a text-book and as a work of reference.

**FIAT REVIEW OF GERMAN SCIENCE.** Banden 89-42, Biochemie, parts I-IV. Berlin, Verlag Chemie, 1947, 1953. DM55 for the set. A rather belated issue in German of reports already available in English, written by such well-known chemists as Kuhn, Fischer, Warburg, Helferich and Wieland. The price is reasonable.

**SYNTHETIC METHODS OF ORGANIC CHEMISTRY.** By W. Theilheimer. Vol. 8, 508 pages, 1954. Basle and New York: S. Karger. 78.95 Swiss francs. The present volume of this series follows the now well-known lines, but also includes a four-page article on "Trends in Organic Chemistry." Though rather brief this innovation will be appreciated and could be extended in future volumes. Dr. Theilheimer has also introduced a service by which the articles in forthcoming volumes, each printed on a separate slip of paper, are available in batches of about 40 twice a month, thus enabling a busy researcher to be right up to date, especially as it is claimed that the information will thus be made available some time before it appears in the Abstracts. The yearly subscription for this service is 160 dollars, with cheaper rates for additional copies, and includes information from the author's files, supplied on request.

**BILDER ZUR QUALITATIVEN MIKROANALYSE ANORGANISCHER STOFFE.** By W. Geilmann. 120 pages. 1954. Berlin: Verlag Chemie. DM. 20.80. This book contains a series of 893 excellent microphotographs of inorganic crystal forms which can be used for identification purposes in qualitative analysis, with brief directions as to their preparation, interfering substances and limits of usefulness. These directions are rather too brief, and must be supplemented with fuller notes from other works, but the photos are so good that they cannot fail to command respect. The general production of this book as far as printing, paper and binding are concerned, is also very good.