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SOUTH WALES GROUP

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Cardiff : August, 1967.

EDITORIAL

The current number of the Welsh Geological Quarterly is made up almost entirely of one item - an annotated bibliography of published excursion guides for Scotland. This is the first of three such guides. The second, covering Wales and the Borders, will appear in the first number of volume 3, and the third, covering the remainder of England, in the third part of volume 3.

Because the first part of the annotated bibliography is much longer than was originally envisaged and occupies 41 pages of the current number, the second part of "The Geological Contents of General Scientific Journals: 1966", which was due to appear in this issue of the Quarterly, is postponed.

Acknowledgements. The cover was designed and printed by Vivian S. James, Barry; the text was prepared and cyclostyled by Mrs. Jean Parsons; and Mr. Michael D. Jones, Leicester University, Miss Patricia Thomas, University College, Swansea, and Mr. Alun J. Thomas assisted with the preparation of the indexes to the bibliography of Scottish geology.

DIRECTORY OF BRITISH GEOLOGY

I. A PROVISIONAL ANNOTATED BIBLIOGRAPHY AND INDEX OF GEOLOGICAL EXCURSION GUIDES AND REPORTS FOR AREAS IN BRITAIN.

D.A. Bassett.

A very common request from teachers and students is for details of excursion itineraries. This provisional bibliography is an attempt to provide a guide to published material and thus supplement the Regional Handbooks of the Institute of Geological Sciences. In annotating the items, considerable emphasis has been given to publications which can be purchased at present.

A. SCOTLAND.

There are four main sources of geological guides and excursion reports for Scottish areas: The Edinburgh Geological Society, the Geological Society of Glasgow, the Geologists' Association, London and the International Geological Congress (London 1948). Their publications include the following:-

SUMMER FIELD MEETING [August 8th-15th], 1936. UNST, SHETLAND.
By H.H. Read. Proc.Geol.Ass., Lond., v.47(1936), pp.295-300.

Four excursions on Unst and one to the Island of Fetlar. The report is accompanied by a paper on: The metamorphic history of Unst, Shetland, written for the Meeting by H.H. Read (pp.283-293) and containing a geological map of the island (1 in. - 1 ml.).

[1]

ORKNEY AND SHETLAND FIELD MEETING. AUGUST 4th-19th, 1936. By G.V. Wilson and J. Knox. Proc.Geol.Ass., Lond., v.48(1937), pp.61-76.

Three excursions on Orkney mainland and one to the Island of Hoy; six excursions on Shetland mainland and one each to the islands of Burra and Bressay. There is a paper on: The geology of the Orkney and Shetland Islands, by G.V. Wilson and J. Knox, written for the Meeting, in v.47(1936) of the Proceedings (pp.270-282).

[2]

GEOLOGICAL EXCURSION GUIDE TO THE ASSYNT DISTRICT OF SUTHERLAND. By M. Macgregor and J. Phemister. Edinburgh: Edinburgh Geological Society, 1937. Reprinted by the Geological Society of Glasgow, 1958. 62pp.

[3 - 9]

There is an Introduction (2pp.) which refers to available maps, memoirs and photographs; and a Summary of the geology (14pp.) with special reference to the localities selected for examination and presented in four sections: A. Unmoved region or "Foreland"; B. Disturbed region or Belt of complication; C. Region east of the Moine Thrust; D. The post-Cambrian intrusive igneous rocks. The Summary begins thus:-

"The most outstanding feature in the geology of the Assynt district is the clear and indisputable evidence for powerful, horizontally directed dislocations or thrusts along which great slices of the country rocks have been driven for considerable distances in a general west-north-westerly direction. Three major lines of disruption traverse the district to be visited and follow one another in definite succession from west to east: the Glencoul Thrust, the Ben More Thrust, and the Moine Thrust. The last-named is the most easterly and most powerful, and differs from the other thrusts to the west in the nature of the materials which it transports; it brings forward rocks belonging to the great series of crystalline schists to which the name Moine or Eastern Schists has been given, rocks, that is, of an entirely different character from any that occur either in the thrust-masses or in the undisturbed region to the west."

The descriptive itineraries are:-

Lochinver and Strathan

"This excursion provides an opportunity for examining a typical area of the orthogneisses and dykes of the Lewisian Gneiss complex. The orthogneisses (gneisses formed from rocks of igneous origin) show very great diversity in composition and in local relative proportion of basic and acid types. Basic varieties, for example, are very abundant between Strathan and Badnaban. Dykes and crush-lines of pre-Torridonian age are numerous in this district ..."

(g.map: 2 $\frac{1}{4}$ in. - 1ml.) (4 $\frac{1}{2}$ pp.) [3]

Loch Assynt and Quinag

"This excursion has been planned with the object of studying (a) the succession of rocks within the unmoved region or 'foreland', ranging from the Lewisian up to the basal dolomites of the Ghrudaigh group, and (b) part of the zone of imbrication that intervenes between the undisturbed succession and the series of large displaced masses brought forward by the great thrust-planes to the east. To the plane of movement above which lie the piled-up wedges of Cambrian strata forming the zone of imbrication the designation 'Sole' has been applied. Within the southern part of the area the course of this lowest thrust or 'Sole' lies in the basal dolomites of the Ghrudaigh group, but from a point west of Achumore northwards to Loch Glencoul it lies in the Fucoid Beds."

