
Edited by

The Permanent Secretary.

March 31st, 1922.

London:
Longmans, Green, and Co.

Price Seven Shillings and Sixpence.
LIST OF THE OFFICERS AND COUNCIL OF THE
GEOLOGICAL SOCIETY OF LONDON.

Elected February 17th, 1922.

President.
Prof. A. C. Seward, Sc.D., F.R.S., F.L.S.

Vice-Presidents.
Prof. Edmund Johnston Garwood, M.A.,
Sc.D., F.R.S. | George Thurland Prior, M.A., D.Sc.,
F.R.S. | Herbert Henry Thomas, M.A., Sc.D.
Richard Dixon Oldham, F.R.S.

Secretaries.

Foreign Secretary.
Sir Archibald Geikie, O.M., K.C.B., D.C.L.,
LL.D., Sc.D., F.R.S.

Treasurer.
Robert Stansfield Herries, M.A.

COUNCIL.
Frederick Noel Ashcroft, M.A., F.C.S.
Francis Arthur Bather, M.A., D.Sc., F.R.S.
Prof. Percy George Hammond Boswell,
O.B.E., D.Sc.
Prof. William S. Boulton, D.Sc., Assoc.
R.C.Sc.
Thomas Crosbee Cantrill, B.Sc.
James Archibald Douglas, M.A., B.Sc.
John Smith Flett, O.B.E., M.A., LL.D.,
D.Sc., M.B., F.R.S.
Prof. Edmund Johnston Garwood, M.A.,
Sc.D., F.R.S.
Sir Archibald Geikie, O.M., K.C.B., D.C.L.,
LL.D., Sc.D., F.R.S.
John Frederick Norman Green, B.A.
Frederick Henry Hatch, O.B.E., Ph.D.
Robert Stansfield Herries, M.A.

Permanent Secretary.
L. L. Belinfante, M.Sc.

Clerk.
M. St. John Hope.

STANDING PUBLICATION COMMITTEE.
Prof. A. C. Seward, President.

Mr. W. Campbell Smith. | Prof. Owen Thomas Jones, M.A., D.Sc.
Mr. J. A. Douglas. | William Bernard Robinson King, O.B.E.,
| M.A.
| Richard Dixon Oldham, F.R.S.
| George Thurland Prior, M.A., D.Sc.,
| F.R.S.
| Prof. Sidney Hugh Reynolds, M.A., Sc.D.
| Prof. Albert Charles Seward, Sc.D.,
| F.R.S., F.L.S.
| Walter Campbell Smith, M.C., M.A.
| Sir Aubrey Strahan, K.B.E., Sc.D., LL.D.,
| F.R.S.
| Herbert Henry Thomas, M.A., Sc.D.
| Prof. William Whitehead Watts, M.A.,
| Sc.D., LL.D., F.R.S.
| Henry Woods, M.A., F.R.S.

ORDINARY MEETINGS OF THE GEOLOGICAL SOCIETY
TO BE HELD AT BURLINGTON HOUSE.
SESSION 1921–1922.

1922.

Wednesday, April ............... 12
" May ................. 10*–24
June ................. 14*–23

[Business will commence at 5.30 p.m. precisely.]

The asterisks denote the dates on which the Council will meet.
JAMES SWIFT & SON LTD.
Makers of the highest grade Microscopes
and Accessories for Petrological Research

Just out
NEW ILLUSTRATED CATALOGUE
OF
PETROLOGICAL MICROSCOPES
INCLUDING NEW MODELS
A copy will be sent gratis on request.

University Optical Works
81 TOTTENHAM COURT ROAD, LONDON, W.1

Publications to be had of the Geological Society,
Burlington House.

QUARTERLY JOURNAL (Vols. III to LXXVII, inclusive). Price to Fellows, £1 0s. 0d. each: £1 5s. 0d. in cloth. [Postage 1s.] Separate parts (2, 5, 7, 9, 55, & 273 are out of print) 7s. 6d. each: price to Fellows 5s. [Postage 5d.]

GENERAL INDEX TO THE FIRST FIFTY VOLUMES OF THE QUARTERLY JOURNAL (1845-1894). Part I (A-La). Part II (La-Z). Price 7s. 6d. each. To Fellows 5s. each. [Postage 6d. each.]

