

SCOTTISH SOCIETY FOR RESEARCH IN  
PLANT-BREEDING.

REPORT.

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THE Directors of the Scottish Society for Research in Plant-Breeding have much pleasure in again submitting the Annual Report—the tenth—to the members of the Society.

It is encouraging to note continued advancement along the various lines of work that are being pursued at the Scottish Plant-Breeding Station. In accordance with the objects the Society have in view, the problems under investigation bear a close relationship to agricultural practice, and, from the research work carried out since the institution of the Society ten years ago, results of practical value are now making a timely appearance.

As the chief aim of the Society is to benefit agriculture, it is desired to draw attention to the practical importance of the work at the Station. One instance of this work may be mentioned—namely, the efforts to produce an oat that will withstand lodging. These efforts have met with a large measure of success. This is evident in the new hybrid variety, named "Elder," which has given very encouraging results in trials conducted for several years, and which has now been registered as a new variety by the Department of Agriculture for Scotland under their scheme for the Registration of Cereals. Other examples of the practical bearing of the work will be noted in the account of the research in progress at the Plant-Breeding Station, given in the report by the Director of Research which appears on pages 17 to 32 hereof.

The various buildings required for the Virus Disease Investigation, towards which a grant was sanctioned by the Empire Marketing Board, have been completed. One chief assistant and two junior assistants have been engaged to carry out investigations under the scheme, and work on virus diseases is now in full progress.

### Financial.

In the Society's ordinary accounts, as audited at 31st March 1931, the funds show an increase of about £60 as compared with the funds a year ago. The total ordinary income has increased from £2262, 18s. 6d. in 1930 to £2390, 17s. in 1931, an increase of about £128. The main items contributing towards this increase were donations of £25 from Scottish Agricultural Industries Ltd., Leith, and of £10 from His Grace the Duke of Buccleuch, and additional income from the sale of produce. The increase in income from produce sold has resulted from the sale of seed of the Elder oat. Had it not been for this additional income the receipts from sale of produce would, in consequence of the low prices prevailing for agricultural produce generally, have been lower than they were in the year ended March 1930. The grant received from the Development Commission, through the Department of Agriculture for Scotland, for the year ended 31st March 1931 amounted to £1166.

The total ordinary expenditure ranking for grant amounts to £3442, 5s. 2d., and it shows a slight increase on that of the previous year. While the salaries of several of the assistants have increased according to scale, decreases have been effected in several other items of expenditure. The workmen's cottages and the greenhouses at Craigs House required extensive overhaul to keep them in a satisfactory condition, and the cost of these repairs accounts largely for the increase in the item for property repairs.

The income and expenditure relating to the Virus Disease Research Work (Empire Marketing Board Grant) are shown

separately, since the cost of this work is met by a special grant from the Empire Marketing Board. A capital grant not exceeding £4450 towards the cost of buildings and equipment was sanctioned. About £3318 of this has already been spent, but several accounts have yet to be paid to contractors and to firms supplying apparatus and equipment. The expenditure on maintenance was comparatively low, as the work at Craigs House and Ainville has been in operation for only a part of the year.

#### **"Dr Wilson" Memorial Fund Accounts.**

The funds in this account now stand at £239, 16s. 6d. The payments from the fund amounted to £38, 3s. 6d., a sum of £26, 5s. having been awarded as a prize to Mr William Runcieman in 1930 for his work in introducing the improved variety of potato oat known as "Castleton."

#### **Membership.**

The Society is composed of 100 life members and 98 annual members (22 at the 10s. rate and 76 at the £1 rate). Two life members and eight annual members were enrolled during the year, three members resigned, and the names of three members who were in arrears with their subscriptions were deleted from the roll. A list of members appears on pages 33 to 37 hereof. A list of members elected since 31st March is appended thereto.

Donors of £20 or over (including donations to the Preliminary Fund) are entitled to become life members of the Society without further payment. Donors of £10 or over may become members of the Society by payment of an annual subscription of 10s., and others by payment of an annual subscription of £1.

In order that the membership list may be kept up to date, changes of addresses should be intimated to the Secretary.

### Election of Directors.

In accordance with the rules of the Society, the six senior Directors retire at this time. Their names are as follows :—

JAMES W. DRUMMOND (Messrs W. Drummond & Sons, Ltd.), Stirling.  
 CHARLES E. GREGOR, Innerwick, East Lothian.  
 WILLIAM LOW of Balmakewan, Laurencekirk.  
 J. T. M'LAREN, 7 Park Place, Stirling.  
 ROBERT MILLER, Ferrygate, North Berwick.  
 JAMES PATON, Kirkness, Glencraig, Fife.

To fill the vacancies thus created, the Directors recommend the election of the following :—

WILLIAM ALLISON, Almond Hill, Kirkliston.  
 Lieut.-Colonel W. T. R. HOULDSWORTH of Kirkbride, Maybole.  
 Major JAMES KEITH, Pitmedden, Udney.  
 ALEXANDER NELSON, Ph.D., Royal Botanic Garden, Edinburgh.  
 Professor ERNEST SHEARER, Agricultural Department, The University,  
 Edinburgh.  
 Professor WILLIAM WRIGHT SMITH, Inverleith House, Arboretum  
 Road, Edinburgh.

JOHN STIRTON,  
*Secretary.*

THE UNIVERSITY OF CHICAGO

DEPARTMENT OF ECONOMICS

[ABSTRACT OF ACCOUNTS

1. The following table shows the results of the accounts for the year ending 1954. The figures are in thousands of dollars.

Item	1954	1953
Income	100	95
Expenses	80	75
Surplus	20	20

2. The following table shows the results of the accounts for the year ending 1955. The figures are in thousands of dollars.

Item	1955	1954
Income	110	100
Expenses	90	80
Surplus	20	20

3. The following table shows the results of the accounts for the year ending 1956. The figures are in thousands of dollars.

Item	1956	1955
Income	120	110
Expenses	100	90
Surplus	20	20

4. The following table shows the results of the accounts for the year ending 1957. The figures are in thousands of dollars.

Item	1957	1956
Income	130	120
Expenses	110	100
Surplus	20	20

5. The following table shows the results of the accounts for the year ending 1958. The figures are in thousands of dollars.

Item	1958	1957
Income	140	130
Expenses	120	110
Surplus	20	20

6. The following table shows the results of the accounts for the year ending 1959. The figures are in thousands of dollars.

Item	1959	1958
Income	150	140
Expenses	130	120
Surplus	20	20

7. The following table shows the results of the accounts for the year ending 1960. The figures are in thousands of dollars.

Item	1960	1959
Income	160	150
Expenses	140	130
Surplus	20	20

## ABSTRACT OF

*For the year ended*

### INCOME.

Interest Received . . . . .	£1,615 12 9
Recoverable Income Tax . . . . .	254 17 5
	£1,870 10 2
Sale of Produce and Stock on Hand . . . . .	377 5 1
Rents Received . . . . .	13 10 0
	Income Ranking for Grant . . . . .
	£2,261 5 3
Subscriptions—Annual . . . . .	84 10 0
<i>Note.</i> —Annual Subscriptions amounting to £8, 10s. are in arrear.	
Donations—	
£10 or over . . . . .	£35 0 0
Under £10 . . . . .	10 1 9
	45 1 9
Total Ordinary Income . . . . .	£2,390 17 0
Grant from the Department of Agriculture for Scotland for the year 1930-31 . . . . .	1,166 0 0
	Total Income . . . . .
	£3,556 17 0
Funds at 1st April 1930 . . . . .	44,154 9 10
	£47,711 6 10