(col.g.map: 3in. - 1ml.) (4 $\frac{1}{2}$ pp.) [4]

Loch Glencoul

"The main objects of this excursion are:-

(a) To demonstrate the overlap of the Cambrian quartzite across the Torridonian sandstones until it comes to rest directly upon the Lewisian Gneiss. The transgression of the unconformable junction between the Cambrian and Torridonian across the much earlier unconformity at the base of the Torridonian is often referred to as the 'double unconformity' of the North-West Highlands. On Quinag the Torridon Sandstone is nearly 2,000 ft. thick. Towards Loch Glencoul it is rapidly reduced in thickness until at locality 4 it has been completely cut out by the transgression of the Cambrian.

(b) To examine the outcrop of the Glencoul Thrust-plane on the south shore of Loch Glencoul. The Glencoul Thrust is the lowest of the great dislocations of the Assynt district and brings a mass of Lewisian Gneiss, at least 1,500 ft. thick, into superposition above Cambrian sediments. The gneiss immediately above the thrust-plane has been mylonitised, and between the thrust and the undisturbed Cambrian strata below lies a narrow zone of imbricated Cambrian sediments."

(col.g.map: 3in. - 1ml.) (3½ pp.) [5]

Conival and Ben More Assynt

"This excursion has for its main objects: (a) examination of the outcrops of the Ben More Thrust-plane; (b) demonstration of the inversion of the Torridonian under the Lewisian Gneiss; and (c) view of the great fold in Cambrian strata seen in section on the 1,000-ft. precipices of Na Tuadhan, a mountain 1½ miles N.W. of Ben More."

(col.g.map: 3in. - 1ml.) (4 pp.) [6]

Knockan and Beinn an Fhuarain

"The main object of this excursion is to examine the famous section at the Knockan Crag (Cnoc an t-Sasunnaich), about 2 miles south-west of Elphin Post Office on the Ullapool road, and 10 miles or so from Inchnadamph. Here the Moine Thrust, having passed transgressively across the Ben More Thrust and all the underlying slices of displaced materials, brings the siliceous schists of the Moine Series almost directly above undisturbed Cambrian rocks. This remarkable overlap of the Moine Thrust is one of the most striking phenomena in the geology of the Assynt district, and for this reason a visit to the Knockan section, where the transgression can be clearly demonstrated, should on no account be omitted."

(col.g.map: 3in. - 1ml.) (5½ pp.) [7]

Loch Borrolan and Cnoc na Sròine

The complex post-Cambrian laccolith.

(sk.map: 1in. - 1ml.) (4½ pp.) [8]

Loch Ailsh

The laccolith.

(sk.map: $1\frac{1}{8}$ in. - 1 ml.)

(3 pp.)

[9]

The Guide also contains: a note on Localities for the collection of the Assynt sills and dykes ($\frac{1}{2}$ p.); suggestions for shorter itineraries (1 p.); a glossary of place-names ($4\frac{1}{2}$ pp.); and an index (5 pp.)

REPORT OF AN EXCURSION TO THE ASSYNT DISTRICT OF THE NORTH-WEST HIGHLANDS. By J. Horne. Proc.Geol.Ass., Lond., v.26(1915), pp.127-136.

Seven excursions are described: Lairg to Inchnadamff; Quinag; Lochinver and Strathan; Glencoul Thrust; Ben More Thrust; Moine Thrust; Klippen above the Ben More Thrust.

[10]

NORTH-WEST HIGHLANDS: ASSYNT AND DURNESS. GUIDE TO EXCURSION A.14. By M. Macgregor and J. Phemister. International Geological Congress. XVIII Session - Great Britain, 1948. 18pp.

The excursions included: Inchnadamph to Lochinver and Strathan (1 p.); Loch Assynt and Quinag ($1\frac{1}{2}$ pp.); Loch Glencoul (2 pp.); Conival and Ben More (1 p.); Elphin and Knockan ($1\frac{1}{2}$ pp.); Loch Borrolan and Cnoc na Sroine ($1\frac{1}{2}$ pp., sk.map); Inchnadamph to Durness (1 p.); The Durness - Loch Eirebol area (2 pp., g.sk.map); The Parph, west of the Kyle of Durness (1 p.); Balnakiel Bay, Faraid Head and Durness ($\frac{1}{2}$ p.); Loch Eirebol area ($\frac{3}{4}$ p.); Southern part of the Durness Limestone area ($\frac{3}{4}$ p.); Durness to Loch Loyal ($\frac{3}{4}$ p.); Durness to Scourie ($\frac{3}{4}$ p.).

[10A]

EAST SUTHERLAND FIELD MEETING. JULY 27th - AUGUST 7th, 1929. By M. Macgregor, H.H. Read, W. Manson and J. Pringle. Proc.Geol.Ass., Lond., v.41(1930), pp.63-86.

The excursions included: a visit to the private museum of the Duke of Sutherland ($\frac{1}{2}$ p.); Carn Liath broch, near Dunrobin Castle (1 p.); The Mound, near Golspie (geomorphology and Moine granulites, $3\frac{1}{2}$ pp.); Rogart (granodiorite, 4 pp.); Helmsdale ($1\frac{1}{2}$ pp.), Loth and Portgower (2pp.) and Brora (Jurassic, 1 p.); the N.W. Highlands (1 p.); Golspie and Dunrobin (Triassic and Old Red Sandstone, $\frac{1}{2}$ p.); John o' Groats (Old Red Sandstone, $\frac{1}{2}$ p.).

The report is accompanied by accounts of: the distribution and petrography of the Moine Series and of the problems connected with it; the Rogart Granodiorite; and an outline of the history of investigation into the Mesozoic rocks of E. Sutherland.