GEOLOGICAL LITERATURE added to the Geological Society's Library during the years ended December 31st, 1894-1913 and 1920. Price 5s. each. To Fellows, 3s. 9d. each. [Postage 7d.] (Nos. 8 & 14 are out of print.)

THE HISTORY OF THE GEOLOGICAL SOCIETY OF LONDON, by H. B. Woodward, F.R.S. Price 3s. net. [Postage 1s.]

THE CENTENARY OF THE GEOLOGICAL SOCIETY OF LONDON, recorded by W. W. Watts, F.R.S. Price 2s. [Postage 5d.]


THE GEOLOGY OF NEW ZEALAND. Translated by Dr. C. F. Fischer from the works of MM. Hochstetter & Petermann. With an Atlas of Six Maps. Price 10s. net. [Postage 9d.]
## CONTENTS

| Proceedings of the Geological Society, Session 1921-22 | lxix-lxxv |

### PAPERS READ

<table>
<thead>
<tr>
<th><strong>Page</strong></th>
<th><strong>2. Mr. E. B. Bailey on the Structure of the South-West Highlands of Scotland</strong> (Plate I)</th>
<th>82</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>3. Miss G. L. Elles on the Bala Country: its Structure and Rock-Succession</strong> (Plate II)</td>
<td>132</td>
</tr>
<tr>
<td></td>
<td><strong>4. Dr. L. J. Wills &amp; Mr. B. Smith on the Lower Palaeozoic Rocks of the Llangollen District</strong> (Plates III-V)</td>
<td>176</td>
</tr>
<tr>
<td></td>
<td><strong>5. Mr. F. S. Wallis on the Avonian of Broadfield Down [Abstract]</strong></td>
<td>227</td>
</tr>
</tbody>
</table>

---

(The Editor of the Quarterly Journal is directed to make it known to the Public that the Authors alone are responsible for the facts and opinions contained in their respective Papers.)

* The Council request that all communications intended for publication by the Society shall be clearly and legibly written on one side of the paper only, with proper references, and in all respects in fit condition for being at once placed in the Printer's hands. Unless this is done, it will be in the discretion of the Officers to return the communication to the Author for revision.

The Library at the Apartments of the Society is open every Week Day from Ten o'clock until Five, except on Saturdays (when the hours are from 10 to 1), and except during the fortnight commencing on the first Monday in September, when the Library is closed for the purpose of cleaning.

Fellows are reminded that they are not entitled to receive the Quarterly Journal regularly, unless a subscription at the rate of 10s. per volume is paid in advance. Those Fellows who do not require the complete series can obtain separate parts at the price of 3s. each, if applied for within one year of the date of issue.
LIST OF THE OFFICERS AND COUNCIL OF THE GEOLOGICAL SOCIETY OF LONDON.

Elected February 17th, 1922.

President.
Prof. Albert Charles Seward, Sc.D., F.R.S., F.L.S.

Vice-Presidents.
Prof. Edmund Johnston Garwood, M.A., Sc.D., F.R.S.
Prof. George Thurland Prior, M.A., D.Sc., F.R.S.
Prof. Walter Campbell Smith, M.C., M.A.

Secretary.

Foreign Secretary.
Frederick Noel Ashcroft, M.A., F.C.S.
Francis Arthur Bather, M.A., D.Sc., F.R.S.
Prof. Percy George Hamnall Boswell, O.B.E., D.Sc.

Treasurer.
Robert Stansfield Herries, M.A.

COUNCIL.
Frederick Noel Ashcroft, M.A., F.C.S.
Francis Arthur Bather, M.A., D.Sc., F.R.S.
Prof. Percy George Hamnall Boswell, O.B.E., D.Sc.
Thomas Crosbee Cantrill, B.Sc.
James Archibald Douglas, M.A., B.Sc.
John Smith Flett, O.B.E., M.A., LL.D., D.Sc., M.B., F.R.S.
Prof. Edmund Johnston Garwood, M.A., Sc.D., F.R.S.
John Frederick Norman Green, B.A.
Frederick Henry Hatch, O.B.E., Ph.D.
Robert Stansfield Herries, M.A.

Permanent Secretary.
L. L. Belinfante, M.Sc.

Librarian.
Arthur Greig.