## ACCOUNTS.

*31st March 1931.*

### EXPENDITURE.

Salaries—	
Officers (including Ainville Sub-Station) . . . . .	£1,935 15 0
Secretary and Office . . . . .	215 0 0
	£2,150 15 0
Labour . . . . .	602 1 6½
National Health and Unemployment Insurances . . . . .	18 4 0
Seeds and Roots . . . . .	11 16 2
Manures . . . . .	103 15 8
Sundry Working Expenses, including renewals of Implements and Tools . . . . .	101 8 4½
Laboratory Expenses . . . . .	13 8 3
Library Expenses . . . . .	39 5 2
Rates and Insurances . . . . .	39 0 2
Office Expenses . . . . .	96 19 5
Heating, Lighting, and Cleaning . . . . .	32 9 1
Travelling Expenses . . . . .	32 18 7
Property Repairs and Upkeep . . . . .	116 8 11
Locality Trials . . . . .	10 10 3
Advertising . . . . .	0 12 0
Ainville Sub-Station Expenses . . . . .	72 12 7
	Expenditure Ranking for Grant . . . . .
	£3,442 5 2
Depreciation on Implements, Tools, Furniture, &c. . . . .	53 14 1
	Total Expenditure . . . . .
	£3,495 19 3
Funds at 31st March 1931, per Balance-sheet . . . . .	44,215 7 7
	£47,711 6 10

## BALANCE-

As at 31st

## LIABILITIES.

I. Accounts Outstanding . . . . .	£33 16 0
II. Funds at 31st March 1931 . . . . .	44,215 7 7

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£44,249 3 7

## DR WILSON

Award—W. Runcieman . . . . .	£26 5 0
Advertising . . . . .	8 18 6

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£35 3 6

Value at 31st March 1931. Funds at 31st March 1931, consisting of—

£208 10 0	£200 5 per cent War Stock, 1929-47— value at date of transfer . . . . .	£176 5 0
	Sum in Bank on Deposit Receipt . . . . .	40 0 0
	Sum in Bank on Current Account . . . . .	23 11 6

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239 16 6

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£275 0 0

## SHEET.

March 1931.

## ASSETS.

I. Houses and Lands, at Cost . . . . .	£7,813 16 4
II. Implements and Tools, at Cost, less Depreciation . . . . .	629 11 4
III. Laboratory Apparatus, at Cost, less Depreciation . . . . .	139 14 6
IV. Office Fittings, at Cost, less Depreciation . . . . .	79 7 2
V. Stocks on Hand, as valued by Directors . . . . .	89 6 8
VI. Accounts Outstanding . . . . .	138 15 10
VII. Income Tax Recoverable . . . . .	254 17 5
VIII. Investments, at Cost :—	

Value at 31st March 1931.		
£14,595 0 0	1. £14,000 5 per cent War Stock, 1929-47 . . . . .	£12,390 0 0
12,810 0 0	2. £14,000 4 per cent Funding Stock, 1960-90 . . . . .	10,045 0 0
13,351 0 0	3. £16,900 3½ per cent Conversion Stock . . . . .	11,140 3 6
800 0 0	4. £800 Edinburgh Corporation Loan . . . . .	800 0 0
£41,556 0 0		34,375 3 6
	IX. Equipment at Ainville Sub-Station, at Cost . . . . .	183 7 6
	X. Cash Balances—	
	In Bank—	
	On Current Account . . . . .	£210 13 9
	On Deposit Receipt . . . . .	300 0 0
	On Hand . . . . .	34 9 7
		545 3 4
		£44,249 3 7

## MEMORIAL FUND.

Funds at 1st April 1930 . . . . .	£261 5 0
Interest for year . . . . .	13 15 0

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£275 0 0

## VIRUS DISEASE RESEARCH SCHEME

## ABSTRACT OF

For the Year ended

## INCOME.

Grant from Empire Marketing Board . . . . .	£1859 12 6
Funds at 1st April 1930 . . . . .	2284 12 0

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£4144 4 6

## BALANCE

As at 31st

## LIABILITIES.

I. Accounts Outstanding . . . . .	£75 3 3
II. Funds at 31st March 1931 . . . . .	3249 10 2

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£3324 13 5

EDINBURGH, 30th April 1931.—The undersigned, having had access to all the Accounts, and verified the same with the Accounts and Vouchers relating thereto, now 16 ALVA STREET.

## (EMPIRE MARKETING BOARD).

## ACCOUNTS.

31st March 1931.

## EXPENDITURE.

Salaries and Wages . . . . .	£582 19 10½
Maintenance Expenses—	
Craigs House . . . . .	£207 6 4
Huntly . . . . .	67 14 4½
Ainville . . . . .	36 13 9

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311 14 5½

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£894 14 4

## Capital Expenditure—

Craigs House . . . . .	£802 11 1
Huntly . . . . .	176 5 7
Ainville . . . . .	53 0 6

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£1031 17 2

Funds at 31st March 1931 . . . . .	3249 10 2
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£4144 4 6

## SHEET.

March 1931.

## ASSETS.

## I. Buildings, Implements, Apparatus, &amp;c., at Cost—

Craigs House . . . . .	£2164 16 4
Huntly . . . . .	832 10 4
Ainville . . . . .	321 0 8

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£3318 7 4

## II. Cash Balances—

In Bank, on Current Account . . . . .	£2 4 11
On Hand . . . . .	4 1 2

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6 6 1

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£3324 13 5

Books and Accounts of the Society, and having examined the foregoing Statements of signs the same as found to be correct, duly vouched, and in accordance with law.

W. SLATER BROWN, C.A., Public Auditor.



## ANALYSIS OF MEMBERS

As at 31st March 1931.

Aberdeen . . . . .	6	Lanark . . . . .	13
Angus . . . . .	8	Linlithgow . . . . .	4
Argyll . . . . .	3	Midlothian . . . . .	37
Ayr . . . . .	13	Moray . . . . .	1
Banff . . . . .	3	Nairn . . . . .	0
Berwick . . . . .	13	Orkney . . . . .	2
Bute . . . . .	0	Peebles . . . . .	3
Caithness . . . . .	1	Perth . . . . .	13
Clackmannan . . . . .	0	Renfrew . . . . .	5
Dumbarton . . . . .	2	Ross and Cromarty . . . . .	6
Dumfries . . . . .	9	Roxburgh . . . . .	4
East Lothian . . . . .	27	Selkirk . . . . .	2
Fife . . . . .	11	Stirling . . . . .	2
Inverness . . . . .	0	Sutherland . . . . .	0
Kincardine . . . . .	1	Wigtown . . . . .	2
Kinross . . . . .	0	England . . . . .	3
Kirkcudbright . . . . .	4		<u>198</u>

## ESTABLISHMENT FOR 1930-31.

## BOARD OF DIRECTORS.

*Trustees.*

THE RIGHT HON. WILLIAM ADAMSON, M.P., Secretary of State for Scotland.

JAMES ELDER, Athelstaneford Mains, Drem.

DAVID BELL, 15 Coburg Street, Leith.

JOHN FINLAYSON M'GILL, 69 Kyle Street, Ayr.

*Ordinary Directors.*

## 1928.

JAMES W. DRUMMOND (Messrs W.

Drummond & Sons, Ltd.), Stirling.

CHARLES E. GREGOR, Innerwick, East Lothian.

WILLIAM LOW of Balmakewan, Laurencekirk.

J. T. M'LAREN, 7 Park Place, Stirling.

ROBERT MILLER, Ferrygate, North Berwick.

JAMES PATON, Kirkness, Glencraig, Fife.

## 1929.

W. J. CAMPBELL, 61 Fountainhall Road, Edinburgh.

WILLIAM CUTHBERTSON (Messrs Dobbie & Co., Ltd.), Edinburgh.

Sir JAMES INGLIS DAVIDSON, Saughton Mains, Corstorphine.

IAN C. MENZIES, W.S., 22 Rutland Street, Edinburgh.

GEORGE G. MERCER, Southfield, Dalkeith.

G. BERTRAM SHIELDS, Rosebery Farm, Gorebridge.

## 1930.

D. L. BOWE, Skateraw, Dunbar.

JOHN CHISHOLM, Ladysbridge, Banff.

JOHN E. B. COWPER, Gogar House, Corstorphine.

J. H. MILNE HOME, Irvine House, Canonbie.

WILLIAM KAY, 19 South St David Street, Edinburgh.

J. P. ROSS TAYLOR, Mungoswalls, Duns.

*Directors Co-opted.*

Major JAMES KEITH, Pitmedden, Udney.