[11]

EAST HIGHLANDS. GUIDE TO EXCURSION C.12. By T.C. Phemister and J. Weir. International Geological Congress. XVIII Session - Great Britain, 1948. 21pp.

Brora section (with brief introduction): Kildonan and Helmsdale ($1\frac{1}{2}$ pp.); The Mound ($\frac{1}{2}$ p.); Rogart Injection Complex (2 pp.); Shore section N.E. of Helmsdale (1 p.); Shore section Brora - Loth (1 p.).

The North-west Highlands ($2\frac{1}{2}$ pp., g.sk.map).

Aberdeen section (with brief introduction): Marischal College, Cove, Doonies Hill, Bay of Nigg, Girdleness (1 p.); Deeside (1 p.); Coast south of Aberdeen (1 p.); Gartley to Huntly and Glens of Foudland (1 p.); Belhelvie, Ellon, Kinharrachie, Bullers of Buchan, Cruden Bay and Slains ($1\frac{1}{2}$ pp.); Banff to Portnochie ($1\frac{1}{2}$ pp.).

[11A]

SUMMARY OF THE GEOLOGY OF ARDNAMURCHAN. INCLUDING THE REPORT OF THE SUMMER FIELD MEETING TO ARDNAMURCHAN, STAFFA, IONA AND OBAN; JULY 22nd TO AUGUST 1st, 1932. By J.E. Richey. Proc.Geol.Ass., Lond., v.44(1933), pp.1-56.

The excursions included: Mingary Pier to Kilchoan Harbour (cone-sheets and linear vents, g.map lin.-350ft., $5\frac{1}{2}$ pp.); Ben Hiant (vents and intrusions, g.map 3in.-1ml., $6\frac{1}{2}$ pp.); Shore near Mingary Castle (Trias and Lower Lias cut by cone-sheets and N.W. basic dykes, lin.-100yds., $1\frac{1}{2}$ pp.); Glebe Hill (hypers-thene-gabbro ring-dyke and sapphire bearing xenoliths, $2\frac{1}{2}$ pp.); Shore section: Kilchoan Bay (Jurassic strata cut by cone-sheets and by basic and acid dykes, g.map 5in.-1ml., $5\frac{1}{2}$ pp.); Beinn na Seilg (ring-dykes and cone-sheets, 5 pp.); Grigadale to the Lighthouse (ring-dykes, $4\frac{1}{2}$ pp.); Achnaha (ring-dykes, g.map 5in.-1ml., $6\frac{1}{2}$ pp.); Faskadale Bay and Meall nan Con (vent-agglomerates and major intrusions cut by outer cone-sheets, $3\frac{1}{2}$ pp.); Staffa and Iona (1 p.); Oban and Dunollie ($1\frac{1}{2}$ pp.); Island of Kerrera (g.map lin.-1ml., $1\frac{1}{2}$ pp.).

The superb air photo-mosaic of the entire Ardnamurchan peninsula, prepared by the Overseas Geological Surveys from photographs taken by the Air Ministry, is reproduced in The geology of Scotland (Ed. G.Y. Craig: Oliver & Boyd, 1965).

[12]

MULL AND ARDNAMURCHAN. GUIDE TO EXCURSION A.12. By E.B. Bailey and J.E. Richey. International Geological Congress. XVlll Session - Great Britain, 1948. 22pp.

The excursions were:

On Mull: Glen Forsa, Goadhail River, Loch Ba ($1\frac{1}{2}$ pp., g.map); Knock, Beinn a'Ghraig, Ben More (1 p.); Gribun, Loch Scridain, Ardtun, Ross, Iona (1 p.); Fishnish, Caignure, Loch Don ($1\frac{1}{2}$ pp.); Strathcoil, Sgurr Dearg, Glen Forsa (3 pp., g.map); Glen More (3 pp., g.map).

On Ardnamurchan: Mingary Pier, Kilchoan ($1\frac{1}{2}$ pp., g.map); Mingary Castle ($1\frac{1}{2}$ pp.); Ben Hiant ($2\frac{1}{2}$ pp., g.maps); Beinn na Seilg and Beinn nan Ord (1 p.); Achosnich to Lighthouse ($\frac{1}{2}$ p.); Achnaha and Sanna ($1\frac{1}{2}$ pp., g.map); Faskadale, Meall nan Con, and Meall an Tarmachain ($\frac{1}{2}$ p.); Shore west of Kilchoan ($\frac{1}{2}$ p.).

[12A]

GUIDE TO THE MOINE SCHISTS AND LEWISIAN GNEISSES AROUND MALLAIG, INVERNESS-SHIRE.
By R.St.J. Lambert and A.B. Poole. Geologists' Association Guide. No.35. 1964.
11pp. Price 2/-.

The Guide contains an Introduction (1p.) and a section on Stratigraphy (1 p.). The one traverse (7½ pp.) is described as follows:

"The rocks exposed along a two-mile traverse eastwards from Mallaig provide the most easily accessible and completely exposed succession of the whole of the Moinian and part of the Lewisian in this region." It is interesting for three reasons: "firstly, it crosses all members of the local Moinian succession, and provides excellent examples of the sedimentary structures which indicate the 'way up' of the sequence; secondly, there are many good examples of tectonic structures, and it is possible to observe the effects of increasing metamorphism and severity of deformation on a range of Moinian psammites and pelites as the traverse is followed eastwards; thirdly, the Moine-Lewisian boundary relationships provide an excellent example of metamorphic convergence of dissimilar rock types."