STANDING PUBLICATION COMMITTEE.
Prof. A. C. Seward, President.
Mr. W. Campbell Smith, Mr. J. A. Douglas.
Prof. P. G. H. Boswell.
Prof. W. S. Boulton.
Dr. J. S. Flett.
Prof. E. J. Garwood.
Mr. J. F. N. Green.

Secretary.
Dr. F. H. Hatch.
Prof. O. T. Jones.
Mr. R. D. Oldham.
Dr. G. T. Prior.
Prof. S. H. Reynolds.

Ordinary Meetings of the Geological Society
To be held at Burlington House.

Session 1922-1923.

1922.
Wednesday, November ...................... 8*-22
'' December ...................... 6—20*

1923.
Wednesday, January ...................... 10*-24*
'' (Anniversary, Friday.
'' Feb. 16th) February ................ 7*-28*
'' March ...................... 14—28*
'' April ...................... 18*
'' May ...................... 2—16*
'' June ...................... 6—20*

The asterisks denote the dates on which the Council will meet.
JAMES SWIFT & SON LTD.

MAKERS OF THE HIGHEST GRADE MICROSCOPES AND ACCESSORIES.

Contractors to all Scientific Departments of H.M. Government.

PETROLOGICAL MICROSCOPES


For specifications and prices see LIST OF NEW MODELS (Petro 1922) post free.

University Optical Works
81 TOTTENHAM COURT ROAD, LONDON, W.1

Publications to be had of the Geological Society, Burlington House.

QUARTERLY JOURNAL (Vols. III to LXXVII, inclusive). Price to Fellows, £1 0s. 0d. each; £1 5s. 0d. in cloth. [Postage 1s.] Separate parts (2, 5, 7, 9, 55, & 273 are out of print) 7s. 6d. each: price to Fellows 5s. [Postage 5d.]

GENERAL INDEX TO THE FIRST FIFTY VOLUMES OF THE QUARTERLY JOURNAL (1845-1894). Part I (A–La). Part II (La–Z). Price 7s. 6d. each. To Fellows 3s. each. [Postage 6d. each.]

GEOLOGICAL LITERATURE added to the Geological Society's Library during the years ended December 31st, 1894–1913 and 1920, 1921. Price 5s. each. To Fellows 3s. 9d. each. [Postage 7d.] (Nos. 8 & 14 are out of print.)

THE HISTORY OF THE GEOLOGICAL SOCIETY OF LONDON, by H. B. Woodward, F.R.S. Price 3s. net. [Postage 1s.]

THE CENTENARY OF THE GEOLOGICAL SOCIETY OF LONDON, recorded by W. W. Watts, F.R.S. Price 2s. [Postage 5d.]


THE GEOLOGY OF NEW ZEALAND. Translated by Dr. C. F. Fischer from the works of MM. Hochstetter & Petermann. With an Atlas of Six Maps. Price 10s. net. [Postage 9d.]
CONTENTS.

Proceedings of the Geological Society, Session 1921-22, including the Proceedings at the Annual General Meeting, the President's Anniversary Address, etc. ................................................................. i-lxviii

PAPER READ.

1. Mr. G. W. Lamplugh on the Junction of Gault and Lower Greensand near Leighton Buzzard ............................................................... 1

[The Editor of the Quarterly Journal is directed to make it known to the Public that the Authors alone are responsible for the facts and opinions contained in their respective Papers.]

The Council request that all communications intended for publication by the Society shall be clearly and legibly written on one side of the paper only, with proper references, and in all respects in fit condition for being at once placed in the Printer's hands. Unless this is done, it will be in the discretion of the Officers to return the communication to the Author for revision.

The Library at the Apartments of the Society is open every Week Day from Ten o'clock until Five, except on Saturdays (when the hours are from 10 to 1), and except during the fortnight commencing on the first Monday in September, when the Library is closed for the purpose of cleaning.

Fellows are reminded that they are not entitled to receive the Quarterly Journal regularly, unless a subscription at the rate of 10s. per volume is paid in advance. Those Fellows who do not require the complete series can obtain separate parts at the price of 3s. each, if applied for within one year of the date of issue.
THE QUARTERLY JOURNAL OF THE GEOLOGICAL SOCIETY.

EDITED BY THE PERMANENT SECRETARY.

SEPTEMBER 23rd, 1922.