Professor ERNEST SHEARER, Agriculture Department, The University, Edinburgh.

Professor WILLIAM WRIGHT SMITH, Inverleith House, Arboretum Road, Edinburgh.

*Directors nominated by the Department of Agriculture.*

Sir ROBERT B. GREIG, M.C., LL.D.,

J. M. CAIE, M.A., B.L., B.Sc.,

T. ANDERSON, M.A., B.Sc.,

ALEXANDER M'CALLUM, M.A., LL.B.,

} York Buildings, Queen Street,  
Edinburgh.

*Chairman of Directors*—JAMES ELDER, Athelstaneford Mains, Drem.

*Vice-Chairman*—DAVID BELL, 15 Coburg Street, Leith.

*Director of Research*—WILLIAM ROBB, N.D.A., F.R.S.E., Craigs House, Corstorphine.

*Chief Assistant*—JAMES W. GREGOR, Ph.D., F.L.S., Craigs House, Corstorphine.

*Assistant*—V. E. M'M. DAVEY, B.Sc., Ph.D., Craigs House, Corstorphine.

*Assistant, Potato-Breeding Sub-Station*—WILLIAM BLACK, B.Sc., Ainville Farm, Kirknewton.

*Assistants under Virus Disease Scheme*—E. C. BARTON WRIGHT, M.Sc., Craigs House, Corstorphine; GEORGE COCKERHAM, B.Sc., Gibston, Huntly; and ALAN M'BAIN, B.Sc., Ainville, Kirknewton.

*Temporary Junior Assistant*—J. M. S. LANG, B.S.A., Craigs House, Corstorphine.

*Secretary*—JOHN STIRTON, 8 Eglinton Crescent, Edinburgh.

## COMMITTEES.

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### RESEARCH.

G. Bertram Shields, *Convener*.  
 T. Anderson.  
 W. J. Campbell.  
 John Chisholm.  
 John E. B. Cowper.  
 William Cuthbertson.  
 J. W. Drummond.  
 Charles E. Gregor.  
 Sir Robert B. Greig.  
 J. H. Milne Home.  
 William Kay.

Major James Keith.  
 William Low.  
 J. F. M'Gill.  
 George G. Mercer.  
 James Paton.  
 Professor Ernest Shearer.  
 Professor W. Wright Smith.  
 J. P. Ross Taylor.  
 James Elder, *Chairman, ex officio*.  
 David Bell, *Vice-Chairman, ex officio*.

### MANAGEMENT.

David Bell, *Convener*.  
 D. L. Bowe.  
 J. M. Caie.  
 John E. B. Cowper.  
 Sir J. Inglis Davidson.  
 Charles E. Gregor.  
 J. H. Milne Home.  
 William Kay.

Major James Keith.  
 J. T. M'Laren.  
 George G. Mercer.  
 Robert Miller.  
 Professor Ernest Shearer.  
 G. Bertram Shields.  
 James Elder, *Chairman, ex officio*.

### FINANCE.

J. H. Milne Home, *Convener*.  
 W. J. Campbell.  
 William Low.  
 Alex. M'Callum.  
 Ian C. Menzies.

Robert Miller.  
 G. Bertram Shields.  
 J. P. Ross Taylor.  
 James Elder, *Chairman, ex officio*.  
 David Bell, *Vice-Chairman, ex officio*.



FIG. 1.

View of the New Laboratories for Virus Disease Research,  
Craigs House, Corstorphine.



FIG. 2.

Another view of part of the New Greenhouses and Laboratories  
for Virus Disease Research.



FIG. 3.  
A few typical ears of the "Elder" Oat.



FIG. 4.  
Crop of "Elder" Oats being cut on 2nd September 1930.

# R E P O R T

BY

## DIRECTOR OF RESEARCH.

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### I. Research Programme.

“The aim of the Society is to establish a thoroughly equipped Station, and to promote the discovery and the creation of such new and improved races of the leading crop plants as are best suited to Scottish conditions.

“The methods employed at the Station to obtain improved types of plants are, in the main :—

- “ (a) Collection and classification of suitable living material.
- “ (b) Isolation of pedigree strains (pure lines).
- “ (c) Hybridisation of pedigree strains, varieties and species.
- “ (d) Comparative trial of varieties, pedigree strains, &c.”

The crop plants on which breeding experiments are being carried out are chiefly Oats, Potatoes, Herbage (Perennial Ryegrass, Cocksfoot, Timothy, and Plantain) and Swedes. A review of the work done and the results obtained during the past year follows.

#### A. CEREALS.

##### *Oats.*

The breeding experiments with oats were successfully continued. The usual area of about four acres at the Station was utilised for the experiments relating to the breeding, selecting and comparing of new strains of oats.

Various varieties and strains were chosen for crossing, and an adequate number of  $F_1$  hybrid grains was secured. A large number of  $F_2$  generation plants was grown for genetical analysis and selection. In crossing black-grained and white-grained oats diverse results have been obtained in a number of instances over a period of several years. In the  $F_2$  hybrid families of these, the proportions of non-white grained to white-grained plants have approximated various ratios as widely different as 3 to 1 and 255 to 1, from which it would appear that there must be genetical differences in the black-grained varieties used as parents. These differences are important from a plant-breeding standpoint, and an endeavour is being made to account for them.

In addition to classifying the various botanical forms in the different crosses, search was made amongst all the  $F_2$  and older generation families, comprising about 10,000 spaced plants, for plants likely to give rise to economic varieties possessing a type of straw which will withstand lodging. Attention is being directed to creating and selecting early-ripening, productive types having the desired type of upstanding straw. In selecting individual plants due consideration is given to those possessing well-filled, thin-skinned grain. The search for improved strains of oats amongst hybrid material has been encouraging, and among the more recently fixed promising hybrid selections the following crosses are represented:—

Orion × Sandy.	Castleton Potato × Yelder.
Orion × Yelder.	Victory × Bathurst.

There are several early-ripening attractive grain types in the Orion hybrids, but in some of them, unfortunately, the straw does not appear to be as resistant to lodging as might be desired in certain circumstances. In the hybrids from Potato × Record there are a few fairly early-ripening, short-strawed types which are likely to withstand lodging, and which possess well-filled grain of medium size.

Two selections from Tam Finlay crosses have been chosen for further trial on account of their leafiness and free-tillering habit of growth. It is quite possible that either of these varieties might be especially valuable as a component of a silage mixture.

Amongst the first hybrid oat selections obtained at the Station, several have now been tested for a number of years.

The most outstanding of these have been obtained by crossing Castleton Potato with Beseler's Prolific, and by crossing Sandy with Leader. A few of the Castleton Potato hybrids have been noted for their relatively short straw which does not readily lodge, and for their productiveness on fertile soils. One of these selections has been subjected to a series of trials at the Plant-Breeding Station and at the Plant Registration Station, Department of Agriculture for Scotland, Corstorphine, and in other localities throughout Scotland. This selection was registered in 1930 by the Department of Agriculture for Scotland under their scheme for the Registration of Cereals, and is now known as "Elder," having been named after Mr James Elder, Chairman of the Board of Directors of the Society. The Certificate of Registration issued by the Department of Agriculture for Scotland in respect of this variety states: "In view of the general excellence of the Elder oat in comparison with the best standard varieties, and especially in view of its capacity to withstand lodging, the Department have registered the variety in terms of their scheme for the Registration of Cereals." Other two selections from Castleton Potato  $\times$  Beseler's Prolific are still undergoing trial. One of these, Aa 615, which closely resembles Elder, has also given encouraging results.

Two selections from Sandy  $\times$  Leader were included in the trials in 1930. These two were selected for comparison with Sandy or Potato varieties. They are early-ripening types with a good quality of straw. As a result of several years' trials it has again been decided to include one of them in the 1931 trials.

Small plot trials of new selections were again made at the Station as in previous years, some in rod-row plots and others in replicated small field plots. In the latter plots twenty-four hybrid selections were compared with six named varieties. The drought in the early part of the summer and the spell of wet weather at harvest time, however, were unfavourable for making satisfactory comparisons of grain yields. The crops were lighter than usual and the yields of grain, particularly in the high-yielding selections, were, in comparison with those of the previous years, considerably lower.