(g.map: 2in. - 1ml.)

[13]

SOUTH-WEST HIGHLANDS. GUIDE TO EXCURSION A.16. By J.G.C. Anderson. International Geological Congress. XVIII Session - Great Britain, 1948. 24pp.

A summary of the geology (9 pp.) is followed by details of excursions to: Oban district (¼ p.); Tyndrum and north slopes of Ben Lui (2 pp., g.map); Kilchrenan (1 p.); Killin - Glen Lochay (½ p.); Tayvallich (1 p.); Pass of Brander and Loch Awe (1 p.); Pass of Brander and Ben Cruachan (2 pp., g.map); Bonawe Quarry and Gleann Salach (½ p.); Head of Loch Lomond and Loch Sloy hydro-electric scheme (½ p.); Loch Don (Mull) (½ p.); Loch Spelve to Sgurr Dearg (Mull) (½ p.); Benderloch (½ p.); Ballachulish Ferry to Duror via Kentallen (1 p.); Loch Etive and Glen Coe (2pp., g.map).

[13A]

REPORT OF AN EXCURSION TO THE WEST HIGHLANDS OF SCOTLAND AND THE ISLE OF SKYE. SEPTEMBER 9th TO 20th (LONG EXCURSION), 1911. By E.B. Bailey, A. Harker and W.F. Gwynnell. Proc.Geol.Ass.,Lond., v.23(1912), pp.157-166.

The excursions included: Glen Nevis (1 p.); Spean Bridge and Glen Roy (½ p.); Onich (Appin Fold, 1 p.); Skye (1 p.); Ben Nevis (1 p.); Loch Leven (½ p.); Kentallen and Glen Coe (½ p.); Skye-Broadford (1 p.); Sligachan (1 p.); Loch Kilchrist (1½ pp.); etc.

Accompanying the report there are three papers in volume 22(1911) of the Proceedings: The geology of the neighbourhood of Fort William, by E.B. Bailey (pp.179-203); The geology of the neighbourhood of Broadford, Skye, by A.Harker (pp.204-209); and Note on the geology of the Cuillin Range, Skye, by W.F. Gwynnell (pp.210-212).

[14]

BEN NEVIS, GLEN COE, BALLACHULISH AREA. GUIDE TO EXCURSION C.11. By E.B. Bailey and J.G.C. Anderson. International Geological Congress. XVIII Session - Great Britain, 1948. 25pp.

Ballachulish Centre. An Introduction to the geology (4 pp., g.sk.map) and guides to the following excursions: Onich ($\frac{1}{2}$ p.); St. John's Church and Gleann an Fhiodh ($\frac{1}{2}$ p.); Callert (2 pp., g.map); Kinlochleven to Invercoe (1 p.); Windows of Etive (1 p.); Cauldron subsidence of Glen Coe - Bidean nam Bian ($\frac{1}{2}$ p., g.sk.); Cauldron subsidence of Glen Coe - Stob Mhic Mhartuin ($\frac{1}{2}$ p.).

Fort William Centre. An introduction to the geology (4 pp., g.sk.map) and guides to the following excursions: Ben Nevis (1 p.); North side of Ben Nevis ($\frac{1}{2}$ p.); Glen Nevis (1 p.); Spean Bridge, Roy Bridge and Glen Roy (1 p.); Loch Laggan (2 pp., g.map); Mallaig (1 p.).

[14A]

ISLE OF SKYE. GUIDE TO EXCURSION A.13. By F.W. Anderson. International Geological Congress. XVIII Session - Great Britain, 1948. 13pp.

Ten pages of a general account (including a geological sketch map), followed by one page of extremely brief directions for six excursions.

[14AA]

NORTH-EAST SCOTLAND: THE DALRADIAN. By H.H. Read. Geologists Association Guide. No.31. 1960. 17pp. Price 2/6.

The geology of Aberdeenshire and Banffshire is outlined in the Introduction (5 pp.).

Itineraries:

Portnockie - Portsoy - Boyne Bay.

The main objectives of the guide are to illustrate: (i) the Lower Dalradian succession; (ii) the steeply-dipping western limb of the Boyndie Syncline and the tectonic mélange; (iii) the regional metamorphism and the migmatitic Cowhythe Gneiss.

(g.sk.map - Portsoy) (3 pp.) [15]

Whitehills - Banff - Macduff.

The main objectives are to illustrate: (i) the Upper Dalradian sediments of greywacke facies; (ii) the eastern limb of the Boyndie Syncline; (iii) metamorphism of the Buchan Type, decreasing in grade eastwards.

(2 g.sk.maps) (3 pp.) [16]

Inzie Head - Fraserburgh - Rosehearty.

The main objectives are to illustrate: (i) the Inzie Head Gneisses (= Ellon Gneisses) of the Lower Dalradian, forming the core of the Banff Nappe and the crest of the Buchan Anticline on this great structure; (ii) the Kinnairds Head Group and the Rosehearty Group of the Upper Dalradian, forming the western limb of the Buchan Anticline.

(g.sk.map) (2 $\frac{1}{2}$ pp.) [17]

Collieston coast-section.

The main objectives are to illustrate: (i) the flat recumbent folds in the Collieston Beds, grits, greywackes, siltstones and andalusite schists; the Mormond Hill Quartzite, similarly folded, lying below the Collieston Beds.