[With Ten Plates, illustrating Papers by Dr. H. H. Thomas, Mr. W. G. Shannon, Prof. A. C. Seward & Mr. R. E. Holttum, and Dr. C. W. Andrews.]

LONDON: LONGMANS, GREEN, AND CO.

PARIS:—CHARLES KLINCKSIECK, 11 RUE DE LILLE.
SOLD ALSO AT THE APARTMENTS OF THE SOCIETY.

Price Seven Shillings and Sixpence.
LIST OF THE OFFICERS AND COUNCIL OF THE GEOLOGICAL SOCIETY OF LONDON.

Elected February 17th, 1922.

**President.**
Prof. A. C. Seward, Sc.D., F.R.S., F.L.S.

**Vice-Presidents.**
Prof. Edmund Johnston Garwood, M.A., Sc.D., F.R.S.
George Thurland Prior, M.A., D.Sc., F.R.S.
Richard Dixon Oldham, F.R.S.

**Secretaries.**
Walter Campbell Smith, M.C., M.A.
James Archibald Douglas, M.A., B.Sc.

**Foreign Secretary.**

**Treasurer.**
Robert Stansfield Herries, M.A.

**Council.**
Frederick Noel Ashcroft, M.A., F.C.S.
Francis Arthur Bather, M.A., D.Sc., F.R.S.
Prof. Percy George Hamboll Boswell, O.B.E., D.Sc.
Prof. William S. Boulton, D.Sc., Assoc. R.C.Sc.
Thomas Crosbee Cantrell, B.Sc.
James Archibald Douglas, M.A., B.Sc.
John Smith Flett, O.B.E., M.A., LL.D., D.Sc., M.B., F.R.S.
Prof. Edmund Johnston Garwood, M.A., Sc.D., F.R.S.
John Frederick Norman Green, B.A.
Frederick Henry Hatch, O.B.E., Ph.D.
Robert Stansfield Herries, M.A.
Prof. Owen Thomas Jones, M.A., D.Sc.
William Bernard Robinson King, O.B.E., M.A.
Richard Dixon Oldham, F.R.S.
George Thurland Prior, M.A., D.Sc., F.R.S.
Prof. Sidney Hugh Reynolds, M.A., Sc.D.
Prof. Albert Charles Seward, Sc.D., F.R.S., F.L.S.
Walter Campbell Smith, M.C., M.A.
Sir Aubrey Strahan, K.B.E., Sc.D., LL.D., F.R.S.
Herbert Henry Thomas, M.A., Sc.D.
Prof. William Whitehead Watts, M.A., Sc.D., LL.D., F.R.S.
Henry Woods, M.A., F.R.S.

**Standing Publication Committee.**
Prof. A. C. Seward, President.
Mr. W. Campbell Smith, Mr. J. A. Douglas, Secretaries. Mr. R. S. Herries, Treasurer.
Dr. F. H. Hatch, Dr. O. T. Jones, Sir Aubrey Strahan.
Prof. W. S. Boulton, Mr. R. D. Oldham, Dr. H. H. Thomas.
Dr. J. S. Flett, Prof. G. T. Prior, Prof. W. W. Watts.
Prof. E. J. Garwood, Prof. S. H. Reynolds, Mr. H. Woods.
Mr. J. F. N. Green.

**Ordinary Meetings of the Geological Society.**
To be held at Burlington House.

**Session 1922–1923.**

1922.
Wednesday, November ...................... 8*–22
" December ............................... 6 – 20*

1923.
Wednesday, January ...................... 10*–24*
" (Anniversary, Thursday, Feb. 16th) February ..... 7*–23*
" March ................................. 14 – 28*
" April .................................. 18*
" May .................................... 2 – 16*
" June .................................... 6 – 20*

The asterisks denote the dates on which the Council will meet.
JAMES SWIFT & SON LTD.
Makers of the Highest Grade
MICROSCOPES AND ACCESSORIES
Contractors to all Scientific Departments of H.M. Government.

Ready end of September
NEW CATALOGUE
OF
PETROLOGICAL ACCESSORIES
and Instruments for Mineralogy and Crystallography,
including Refractometers, Goniometers, etc.
Applications invited for copies to be sent post free on publication.

University Optical Works
8 TOTTENHAM COURT ROAD, LONDON, W.I.