*Locality Trials.*—Arrangements were again made with the Agricultural Colleges in Scotland to have several of the Society's selections included in some of the trials in the



respective College areas. There were four strains, including Elder, from the Castleton Potato—Beseler's Prolific cross, two strains from the Sandy—Leader cross, and one strain from a Sandy—Record cross.

*Elder Oats.*—This variety was tested more extensively than any of the other strains from the same cross. At Craibstone, Aberdeen, in Standing Power Trials, Elder withstood lodging better than any other variety, and gave a yield at the rate of 30.7 cwt. per acre. In 1929 and 1930 Elder has been the stiffest-strawed variety in the trials at the Edinburgh and East of Scotland College Farm, Boghall, Midlothian. In a field trial near Rothies in Morayshire, Elder gave a yield of grain at the rate of 36 cwt. per acre in comparison with 30 cwt. from Victory, and the crop stood satisfactorily until it was cut.

Favourable reports on the Sandy—Leader crosses, No. Aa 604 and Aa 605, were again received from the trials in the North of Scotland and also from the trials in Dumfriesshire. Mr H. H. Corner, B.Sc., County Organiser for Orkney, reporting on the trial there, states: "No. Aa 605 is a most promising oat for Orkney, and, considering its marked earliness compared with White or Red Sandy, the quantity and quality of straw and grain, and its rather better resistance to lodging, it is worth extended trial throughout the county. It would appear to be specially suitable for the poorer soils, and it is likely to withstand shaking in exposed situations." The selection Aa 604 was tried on a farm near Thurso. It appears that it had been sown rather too thickly, but, notwithstanding, it gave a slightly better yield of grain than did Castleton Potato. It also ripened earlier, and the grain was heavier per bushel than that of Castleton Potato.

In the trials in Dumfriesshire of No. Aa 604 and Aa 605, it was reported that both varieties were early-ripening and that they produced a fine type of straw. No. Aa 605 gave the heavier yield of grain.

*Multiplication of the Elder Oat.*—About 9 acres of this oat were grown under contract for the Society in 1930. A limited quantity—viz., 3 cwt.—of seed of this oat was offered to members of the Society, and thirty members applied for and received seed. Several applications were also received from non-members of the Society, but these applicants could not be supplied with seed this season. Arrangements have been made to have about 27 acres of Elder oats grown under con-

tract for the Society in 1931, and an additional 2 acres are being grown at the Plant-Breeding Station, Corstorphine.

*Multiplication of No. Aa 605.*—In view of the favourable reports from the North of Scotland, about 3 acres of this variety are also being grown for the Society in 1931.

### *Wheat and Barley.*

Several small plots of wheat and barley were again grown for comparison and selection. A few wheat crosses in the  $F_2$  generation were studied by Mr J. M. S. Lang, Temporary Junior Assistant, who chose some promising types for further trial. Several other crosses were also made with a view to obtaining improved varieties of spring wheat. Nearly fifty single-ear selections of Plumage Archer Barley have been received from Mr William Kay, St David Street, Edinburgh, for observation and comparison. A further trial was also made of the stiff-strawed selection from the single plant of Plumage Archer received in 1927 from Mr G. Bertram Shields, Rosebery Farm, Gorebridge. This selection is again being tested in 1931.

### B. POTATOES.

*Assistant in Charge*—WILLIAM BLACK, B.Sc. (Ainville Sub-Station).

The potato breeding work was continued along the lines described in previous reports. This work is concerned largely with the study of hereditary characters and the selection of promising seedling potatoes. Efforts are being made to ascertain more definitely the genetical constitution of several varieties. This work entails the raising of families of seedlings, as large as possible, for comparative study. After the required botanical comparisons are made, any promising economic seedlings are retained for further comparison in field trials.

The first year seedlings studied in 1930 included families from—

Majestic × Flourball.	Up-to-date × 160(78) (a back cross).
Epicure × 135(10).	Edzell Blue × 120(4).
Edzell Blue × Majestic.	Kerr's Pink × 147(52) (a back cross).
British Queen × 120(4).	

Several families of selfed seedlings were also studied. It has been repeatedly noted that many of the later-maturing seedlings make the most vigorous growth and produce the largest yield of tubers. Frequently the earlier-maturing seedlings make comparatively little growth after they have been planted out in the open, and their tubers are generally small and few in number. This condition, no doubt, tends to make the separation of the early-ripening types from some of the lower-yielding and later-ripening types difficult. When preference in making selections had been given to the higher-yielding seedlings, subsequent trials of these have shown that they were mainly if not entirely late-maturing types. Within the last few years greater attention has been devoted to searching for early-maturing varieties, and a considerable number of seedlings which appear to be early-maturing has been retained for further comparison and selection.

Since the first year seedlings tend to make rather slow growth at Ainville Sub-Station, it has been necessary to grow larger numbers of seedlings in the second year in order to ascertain more accurately their maturity and relative productiveness. Plots of selected first year seedlings were grown both at Corstorphine and at the Sub-Station. It was noted that families of seedlings from the varieties Ally, Bishop, King Edward and Majestic contained a relatively large proportion of plants possessing tubers of desirable shape and free from pigment on the skin. The standard of excellence now required in any new variety is high, and unless a seedling produces tubers of good shape, preferably oval and shallow-eyed, it has but a slight chance of ever being cultivated extensively. It is therefore important in breeding potatoes to ascertain which varieties or combination of varieties will produce families of seedlings in which the tubers of the bulk of the plants are all of good shape and size. Fine tuber shape, however, is not the only desirable character that a promising seedling must possess, and the second and succeeding years' trials provide opportunities for further elimination of those that fail to reach the necessary standards. The third and fourth years' trials show which selections can be confidently discarded as a result of more accurate estimates of productiveness, habit of growth, susceptibility to disease, or cooking quality of the tubers.

The experiments started a few years ago for the purpose of

obtaining some new varieties for experimental breeding, by repeated self-fertilisation of various strains, have made further progress, and a number of plants are now in the fifth generation. Other families are also being propagated, and several of these are now in the  $F_2$ ,  $F_3$ , or  $F_4$  generations. While the degree of uniformity in type is becoming more pronounced, none of the strains is as yet breeding true to type for all the characters that are being observed. The rate at which uniformity of type is obtained depends upon the genetic constitution of the plants selected as parents. Should the more heterozygous plants be selected, progress towards uniformity must necessarily be slower than when relatively homozygous plants have been chosen, and the selector cannot be certain of the pure-breeding or homozygous plants except through the progeny test.

It is of interest to note that the plants which have been produced through repeated self-fertilisation remain strong and healthy, and that loss of vigour through inbreeding has not yet become apparent. At the Sub-Station at Ainville little difficulty has been experienced in maintaining selected stocks of seedlings and also of named varieties in an apparently healthy condition. The increase in the amount of virus disease was practically negligible. Only a few plants were discarded last year on account of the appearance of symptoms of virus disease. Small degenerate-looking plants were again found amongst the first year seedlings, and, although slight symptoms of virus disease were found in some of them, it is suspected that the majority of the degenerate plants suffered from abnormalities which were probably of genetic origin.

Field trial plots of the most promising seedlings were grown at Craigs House. 273 seedling selections were included in the trial plots for comparison, mainly with Great Scot and Kerr's Pink. After tabulating and comparing the results of the various trials, it was decided that three varieties should be entered in 1931 for the 1st Year Registration Trials conducted by the Department of Agriculture for Scotland. Two of these varieties were included because one of their meritorious properties was the excellent cooking quality of their tubers.

*Philpstoun Trials.*—A large group of seedlings was again sent to the Trials at Philpstoun, carried out by the Department of Agriculture for Scotland, and various selections were recommended for further trial.