(g.sk.map)

(3 pp.) [18]

EXCURSION TO THE EAST OF SCOTLAND. THE NEIGHBOURHOOD OF ABERDEEN, STONEHAVEN, EDZELL AND ARBROATH, WITH SUPPLEMENTARY EXCURSIONS IN THE EDINBURGH DISTRICT. SEPTEMBER 1912. By G. Barrow, R. Campbell and G. Hickling. Proc.Geol.Ass., Lond., v.23(1912), pp.265-267.

The excursions included: Dee valley (metamorphic rocks and intrusive granite, 2½ pp.); Kincausie (granite, 1 p.); Edzell (Highland Border rocks, 1½ pp.); North Esk (metamorphic grades, ½ p.); Stonehaven to Crawton - coast section (1½ pp.); Stonehaven to Garron Point (Downtonian and (?) Upper Cambrian, 1½ pp.); Arbroath (Old Red Sandstone, 1½ pp.); Carmyllie (Old Red Sandstone, 1 p.); Bathgate (Lower Carboniferous, 2 pp.); Pentland Hills (½ p.).

The reports of the excursion are accompanied by the following papers: On the geology of the Lower Dee-side and the Southern Highland Border, by G. Barrow (pp.274-290, with col.g.map); On the geology of south-eastern Kincardineshire, by R. Campbell (pp.295-298); On the geology and palaeontology of Forfarshire, by G. Hickling (pp.302-311).

[19]

EXCURSION GUIDE TO THE GEOLOGY OF ARRAN. By M. Macgregor, with contributions by A. Herriott and B.C. King. Glasgow: Geological Society of Glasgow. 1965. 192pp. with index. Price 12/6. [20 - 34]

"Arran has a perennial fascination for the geologist. Since the days of James Hutton (1726-1797) it has drawn students and research workers from many lands, attracted to the island by its diversity of scenery, by its wide range of formations and by the profusion and variety of its igneous rocks. Nineteen miles in length and from eight to ten and a half miles in breadth, it contains within the small compass of about one hundred and sixty-five square miles sedimentary rocks belonging to nine different geological formations ranging in age from the unconsolidated deposits of Recent and Glacial times to the ancient crystalline schists to which the name Dalradian has been given. ... In addition to these rocks of sedimentary origin, nearly half the area of the island is occupied by igneous rocks of various ages and of very diverse nature." (p.9)

The introduction contains a summary of physical features and a section on the sources of information available. There is also a Summary of Geology, with special reference to localities selected for examination (27 pp.), brief archaeological notes (6 pp.), a glossary of place-names (8 pp.), a list of 95 references and an index.

Descriptive itineraries:

Glen Rosa and Glen Shurig.

"The main purpose of this excursion is to provide the visitor with an introduction to the geology of north Arran" covering "sections of Dalradian,

Lower Old Red Sandstone, Upper Old Red Sandstone, Carboniferous and Permian rocks, as well as sections in the Northern Granite and representative examples of some of the minor intrusions (pitchstones, felsites and dolerites) of Tertiary age. The excursion also furnishes numerous illustrations of glacial phenomena and striking views of the scenery of the North Arran mountains."

(g.map: 1½in. - 1ml.) (12 pp.) [20]

Brodick to Lamlash Bay by the coast.

"The objects of this excursion are: (1) to study the rock-types present in the two subdivisions of the Permian known as the Brodick Breccia and the Lamlash-Machrie Sandstone; and (2) to examine some of the dykes and sills traversing the Permian along part of this coast. Magnificent, almost continuous exposures are available in the cliffs at the back of the low raised beach platform and on the beach itself."

(6½ pp.) [21]

Corrygills and the Clauchland Hills.

"to continue the examination of the Tertiary dykes and sills of the Corrygills district and particularly to study in more detail the textural variations and mode of intrusion of the massive sill of olivine-dolerite forming the Clauchland Hills."

(g.map: 1½in. - 1ml.) (7 pp.) [22]

Corrie Shore.

"to examine the Carboniferous rocks of Arran in an area that is readily accessible and where the succession of rock types is clearly displayed. The succession on the Corrie shore is illustrated diagrammatically .. The thickness of the Carboniferous sedimentary rocks present is very approximately 960 feet, made up of Coal Measures, about 245 feet; Millstone Grit (Passage Group), perhaps 30 feet; Carboniferous Limestone Series, about 390 feet; and Calciferous Sandstone Series, about 295 feet. A group of basic lavas, approximately 375 feet thick is intercalated near the base of the Calciferous Sandstone Series."

(g.map: 1½in. - 1ml.) (7 pp.) [23]

Locherim Burn and Coire nan Larach.

"(1) to continue the study of the Carboniferous rocks of the Corrie district: (2) to examine the junction of the Lower Old Red Sandstone and the granite in the Locherim Burn and the contact of the latter with the Dalradian schists in the Allt a'Chapuill; (3) to see the lateral moraines and other glacial phenomena in Coire nan Larach."

(5 pp.) [24]

Glen Sannox and North Glen Sannox.

"(1) to traverse the Lower Old Red Sandstone succession seen in Glen Sannox and on the hillsides to the north, including a visit to the old barytes mines; (2) to study the exposures of Dalradian and Arenig(?) rocks ...; (3) to examine the sections of the coarse granite in Coire nan Ceum

and of the granite-schist contacts at selected localities; (4) to traverse the faulted outcrops of Lower and Upper Old Red Sandstone, including the volcanic series intercalated in the latter between Glen Sannox and the Fallen Rocks."