Publications to be had of the Geological Society,
Burlington House.

QUARTERLY JOURNAL (Vols. III to LXXVII, inclusive). Price to
Fellows, £1 0s. 0d. each: £1 5s. 0d. in cloth. [Postage 1s.] Separate parts (2, 5,
7, 9, 55, & 273 are out of print) 7s. 6d. each: price to Fellows 5s. [Postage 5d.]

GENERAL INDEX TO THE FIRST FIFTY VOLUMES OF THE
Price 7s. 6d. each. To Fellows 5s. each. [Postage 6d. each.]

GEOLOGICAL LITERATURE added to the Geological Society’s Library
during the years ended December 31st, 1894–1913 and 1920, 1921. Price 5s. each.
To Fellows, 3s. 9d. each. [Postage 7d.] (Nos. 8 & 14 are out of print.)

THE HISTORY OF THE GEOLOGICAL SOCIETY OF LONDON,
by H. B. Woodward, F.R.S. Price 3s. net. [Postage 1s.]

THE CENTENARY OF THE GEOLOGICAL SOCIETY OF LONDON,
recorded by W. W. Watts, F.R.S. Price 2s. [Postage 5d.]

ARCHIBALD GIEKIE, D.C.L., F.R.S Price 3s. 6d. To Fellows, 2s. [Postage 9d.]

THE GEOLOGY OF NEW ZEALAND. Translated by Dr. C. F.
FISCHER from the works of MM. HOCHESTETTER & PETERMANN. With an Atlas of
Six Maps. Price 10s. net. [Postage 9d.]
CONTENTS.

PAPERS READ.

6. Dr. H. H. Thomas on Xenolithic Tertiary Minor Intrusions in Mull (Plates VI-X) ................................................................. 229

7. Mr. W. G. Shannon on a Composite Sill at Newton Abbot (Plate XI) ...... 261

8. Prof. A. C. Seward & Mr. R. E. Holttum on Jurassic Plants from Ceylon (Plate XII) ................................................................. 271

9. Prof. A. C. Seward on Carboniferous Plants from Peru (Plate XIII) ...... 278

10. Dr. C. W. Andrews on a New Plesiosaur from the Weald Clay of Berwick, Sussex (Plates XIV & XV) ........................................... 285

The Editor of the Quarterly Journal is directed to make it known to the Public that the Authors alone are responsible for the facts and opinions contained in their respective Papers.

The Council request that all communications intended for publication by the Society shall be clearly and legibly written on one side of the paper only, with proper references, and in all respects in fit condition for being at once placed in the Printer's hands. Unless this is done, it will be in the discretion of the Officers to return the communication to the Author for revision.

The Library at the Apartments of the Society is open every Week Day from Ten o'clock until Five, except on Saturdays (when the hours are from 10 to 1), and except during the fortnight commencing on the first Monday in September, when the Library is closed for the purpose of cleaning.

Fellows are reminded that they are not entitled to receive the Quarterly Journal regularly, unless a subscription at the rate of 10s. per volume is paid in advance. Those Fellows who do not require the complete series can obtain separate parts at the price of 3s. each, if applied for within one year of the date of issue.
LIST OF THE OFFICERS AND COUNCIL OF THE
GEOLOGICAL SOCIETY OF LONDON.
Elected February 17th, 1922.

President.
Prof. Albert Charles Seward, Sc.D., F.R.S., F.L.S.

Vice-Presidents.
Prof. Edmund Johnston Garwood, M.A., Sc.D., F.R.S.
Richard Dixon Oldham, F.R.S.

Secretaries.
Walter Campbell Smith, M.C., M.A.
James Archibald Douglas, M.A., B.Sc.

Foreign Secretary.

Treasurer.
Robert Stansfield Herries, M.A.

COUNCIL.
Frederick Noel Ashcroft, M.A., F.C.S.
Francis Arthur Bather, M.A., D.Sc., F.R.S.
Prof. Percy George Hamnall Boswell, O.B.E., D.Sc.
Thomas Crosbee Cantrill, B.Sc.
James Archibald Douglas, M.A., B.Sc.
John Smith Flett, O.B.E., M.A., LL.D., D.Sc., M.B., F.R.S.
Prof. Edmund Johnston Garwood, M.A., Sc.D., F.R.S.
John Frederick Norman Green, B.A.
Frederick Henry Hatch, O.B.E., Ph.D.
Robert Stansfield Herries, M.A.