In 1930 six varieties raised by the Society were grown in the Department's Registration Trials, three in the second year and three in the first year trials. In view of the reports received on these varieties, it was decided not to multiply further the three varieties in the second year trials for the following reasons: In No. 94(105) the cooking quality of the tubers was considered to be inferior; in No. 96(33) and 96(43) the maturity of the tubers was too late. These two varieties, No. 96(33) and 96(43), produced heavy crops, and the foliage of both was remarkably vigorous and free from symptoms of virus disease. Of the three varieties in the first year trials, one—No. 93(53)—was recommended for inclusion in the trials in 1931. This variety was placed in the early maincrop group: it has white oval tubers of attractive appearance, and has produced a good yield of tubers in previous trials. The remaining two varieties have been discarded; in No. 96(35) the tubers were rather "small in the run," and in No. 96(130) the tubers developed a brown ring in the flesh. The demand for new varieties of potatoes with tubers of the highest table quality renders it imperative to ascertain the cooking quality of selected seedlings at as early a stage as possible, and an endeavour is made on a small scale each winter to do this. This test, however, cannot be made at the earliest before the second year. Hence it not infrequently happens that a seedling variety which has given encouraging cropping results in the first two years fails to come up to the standard requirements as regards quality.

As in previous years, tubers from seedlings were submitted to the Department of Agriculture for Scotland for inclusion in their Wart Disease Trials.

### C. HERBAGE PLANTS.

*Assistant in Charge*—J. W. GREGOR, Ph.D., F.L.S.

While the usual work in connection with the selection of Perennial Ryegrass, Cocksfoot and Timothy was undertaken, much of the research in this section has been devoted to the examination of timothy types. It may be of interest to mention with regard to the agricultural utilisation of timothy that the present distribution of common timothy (*Phleum pratense* L.) offers an example of man's interference with

nature. *Phleum pratense* L. is a native of the Old World, occurring in Europe and temperate Asia and extending from the Mediterranean northward to about lat. 70°. Although the species has long been extensively cultivated in America, the botanical evidence is strongly against its being indigenous to the New World. Alpine timothy (*P. alpinum* L.), on the other hand, is not confined to the Old World, but occurs in Greenland, North America, and has been recorded from Patagonia.

Common timothy was probably introduced into America from Europe during the early colonial period. It is, however, believed that timothy was first brought into cultivation in the United States of America, and that it was from there that the cultivated form was imported into Britain. According to Witte, timothy had already been cultivated in Sweden, under the name Ångskampe, prior to the introduction of seed from America.

The cultivated timothy of to-day certainly exhibits a certain uniformity of type, but it cannot be regarded as the only type found in Britain. From the examination of populations growing in culture at Corstorphine, collected from various habitats, both in Britain and Continental Europe, it is apparent that two distinct groups of agricultural value occur within the species *P. pratense*. It has already been mentioned in a previous report that the cultivated forms have been included in Group I., and that the comparatively low-growing forms have been included in Group II. So far it has not been found possible to obtain hybrids between these two groups. Populations collected from old "natural" heavily grazed pastures contained solely Group II. forms, but in collections from certain "cultivated" pastures, only occasional plants of this group were present in association with those of the predominating "cultivated" group; both groups have been found in waste places where the grazing factor was absent, but Group II. forms seem to be better suited to dry conditions.

Although no hybrids between the two groups of *P. pratense* have so far been obtained, it has been found possible to hybridise both these groups with a particular form of Alpine timothy (a tetraploid form), and also to bridge the sterility gap between Groups I. and II. by making a series of crosses which initially involved this tetraploid form of alpine timothy. In addition to the possible agricultural value of the numerous forms resulting from the various crosses the work has em-

phased some of the limitations of the present system of classification for economic plants. An outline of a system of classification based on several lines of inquiry has been suggested for the group *P. pratense—alpinum*, and it will be published shortly in the 'New Phytologist,' Vol. 30, No. 3.

Populations of *P. pratense* L., from various habitats in Britain and Continental Europe, and of *P. alpinum* L., from Britain, Central Europe, Arctic Europe and Canada are being critically studied with a view to obtaining forms suited to the conditions of pasture land.

The experimental study of habitat populations of the sea plantain (*Plantago maritima*) has been continued, and populations from Britain, Arctic Europe, Faroe Isles, Iceland, Greenland and Western America are now in culture at Corstorphine. The results so far obtained are believed to have much agricultural significance. It is possible that in addition to elucidating certain problems in connection with the occurrence of habitat types, the examination of wild populations from different geographical positions may indicate areas from which collections of plants of economic importance could be made with advantage.

An effort is being made to ascertain whether the sea plantain might be of agricultural value, and one encouraging result has been obtained. In a report received from Dr J. B. Orr of the Rowett Research Institute, Aberdeen, on the chemical composition of a sample of sea plantain grown at this Station, it was shown that the leaves were rich in calcium and protein.

*Multiplication of Strains.*—Three strains of pasture grasses have now reached the seed multiplication stage; these include (1) Group II. timothy, (2) a grazing type of perennial ryegrass, and (3) a broad-leaved type of cocksfoot of intermediate height. Quantities of seed of these strains have been forwarded to the Director of the National Institute of Agricultural Botany, Cambridge, with whom arrangements were made to have the strains multiplied by seed for the Society. Vegetative multiplication and the raising of 'stock' seed is being made simultaneously at the Plant-Breeding Station, Corstorphine.

*Perennial Ryegrass and Cocksfoot.*—Numerous strains of these two species are being examined for grazing types.

## D. ROOT CROPS.

(*Swedes and Turnips.*)

*Assistant in Charge*—V. E. M'M. DAVEY, B.Sc., Ph.D.

The main purpose underlying the experiments with swedes is the examination of various methods for selecting and comparing individual bulbs, intended for use in breeding, with a view to obtaining improved strains or varieties.

*Pedigree Breeding.*—About 210 strains of swedes and turnips were sown out in small plots, commercial varieties being employed as controls; and some of the strains were also sown in larger plots in suitable groupings for the purpose of comparative trials. The pedigree lines of swedes included a wide range of types chosen originally from the 1922 variety trials, and then in the fourth selfed generation. There was also a number of more recently selected strains, which were being introduced as the less suitable of the older stocks became discarded. A considerable area was allotted to second generation hybrids. These hybrids represent crosses made in 1927 between yellow- and white-fleshed swedes, and between various colour types in turnips. Observations were made periodically on all the strains during the season, and in autumn representative selections were made for propagation.

*Controlled Seeding.*—About 160 samples of seed were obtained by self-fertilisation of single plants under bag isolation, while two larger samples, each over 1 lb., were obtained by seeding groups of plants in distance isolation. About twenty hand-crossings were also performed for the purpose of obtaining recombinations of characters, or to test their inheritance.

*Analysis of Hereditary Characters.*—Further investigations were made on the manner of inheritance of various characters, such as yield, dry-matter and sugar percentages, shape of bulb, colour of flesh and skin, type of foliage, disposition to bolt, malformation of bulb, and resistance to finger-and-toe disease. Some results of interest may be quoted with regard to colour of skin and flesh.

A few notes were given in the Report of 1929, in which it was shown that the presence of white flesh in swede was due to duplicate pairs of hereditary factors. In the presence of one factor alone the flesh is white, and when none is present the flesh is yellow. In turnip only one such pair of factors has yet been found, so that in the presence of one or both factors



of the pair the flesh is white, and when neither is present the flesh is yellow. It has now been shown conclusively that in swede another duplication of factor-pairs occurs, the character of the purple-top skin colour being caused by two separate hereditary mechanisms. When purple-top plants of yellow- and white-fleshed strains were crossed, the first generation hybrids were all purple-top, having received one factor for that character from each parent. If those two factors had been identical, they would have formed a pair in the hybrid, and thus ensured true-breeding purple-tops throughout the subsequent generations. Actually, however, they were bronze-tops to the extent of one-sixteenth in the progenies of hybrid plants (1343 purple-top, 84 bronze-top). It may be concluded therefore that the factor causing purple-top in the white-fleshed parent was different from that common to the yellow-fleshed varieties. When thrown together in the hybrid each factor was in a state which could not breed true; it followed therefrom that in the next generation one or both factors was present in fifteen cases, whilst in the sixteenth both were absent and the plant was consequently bronze. In turnip only simple Mendelian inheritance with one factor pair has so far been found for the red skin colour.