(g.map: $1\frac{1}{2}$ in. - 1ml.) (11 pp.) [25]

Loch Ranza, North Newton and Cock of Arran.

"(i) to continue the examination of the Dalradian schists, this time on the north margin of the north Arran granite mass; (2) to examine the classic unconformity on the shore at North Newton; (3) to study the Permian sandstones and breccias at the Cock of Arran and the land-slipped masses of the Scriden."

(g.map: $1\frac{1}{2}$ in. - 1ml.) (6 pp.) [26]

Catacol, Loch Ranza and Creagan nan Caorach.

"This excursion continues the examination of the Dalradian Schists, this time in the area south of Loch Ranza, and the further evidence they provide for the basin-shaped structure known as the Catacol Synform. ... Opportunities are also given ... for examining some striking exposures of the junction of the schists with the Northern Granite."

(g.map: $1\frac{1}{2}$ in. - 1ml.) (5 pp.) [27]

Catacol, Loch Tanna and Pirnmill.

"to examine (1) sections in the steeply inclined Dalradian schists along the western edge of the Northern Granite; (2) contacts of the outer coarse-grained granite and the inner fine-grained granite exposed in Glen Catacol and on the high ground to the west. The two types of granite differ not only in their texture but also in their joint systems and mode of weathering. The wide-spaced mural jointing in the coarse variety and the more compact close-set jointing in the fine are reflected in the topography."

(g.map: 1in. - 1ml.) (4 pp.) [28]

Pirnmill to Catacol.

"the study of the rock-types and structures shown by the Dalradian schists along the western margin of the Northern Granite."

(3 pp.) [29]

Kingscross Point - Whiting Bay - Glen Ashdale.

"to examine phenomena connected with the intrusion of the Kingscross 'crinanite sill', to study the New Red Sandstone sediments and the dykes intruded into them, and to visit composite sills of the quartz-dolerite-felsite suite."

(g.map: 1in. - 1ml.) (7 $\frac{1}{2}$ pp.) [30]

Holy Island.

"Holy Island, dominating the approaches to Lamlash Bay and rising steeply to a height of 1,030 feet, is about two miles long and, at its widest part, some two-thirds of a mile broad. The island is mainly composed of a massive sill-like intrusion of trachyte. The thickness of this intrusion (800 ft. or so remain) suggests that it may be mushroom-shaped or laccolithic in form."

(g.map: lin. - 1ml.) (2. pp.) [31]

Largybeg to Bennan.

Minor intrusions.

(g.map: 1 $\frac{1}{2}$ in. - 1ml.) (6 pp.) [32]

Drumadoon and the Tormore dykes.

"the examination of the composite dykes and other intrusions which abound on this stretch of shore."

(g.map: lin. - 2000 ft.) (6 pp.) [33]

Area around Ard Bheinn.

"to examine the northwestern part of the Central Ring Complex, mainly around Ard Bheinn and Binnein na h-Uaimh. This area offers a great diversity of rock types and is for the most part fairly well exposed. The route map and the locality descriptions have been contributed by Professor B.C. King who has made a special study of the region. He regards the masses of sedimentary rocks and basic lavas within the Complex as relics of a block which subsided some 3,000 feet during the formation of a volcanic caldera. The structure of the block has been complicated by dislocation along a number of internal arcuate and radial faults, as well as by extensive dissection as a result of the emplacement of intrusive agglomerates and breccias."

"Further complexity has been introduced by the development of a series of lavas, breccias and agglomerates of andesitic and dacitic composition, together with extensive masses of felsite. These are regarded by Professor King as representing the basal parts of the superstructure of volcanic cones which rose above the caldera floor. The two main volcanic centres corresponded approximately to the positions of the Ard Bheinn and Binnein na h-Uaimh summits, while from the concentric and radial structures shown by the felsites other centres are inferred to the east and northeast."

(g.map: lin. - $\frac{1}{2}$ ml.) (9 pp.) [34]

ISLE OF ARRAN. By S.I. Tomkeieff. Geologists' Association Guide. No.32. 1961. 33pp. Price 3/-.

"Since the days of James Hutton and Robert Jameson, the Isle of Arran has been, and still is, a great attraction to many geologists and lovers of nature. The diversity of its scenery, reflecting the great diversity of rock types, has made Arran a 'treasure island' for geologists. In a sense Arran is Scotland in miniature. The northern part of the island is a fragment of the Scottish Highlands penetrated by a Tertiary granite mass,

while the dissected plateau and rolling hills of southern Arran correspond to the Midland Valley of Scotland. These two regions are separated by the well-known Highland boundary fault zone which runs from Stonehaven to the west coast of Ireland."

The Guide contains a Preface ($1\frac{1}{2}$ pp.) and an Introduction (4 pp.) to the geology.

Brodick, Corrygills - Clauchland area.

"The purpose of this excursion is to get an introduction to the Permian rocks of Brodick region and to examine the numerous intrusive sheets and dykes of Corrygills - Clauchland region to the S.E. of Brodick. The intrusive sheets of this region, both basic and acid, may be considered to be part of a cone-sheet complex centred on Lamash Bay."

(g.sk.map: 2mls. - lin.) (7 pp.) [35]

Glen Cloy, Glen Dubh, etc.

"to examine two outcrops of felsite cone-sheets of Glen Cloy and Glen Dubh, the igneous breccia of the Sheans, the basic rocks of the eastern part of the Central Complex and the intrusive felsite of Windmill Hill on the Carboniferous ridge."