Ordinary Meetings of the Geological Society
To be held at Burlington House.
Session 1922-1923.

1923.

Wednesday, January ........................ 10*-24*

(Anniversary, Friday.
" Feb. 16th) February ..... 7*-28*
" March ................................ 14 - 28*
" April ................................ 18*
" May .................................. 2 - 16*
" June .................................. 6 - 20*

The asterisks denote the dates on which the Council will meet.
JUST PUBLISHED

NEW CATALOGUE
OF
PETROLOGICAL ACCESSORIES
and Instruments for Mineralogy and Crystallography,
including Refractometers, Goniometers, etc.
A copy will be sent post free on request.

University Optical Works
81 TOTTENHAM COURT ROAD, LONDON, W.1.

Publications to be had of the Geological Society,
Burlington House.

QUARTERLY JOURNAL (Vols. III to LXXVIII, inclusive). Price to Fellows, £1 0s. 0d. each; £1 5s. 0d. in cloth. [Postage 1s.] Separate parts (2, 5, 7, 9, 55, & 273 are out of print) 7s. 6d. each; price to Fellows 5s. [Postage 5d.]

GENERAL INDEX TO THE FIRST FIFTY VOLUMES OF THE QUARTERLY JOURNAL (1845–1894). Part I (A–La). Part II (La–Z). Price 7s. 6d. each. To Fellows 5s. each. [Postage 6d. each.]

GEOLOGICAL LITERATURE added to the Geological Society's Library during the years ended December 31st, 1894–1913 and 1920, 1921. Price 5s. each. To Fellows, 3s. 9d. each. [Postage 7d.] (Nos. 8 & 14 are out of print.)

THE HISTORY OF THE GEOLOGICAL SOCIETY OF LONDON, by H. B. Woodward, F.R.S. Price 3s. net. [Postage 1s.]

THE CENTENARY OF THE GEOLOGICAL SOCIETY OF LONDON, recorded by W. W. Watts, F.R.S. Price 2s. [Postage 5d.]

HUTTON'S 'THEORY OF THE EARTH,' Vol. III, edited by Sir ARCHIBALD GRIEVE, D.C.L., F.R.S. Price 3s. 6d. To Fellows, 2s. [Postage 9d.]

THE GEOLOGY OF NEW ZEALAND. Translated by Dr. C. E. FISCHER from the works of MM. HOCHSTETTER & PETERMANN. With an Atlas of Six Maps. Price 10s. net. [Postage 9d.]
CONTENTS.

PAPERS READ.

11. Dr. F. Dixey on the Norite of Sierra Leone (Plates XVI–XIX) 299

12. Mr. H. B. Milner on the Pliocene Deposits of Cornwall, and their Bearing on the Pliocene Geography of the South-West of England 348

13. Mr. S. S. Buckman on Certain Jurassic Strata near Eynesmouth (Dorset); the Junction-Bed of Watton Cliff and Associated Rocks 378

[Title-Page, Contents, and Index to Vol. LXXVIII.]

[The Editor of the Quarterly Journal is directed to make it known to the Public that the Authors alone are responsible for the facts and opinions contained in their respective Papers.]

* * * The Council request that all communications intended for publication by the Society shall be clearly and legibly written on one side of the paper only, with proper references, and in all respects in fit condition for being at once placed in the Printer's hands. Unless this is done, it will be in the discretion of the Officers to return the communication to the Author for revision.

The Library at the Apartments of the Society is open every Week Day from Ten o'clock until Five, except on Saturdays (when the hours are from 10 to 1), and except during the fortnight commencing on the first Monday in September, when the Library is closed for the purpose of cleaning.

Fellows are reminded that they are not entitled to receive the Quarterly Journal regularly, unless a subscription at the rate of 10s. per volume is paid in advance. Those Fellows who do not require the complete series can obtain separate parts at the price of 3s. each, if applied for within one year of the date of issue. Subscriptions for Vol. LXXIX (1923) are now due, and Fellows who wish to subscribe for the same are requested to send the amount payable, as soon as possible, to the Clerk, Geological Society, Burlington House, W. 1.