*Feeding Quality Investigations.*—The methods at present employed in attempts to improve strains of swede comprise estimations of (i) yield or weight, (ii) dry matter, (iii) soluble solids, and (iv) sugar. Three yield trials were carried out in which these tests, except that for sugar, were used. In two of these, groups of pedigree lines derived from certain varieties were compared with samples of their parent varieties, with a view to deciding which lines should be continued and which discarded. In the third trial three mass-multiplied strains were similarly tested in larger plots.

Several hybrid populations were compared with adjacent plots of their parent lines, in order to study the effects of crossing and selfing on vigour. Dry-matter, sugar and yield determinations were made on single plots of progenies of plants which had been similarly tested.

Three second hybrid generations were employed for single bulb analyses, large and well-shaped bulbs being tested for dry-matter percentage and weight, and those showing well-marked differences being saved for seeding.

The purpose of these trials is to sort out the various lines with a view to assessing their agricultural value.

## E. VIRUS DISEASE RESEARCH.

(Under Empire Marketing Board Grant.)

E. C. BARTON WRIGHT, M.Sc., *Chief Assistant, Craigs House.*  
 GEORGE COCKERHAM, B.Sc., *Assistant, Huntly Sub-Station.*  
 ALAN M. M'BAIN, B.Sc., *Assistant, Ainville Sub-Station.*

Research work on virus disease of potatoes is being undertaken by the Society at Craigs House, Corstorphine, and at the Sub-Stations at Gibston, Huntly, Aberdeenshire, and at Ainville, Kirknewton, Midlothian.

The Chief Assistant was appointed in September 1930, and he took up his duties as from 15th December following. Prior to starting work at Craigs House, Mr Barton Wright visited the research stations at Cambridge, Rothamsted and Cheshunt, where investigations are also being made on virus diseases. Mr George Cockerham, the assistant who is in charge of the work at the Huntly Sub-Station, was appointed in July 1929, and has carried out a series of preliminary investigations and collected material for future experimentation. Mr Alan M'Bain, the other assistant, who was appointed in the summer of 1930, was engaged mainly at the Sub-Station at Ainville, making preparations and collecting material for the investigations to be made in 1931. Research work is now proceeding at all three centres.

## II. Publications and Lectures by Staff, for the Year ended 31st March 1931.

### PUBLICATIONS (P) AND LECTURES (L).

Director of Research :—

“Some Recent Work on Herbage Plants.” New Monkland Agricultural Discussion Society, 9th December 1930; and Strathaven Agricultural Discussion Society 11th December 1930. (L)

“A New Oat.” Wireless Talk, 26th January 1931. (L)

"The Improvement of Agricultural Plants." Perth Royal Horticultural Society, 4th February 1931. (L)

"Breeding New Varieties of Crop Plants." Dunfermline Naturalists' Society, 10th February 1931. (L)

Chief Assistant J. W. Gregor, Ph.D., F.L.S. :—

"Experiments on the genetics of wild populations *Plantago maritima* L., I." Jour. Genetics, Vol. XXII., No. 1, 1930. (P)

"Experiments on the genetics of wild populations II., *Phleum pratense* L., and the hybrid *P. pratense* L. x. *P. alpinum* L. Gregor and Sansome, Jour. Genetics, Vol. XXII, No. 3, 1930. (P)

"Evolution and Plant-Breeding: Origin of new characters." Wireless Talk, 9th October 1930. (L)

"Evolution and Plant-Breeding: New combinations of characters." Wireless Talk, 16th October 1930. (L)

"Species and their varieties." Glasgow University Society of Agricultural Science. 9th December 1930. (L)

"Experimental methods in Taxonomy." Society for Experimental Biology, 30th March 1931. (L)

Assistant William Black, B.Sc. :—

"Notes on the progenies of various Potato hybrids." Jour. Genetics, Vol. XXII., No. 1, April 1930. (P)

"Some scientific and economic aspects of Potato Breeding." Edinburgh Natural History Society, 23rd April 1930. (L)

Assistant V. E. M'M. Davey, B.Sc., Ph.D. :—

"Inheritance of colour in certain species of Brassica." Conference of the Society for Experimental Biology, 30th March 1931. (L)

#### VISIT.

Chief Assistant J. W. Gregor, Ph.D., F.L.S. :—

International Botanical Congress, Cambridge, 1930.

### III. Demonstrations.

Several agricultural parties and a number of research workers visited the Station at different periods throughout the year. The visitors were conducted round the experimental plots, and various aspects of the work at the Station were described by members of the staff.

### IV. Acknowledgments.

Grateful acknowledgment is made to the undernoted departments, institutes, firms and individuals for gifts of samples or other material for experiment :—

Abrams, Professor Leroy, Ph.D., Stanford University, California.

Anderson, Thomas, Esq., Director of the Seed-Testing Station, Corstorphine.

Bell, David, Esq., J.P., 15 Coburg Street, Leith.

Braid, Professor K. W., B.A., B.Sc., West of Scotland Agricultural College, Glasgow.

Carters, Messrs, Raynes Park, London.

Department of Agriculture, Field Division and Plant Research Station, New Zealand.

Dobbie & Co., Messrs, Ltd., Moira Place, Edinburgh.

Drummond, J. W., Esq., Messrs Drummond & Sons, Ltd., Stirling.

Elder, James, Esq., Athelstaneford Mains, Drem.

Findlay, W. M., Esq., Marischal College, Aberdeen.

Gentner, G., Esq., Bayerischen Landesanstalt für Pflanzenbau und Pflanzenzucht, München.

Gilmour, J. S. L., Esq., B.A., Botany School, Cambridge.

Haldane, David, Esq., Forester, Dalmeny.

Hogg, Thomas, Esq., Messrs Alex. Cross Seed Co. Ltd., 21 Hope Street, Glasgow.

Kay, William, Esq., 19 South St. David Street, Edinburgh.

Kündsen, Eigner, Esq., Højvig pr. Thorshavn, Faroe Isles.

- M'Cormick, Thomas, Esq., Messrs E. Webb & Sons,  
Worcester.
- Miln, T. E., Esq., Messrs Gartons Ltd., Warrington.
- Nilsson-Leissner, G., Esq., Ph.D., Svalof, Sweden.
- Nishiyama, Ichizo, Esq., Kyoto Imperial University,  
Japan.
- O'Brien, D. G., Esq., M.A., B.Sc., Ph.D., West of Scot-  
land Agricultural College, Glasgow.
- Orr, J. B., Esq., M.A., M.D., D.Sc., Rowett Research  
Institute, Bucksburn, Aberdeen.
- Pardy, Alex., Esq., North of Scotland College of Agri-  
culture, Aberdeen.
- Porsild, M. P., Esq., Ph.D., Disko, Greenland.  
The Director, Royal Botanic Gardens, Kew.
- Royal Danish Agricultural Society, Copenhagen.
- Sansome, F. W., Esq., Ph.D., John Innes Horticultural  
Institute, Merton Park, London.
- Schacke, Erik, Esq., 12 Mortonhall Road, Edinburgh.
- Seaton, Ian W., Esq., Ministry of Agriculture for Northern  
Ireland, Stormont, Strandtown, Belfast.
- Schmitz, Herr, München.
- Smith, The Executors of the late Charles, Corstorphine.
- Stevenson, F. J., Esq., United States Department of  
Agriculture, Bureau of Plant Industry, Washington,  
U.S.A.
- Sutton, Messrs, & Sons Ltd., Reading.
- Tryselius, Olof, Esq., Abisko, Sweden.
- Turesson, Göte, Esq., Ph.D., Landskrona, Sweden.
- Vilmorin, Messrs, Andrieux et Cie, Paris.

Thanks are also due to the Director of the Seed-Testing and Plant-Registration Station, Corstorphine, for carrying out laboratory tests on potato seedlings for susceptibility to wart disease; to members of the staffs of the three Scottish Agricultural Colleges who arranged and supervised the trials of certain of the Society's new varieties of oats; and to Mr Ian W. Tervet who kindly gave his services as an honorary member of the staff for a part of the year.