(folding g.map: 2in. - 1ml.) (3 pp.) [36]

The northern granite

"the exploration of the northern granite by walking up Glen Rosa and climbing Cir Mhor (pronounced Keer Vor) and Goat Fell (Gaelic Goath Bhein, the Hill of the Winds)."

($1\frac{1}{2}$ pp.) [37]

Corrie shore

"a detailed examination of the shore section at Corrie, where the whole of Arran's Carboniferous strata is exposed, also the examination of the New Red and the Old Red Sandstone strata, of the examination of the complex fault system of the region and of the granite contact to the west of Corrie."

(3 pp.) [38]

Glen Sannox, etc.

"the examination of the Old Red Sandstone conglomerate; the Arenig rocks Dalradian schists and granite as exposed in the North Glen Sannox; the Dalradian schist of Glen Chalmadale; the Carboniferous rocks of Laggan shore; 'Hutton's unconformity', and the Dalradian schists and other rocks of the western part of northern Arran."

(g.map: 3in. - 1ml.) ($3\frac{1}{2}$ pp.) [39]

Central Complex and Tormore shore.

"This excursion consists of two distinct parts: first, the examination of the northern and the north-western margins of the Central Complex and, second,

the examination of the Tormore shore dykes and sills.

(2 g.maps: 6in. - 1ml.) (6 pp.) [40]

Lamlash.

"the study of the Lamlash cone-sheet complex, and the examination of the petaloid sills complex and the dyke-swarms of southern Arran.

(3 pp.) [41]

EXCURSION TO ARRAN. JULY 27th TO AUGUST 3rd, 1923. By J.W. Gregory and G.W. Tyrrell. Proc.Geol.Ass., Lond., v.35(1924), pp.401-423.

The excursions included: Clauchland Hills and Corriegills Shore (2 pp.); around the northern half of the Island ($3\frac{1}{2}$ pp.); Goat Fell to Corrie (2 pp.); the Ard Bheinn Complex ($2\frac{1}{2}$ pp.); Glen Rosa to Glen Sannox (2 pp.); Glen Cloy and Glen Shurig ($2\frac{1}{2}$ pp.); Tormore and Drumadoon ($\frac{1}{2}$ p.); motor excursion through Southern Arran (5 pp.).

[42]

ARRAN AND SOUTH-WEST SCOTLAND. GUIDE TO EXCURSION A.15. By G.W. Tyrrell, J.B. Simpson and others. International Geological Congress. XVlll Session - Great Britain, 1948. 22pp.

Arran. An introduction to the geology ($1\frac{1}{2}$ pp.) and guides to the following excursions: Brodick and Glen Rosa (1 p.); Corrygills and Clauchland Hills (1 p.); String Road, Machrie Bay, Tormore, Blackwaterfoot (1 p.); North Glen Sannox, Sannox and Corrie (1 p.); South end of Arran (1 p.); The Sheans and Glen Dubh ($1\frac{1}{2}$ pp.); Northern end of Arran (1 p.).

South-west Scotland. An introduction, with a geological sketch map of South-west Scotland (1 p.) and guides to the following excursions: The Southern Uplands (2 pp.); The Girvan district ($1\frac{1}{2}$ pp., g.sk.map); Cumnock, Kirkconnel, Thornhill (1 p.); Central Ayrshire ($1\frac{1}{2}$ pp.); East Ayrshire (1 p.).

[42A]

GEOLOGICAL EXCURSION GUIDE TO THE GLASGOW DISTRICT. By D.A. Bassett. Glasgow: Geological Society of Glasgow, 1958. 104pp. Price 7/6.

"Throughout the compass of the British Isles few places present such an excellent field as Glasgow for varied and interesting geological pursuits. Even within the municipal boundaries, and at a short distance beyond them, the geologist finds material inviting his attention, while the multiplied facilities provided by modern conveniences of locomotion have so enlarged his field of observation as to make this a centre of singular attractiveness."

There is an Introduction (1 p.), in which the scope of the guide is outlined, and a Summary of the geology (7 pp.)

[43 - 65]

Descriptive itineraries:

Loch Lomond: Balmaha to Strathcashell.

"The Highland Boundary Fault, which demarcates the Grampian Highlands to the south-east, is one of the major dislocations in the country. Like most other major fracture-zones, it has had a complicated geological history, probably beginning in Ordovician times. The fault crosses Loch Lomond immediately north of Balmaha and in the traverse along the shore northward from the pier the effects of the various fault movements on the country rocks can be studied. The outward and inward journeys from Glasgow illustrate the relationship of solid rock to topography in the area between the Kilpatrick Hills and Balmaha."

(g.map: $1\frac{1}{2}$ in. - 1ml.) (3 $\frac{1}{2}$ pp.) [43]

Aberfoyle and the Duke's Pass.

"The Aberfoyle District is one of the few areas within easy reach of Glasgow where undoubted Lower Palaeozoic rocks occur, namely the Highland Border Series. The excursion illustrates the stratigraphy of these beds and their structural relationship to the Dalradian and Old Red Sandstone rocks. The optional outward and inward journeys illustrate the Tertiary, Glacial and Recent history of the area north of Glasgow."

(g. map: $1\frac{1}{2}$ in. - 1ml.) (3 $\frac{1}{2}$ pp.) [44]

Bowling, Dumbarton, Cardross.

"Intrusive and extrusive igneous rocks of Carboniferous age as well as basal Carboniferous and uppermost Old Red Sandstone sediments are well exposed in a series of sections in and around Dumbarton."