WILLIAM ROBB,  
*Director of Research.*

## LIST OF MEMBERS as at 31st March 1931.

- Alison, John P., D'Arcy, Dalkeith.  
 Allison, James, Carlowrie, Kirkliston.  
 Allison, William, Almond Hill, Kirkliston.  
 Arnot, David, Mains, Edzell.
- Baird, Major W. A., Lennoxlove, Haddington.  
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 Barrie, Walter, Sundhope, Selkirk.  
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 Brown, Joseph, High Merryton, Larkhall.  
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 Chisholm, John, Gibston, Huntly.  
 Clarkson, Alexander, Skirling Mill, Biggar.  
 Connell, Sir Isaac, S.S.C., 10 Duke Street, Edinburgh.  
 Corbett, Hon. T. G. P., Rowallan, Kilmarnock.  
 Cowan, Alex., Valleyfield, Penicuik.  
 Cowper, H. S., Montrose.  
 Cowper, John E. B., Gogar House, Corstorphine.  
 Craig, Edward J., Burn, Thornhill.  
 Crawford, Hugh W. B., Forneth, Castle Douglas (*since deceased*).

- Crawford, Robert, Drumbeg, Turnberry.  
 Crichton, Jas. B., of Luthrie Bank, Cupar.  
 Cruickshank, James, Kilmarnock Arms Hotel, Cruden Bay.  
 Cunningham, Howard U. (Scottish Agricultural Industries, Ltd.),  
 Council Chambers, Charlotte Street, Leith.  
 Currie, William, Greenhill, Deskford, Cullen.  
 Cuthbertson, William (Dobbie & Co., Ltd.), Edinburgh.
- Dale, J. R., Auldham, North Berwick.  
 Davidson, Sir James Inglis, Saughton Mains, Corstorphine.  
 Davidson, Sir Leyburn F. W., Huntly Lodge, Huntly.  
 Deans, John H., Pitcoch, Dunbar.  
 Drummond, James W. (W. Drummond & Sons, Ltd.), Stirling.  
 Drummond, Professor Montagu, Botany Department, The University,  
 Manchester.
- Dudgeon, G. E., Kildalloig, Campbeltown.  
 Duncan, John, Castlehill, Maybole.  
 Duncan, J. Bryce, Newlands, Dumfries.  
 Duncan, William Watson (Drummond Bros.), Central Station  
 Buildings, Leith.  
 Duthie, Edwin C. (Ben Reid & Co.), 72 Guild Street, Aberdeen.
- Elder, James, Athelstaneford Mains, Drem.  
 Elder, James H., Athelstaneford Mains, Drem.
- Fleming, William, Meinfoot, Ecclefechan.  
 Forbes, Alexander, of Rettie, Banff.  
 Forrest, Robert Jack, Preston, Duns.
- Garden, W. J. (R. Garden, Ltd.), 18 Bridge Street, Kirkwall.  
 Gardner, James, South Hillington, Cardonald, Glasgow (*since  
 deceased*).
- Garvie, R., Hillocks of Gourdie, Blairgowrie.  
 Gibb, John, Gladstone Farm, Bishopton.  
 Gibson, Walter H., Camptoun, Drem.  
 Gill, William Hope, Tomich, Invergordon.  
 Gilmour, The Right Hon. Sir John, Bart., Montrave, Leven.  
 Gordon, Alexander P., Bindal, Portmahomack.  
 Gray, James, 74 Osborne Street, Glasgow.  
 Gregor, Charles E., Innerwick, East Lothian.  
 Gregor, David Clunie, Innerwick, East Lothian.  
 Greig, Sir Robert B., Department of Agriculture for Scotland,  
 Edinburgh.
- Hannah, John M., Girvan Mains, Girvan.  
 Harper, Thomas, Charlotte Street, Stranraer.  
 Hay, Major J., Belton, Dunbar.  
 Henderson, John, Annandale Estate Office, Moffat.  
 Herbertson, Robert H., Fans, Earlston.  
 Highet, John J. I. (Messrs J. J. Inglis & Sons), Alloway Street,  
 Ayr.
- Hogg, Thomas (A. Cross Seed Co., Ltd.), 21 Hope Street, Glasgow.  
 Hogg, William, Birkenhead, Earlston.

Home, J. H. Milne, Irvine House, Canonbie.  
 Hope, Colonel Charles, Cowdenknowes, Earlston.  
 Hope, William W., Linton Lodge, Prestonkirk.  
 Houldsworth, Lieut.-Colonel W. T. R., of Kirkbride, Maybole.  
 Howie, Robert, Drumfork Farm, Helensburgh.  
 Howie, Robert, The Grange, Kinghorn.  
 Hunter-Weston, Sir Aylmer, Hunterston, West Kilbride.  
 Hunter, A. N. (Austin & M'Aslan), 95 Mitchell Street, Glasgow.  
 Hunter, James Adam, Inchmartine, Inchtute.  
 Hunter, Thomas, 24 Brewery Street, Dumfries.  
 Hutchison, A. (R. Hutchison & Co.), Kirkcaldy.  
 Hutchison, Lieut.-Colonel R. G. O., D.S.O., M.C., Cunnoquhie,  
 Ladybank.

Inglis, Wm. (J. Inglis & Sons), Leith.  
 Irvine, Charles, sen. (C. Irvine & Sons), 1 Market Place, Jedburgh.

Jack, Archibald, Hermiston, Currie.

Kay, William, 19 South St David Street, Edinburgh.  
 Keith, Major James, Pitmedden, Udney.  
 Kerr, H. R. (Forage Supply Co., Ltd.), Springfield Mills, Leith.  
 Kerr, T. B. B., 63 Queen Street, Glasgow.

Laird, W. P. (Laird & Sinclair, Ltd.), 9 Nethergate, Dundee.  
 Law, Andrew, Bankrugg, Gifford.  
 Law, William, Windyedge, Perthshire.  
 Leitch, James Mackessack, Carden and Inchstelly, Alves, Forres.  
 Lennox, James, Redhills, Crieff.  
 Linlithgow, The Marquess of, Hopetoun House, South Queensferry.  
 Low, William, of Balmakewan, Laurencekirk.  
 Lyburn, R., 8-10 Germiston Street, Glasgow.

M'Alister, A. W., Potato Merchant, Dumfries.  
 M'Arthur, A. (J. & A. M'Arthur), 204 Hunter Street, Glasgow.  
 M'Corquodale, A. C., Meddat, Kildary.  
 M'Dougal, Captain Arthur Robert, Blythe, Lauder.  
 M'Gill, John F. (M'Gill & Smith, Ltd.), Ayr.  
 Mackie, Maitland, North Ythsie, Tarves.  
 M'Laren, J. T., 7 Park Place, Stirling.  
 Maclennan, George, 34 North Bridge, Edinburgh.  
 Maclennan, George, Redheugh, Gorebridge.  
 M'Millan, Nigel, Knowe, Kirkconnel.  
 M'Nab, J. B., Newtonmill, Brechin.  
 Macpherson, D. J. R., B.Sc. (Scottish Agricultural Industries,  
 Ltd.), Council Chambers, Charlotte Street, Leith.  
 Marshall, H. B., Rachan, Broughton.  
 Mather, Charters J. (Laing & Mather), Kelso.  
 Mather, Matthew, Silverknowes, Davidson's Mains.  
 Menzies, Ian C., W.S., 22 Rutland Street, Edinburgh.



- Menzies, J. C. (Scottish Agricultural Industries, Ltd.), Council Chambers, Charlotte Street, Leith.
- Mercer, George G., Southfield, Dalkeith.
- Miller, Hugh, West Fortune, Drem.
- Miller, Jas. W., Lochhead Farm, East Wemyss.
- Miller, Robert, Ferrygate, Dirleton.
- Mills, Fred (Messrs Roughead & Park, Ltd.), Haddington.
- Milne, Frank G., Southesk Granaries, Montrose.
- Mitchell, James, B.Sc., East Craigs, Corstorphine.
- Montgomerie, A. W., Lessnessock, Ochiltree.
- Montgomery, Andrew Mitchell, Netherhall, Castle Douglas.
- Morrison, John A., West Fenton, Drem.
- Motherwell, Andrew (A. Motherwell, Ltd.), Gorbals, Glasgow.
- Munro, James, Crook, Bilbster, Wick.
- Murdoch, Alexander, East Hallside, Hallside, Glasgow.
- Murray, James C. (Lothian Coal Co., Ltd.), Newbattle Collieries, Newtongrange.
- Murray, T. P. D., Dryburgh, Dundee.
- Nagel, F. J. (Peter Lawson & Sons, Ltd.), 1A George IV. Bridge, Edinburgh.
- Nelson, Alexander, Ph.D., Royal Botanic Garden, Edinburgh.
- Novar, Right Hon. Viscount, of Raith and Novar, K.T., Raith, Kirkcaldy.
- Paterson, Principal William G. R., West of Scotland Agricultural College, Glasgow.
- Paton, James, Kirkness, Glenraig.
- Pattullo, I. N., Langlogie, Meikle.
- Pollok, Mrs Gladys, Ronachan, Clachan.
- Rae, W. A., Douglasfield, Murthly, Perth.
- Ramsay, Charles, High Drummorie, Drummorie.
- Rattray, Colonel P. Burn Clerk, C.B.E., Craighall Rattray, Blairgowrie.
- Reid, A. T., Auchterarder House, Auchterarder.
- Reid, W. J., Bridge of Dun, Montrose.
- Robertson, A., 125 Willowbrae Road, Edinburgh.
- Robertson, Peter D., of Castlecraig, Nigg.
- Robertson, Wilson Mathieson, Saughton Mains, Corstorphine.
- Rodger, Andrew, Kellie Castle Farm, Pittenweem.
- Sanderson, Charles William, Birnieknowes, Cockburnspath.
- Sansome, Frank W., Ph.D., John Innes Horticultural Institute, Merton, Surrey.
- Scarlett, James W., Sweethope, Inveresk, Musselburgh.
- Scott, D., Fernyhill, Kelso.
- Shearer, A. (Macfarlane, Shearer & Co.), Greenock.
- Shearer, Professor Ernest, The University, Edinburgh.
- Shields, G. Bertram, Rosebery Farm, Gorebridge.
- Simpson, Major J., Glencarse.

Simpson, Mark F., Duddingston Farm, Portobello.  
 Simpson, R. C., Renton Hall, Haddington.  
 Simpson, Robert G., Monktonhall, Musselburgh.  
 Simpson, William D., Highfield, North Berwick.  
 Smith, Mrs Ida F., Whitchester, Duns.  
 Smith, Professor William Wright, Inverleith House, Arboretum  
 Road, Edinburgh.

Stevens, Alexander B., Queenstonbank, Dirleton.  
 Stevenson, A. Harvey, Saltcoats, Gullane.  
 Stevenson, Allan, Luffness Mains, Aberlady.  
 Stewart, Sir Hugh Shaw, Bart., Ardgowan, Inverkip.  
 Stirling, Hugh B., Allanbank, Edrom.  
 Stirling, Captain John, of Fairburn, Muir of Ord.  
 Stodart, Charles, Leaston, Humbie.  
 Stodart, Colonel Thomas, C.I.E., I.M.S., Kingston, North Berwick.  
 Strang, Gavin, Moneydie, Redgorton.

Tait, Charles William (J. & W. Tait), Kirkwall.  
 Taylor, J. P. Ross, Mungoswalls, Duns.  
 Thom, A. S. (T. Imrie & Sons), Ayr.  
 Thomson, John (Thomson Bros.), 106 Taylor Street, Glasgow.  
 Thomson, Moffat S., of Lambden, Greenlaw.  
 Thomson, T. (J. Donaldson & Co.), 24 St Giles Street, Edinburgh.  
 Thorburn, M. G., Glenormiston, Innerleithen.  
 Tullis, R., Strathenny, Leslie.  
 Turnbull, Phipps O., Smeaton, Dalkeith.

Usher, Sir Robert, Bart., Wells, Hawick.

Wallace, Falconer L., of Candacraig and Balcairn, Strathdon.  
 Wallace, Sir Matthew G., Terreglestown, Dumfries.  
 Watson, Professor J. A. S., School of Rural Economy, Oxford.  
 Willison, Douglas, Acharn, Killin.  
 Wilson, Emma, Lady, Kippen House, Dunning.  
 Wright, William J., The Heugh, North Berwick.  
 Wyllie, J. G. C. (Dan Wyllie & Co.), 197 High Street, Ayr.

Younger, H. G. (W. Younger & Co., Ltd.), Abbey Breweries,  
 Edinburgh.  
 Young, James G., Cadboll, Fearn.

### Members elected since 31st March 1931.

Baird, W. J., Deanscroft, Oakham, Rutland.  
 Brown, James Hally (Brown & Polson, Ltd.), Paisley.  
 Colquhoun, Archibald (Charles Tennant & Co., of Carnoustie,  
 Ltd.), Carnoustie.  
 Cunningham, Thomas (of John G. Cunningham), 26 Murrayfield  
 Avenue, Edinburgh.

- Dewar, Andrew (Joseph Gartshore & Sons), Stirling.  
 Dickie, Robert (J. & W. Wallace, Ltd.), 498 Gallowgate,  
 Glasgow, S.E.  
 Donald, John (Wotherspoon, Donald & Geo. Graham, Ltd.),  
 11 Braemar Street, Langside, Glasgow.  
 Elder, Thomas, of Stevenson, Haddington.  
 Elliot, Captain Thomas, Thirlestane, Lauder.  
 Ellis, Charles M., Mains of Moy, Forres.  
 Fletcher, Captain Andrew M. Talbot, of Saltoun, Pencaitland.  
 Gardner, Andrew (John Wallace & Sons, Ltd.), 34 Paton Street,  
 Glasgow.  
 Gebbie, Alexander (Scottish Co-operative Wholesale Society,  
 Ltd.), Shieldhall, Govan, Glasgow.  
 Glendinning, George E., Kirkhouse, Traquair, Innerleithen.  
 Graham, Alexander (Wotherspoon, Donald & Geo. Graham,  
 Ltd.), 65 Stonelaw Drive, Rutherglen.  
 Grant, James (John Grant & Sons, Ltd.), Kingennie House,  
 Kingennie, Angus.  
 Hill, William James, 19 St Vincent Place, Glasgow, C. 1.  
 Hope, Sir Harry, M.P., Kinnettles, Forfar.  
 Hunter, A. Thornton (Alexander Jack & Sons, Ltd.), Maybole.  
 Inch, John (Robert Inch & Son), 46 Timber Bush, Leith.  
 Johnston, W. L., Oxnam Neuk, Jedburgh.  
 Laing, Robert Paterson (Thomas Bernard & Co., Ltd.), Seafield,  
 Leith.  
 Lobnitz, Sir Frederick, K.B.E., Ross Hall, Crookston, near  
 Glasgow.  
 Marshall, Robert C., Burntshields, Kilbarchan.  
 Meiklejohn, John A., 86 St Vincent Street, Glasgow, C. 2.  
 Mitchell, Lieut.-Colonel A., Tulliallan, Kincardine, Fife.  
 Muir, Sir A. Kay, Bart., of Blair Drummond, Perthshire.  
 Munro, Henry, 36 Tay Street, Perth.  
 Nelson, John M., Pleasants, Dunbar.  
 Reynard, James N., Manuel House, Linlithgow.  
 Riddell, John (Andrew Riddell & Co.), 5 Grassmarket, Edinburgh.  
 Robertson, John, Drumnagair, Laurencekirk.  
 Scott, James, Fearn, Ross-shire.  
 Shields, Mrs E. H., The Farm, Longniddry.  
 Speirs, A. A. Hagart, of Elderslie, Houston House, Houston.  
 Stanhope, John M. Spencer, of Glenure, Argyllshire.  
 Tweedie, R. W., Phantassie, Prestonkirk.  
 Whitburgh, Lord, Whitburgh, Ford.  
 Wyllie, James (James Wyllie & Sons), Corn Exchange, Dumfries.