(4 $\frac{1}{2}$ pp.) [45]

The Northern slopes of the Campsie Fells.

"The precipitous northern slopes of the Campsie Fells form some of the most striking topography in the Glasgow District, especially near two of the most perfectly developed corries in the Midland Valley of Scotland, namely the Balglass Corries. The sedimentary rocks of the area are of Lower and Upper Old Red Sandstone and lowermost Calciferous Sandstone age, cut by a number of volcanic vents."

"The vents reveal themselves as special circumscribed outcrops of tuff, agglomerate, and massive igneous rock, distributed without regard to the stratigraphy of the district. That they are vertical, continuing to a great depth, is most clearly shown by their persistence as surface features in places where erosion has removed all other trace of volcanic accumulation; they may be cut deeply, but they cannot be planed away."

"Scenic independence follows geological independence, and the vents of the district are most of them striking features in the landscape. They are apt to show particularly abrupt and picturesque form where they are surrounded on all sides by older sedimentary strata, as is the case with Dumgoyn and Dumfoyn; but even where they occur in connection with the lavas of the plateau

they seldom hide themselves. Dungoil is a landmark none can miss, and the northern front of the Campsie Fells, with its long succession of vents, is obviously no ordinary escarpment' (Glasgow Memoir, p.142)."

(g.map: 2in. - 1ml.) (4 pp.) [46]

The southern slopes of the Campsie Hills: Campsie Glen.

The petrography of the Clyde Plateau Lavas, the underlying Ballagan Beds, and the Permo-Carboniferous intrusions.

(g.map: 2½in. - 1ml.) (4 pp.) [47]

Corrieburn.

"The three burns, flowing southward past Queenzieburn, expose the most complete succession of the upper part of the Calciferous Sandstone Series [- above the Clyde Plateau Lavas -] and of the Lower Limestone Group in the Glasgow District."

(g.map: 2½in. - 1ml.) (4 pp.) [48]

Milngavie and Mugdock.

"The area north and east of Milngavie is a favourite one with country rambblers, because of the diversity of scenery within small compass and its proximity to the city centre. The area is equally interesting to the geologist, partly because of the sediments and contemporaneous volcanics of Lower Carboniferous age and partly because of the suite of intrusives known collectively as the Milngavie Dolerite Sills."

(2 pp.) [49]

South Brae of Campsie.

The stratigraphy of the sediments immediately overlying the Clyde Plateau Lavas.

(2 pp.) [50]

The Bathgate Hills.

"The Bathgate Hills are made up of Lower Limestone Group strata, whose overall character differs markedly from that of rocks of the same age in Midlothian, Stirlingshire and Dumbartonshire owing to the intercalation within the normal sediments of great thicknesses of contemporaneous igneous rocks."

(g.map: 2½in. - 1ml.) (4 pp.) [51]

South Bute.

"The island of Bute is divided into two portions by the Highland Boundary Fault, which crosses the island from Rothesay Bay to Scalpsie Bay. The northern section consists of Dalradian schists, phyllites and grits while the southern section is composed, for the most part of Old Red Sandstone sediments and Calciferous Sandstone lavas which are cut by Tertiary faults and injected by numerous dykes and two large sills.

(g.map: 2½in. - 1ml.) (5½ pp.) [52]

Great Cumbrae.

"Great Cumbrae is composed of Upper Old Red Sandstone conglomerates and sandstones overlain by mixed sediments which are probably of Calcififerous Sandstone age. The rocks are folded into a shallow pitching syncline occupying the area west of the Great Cumbrae Fault and a pitching anticline occupying the narrow tract to the east of the fracture."

"The sediments are cut by an exceptionally large number of dykes which are in general easily accessible and well exposed around the coast of the island. The essential purpose of the excursion is the study of these dykes which are classified as follows:-

Carboniferous (Calcififerous Sandstone) Suite: (a) Basaltic vents; (b) ENE. bostonite intrusions; (c) ENE. dykes of Markle, Dunsapie and Jedburgh basalt; (d) some intrusions of bostonite and ENE. trending felsites.

Permo-Carboniferous Suite: E.-W. dykes of quartz-dolerite.

Tertiary Suite: (a) NNW. dykes of olivine-dolerite and crinanite; (b) NNW. dykes of Cumbraite; (c) One NW. tholeiite (Brunton type) dyke."

(g.map: 2½in. - 1ml.) (4½ pp.) [53]

Saltcoats - Ardrossan.

"The coast between Ardrossan Harbour and the New Pier, Saltcoats, affords good exposures of strata ranging from the Upper Old Red Sandstone to the Coal Measures, cut by numerous Tertiary dykes and intruded by picrite and teschenite sills."

(g.map: 2½in. - 1ml.) (4 pp.) [54]

Heads of Ayr.

"The main object of this excursion is to examine the famous shore-section between Doonfoot and Bracken Bay, where the following relationships between Old Red Sandstone and Carboniferous rocks are well exposed: (a) Lower Old Red Sandstone lavas in faulted contact with Upper Old Red Sandstone sediments, which, in turn, are faulted against Cementstone strata; (b) the Cementstone strata cut by a large Lower Carboniferous agglomerate vent which contains a number of small Lower Carboniferous or Permo-Carboniferous monchiquite intrusions; (c) Cementstone strata overstepped by Millstone Grit sediments and lavas; and finally (d) numerous Tertiary dykes cutting both Old Red Sandstone and Carboniferous strata."

(g.map: 2½in. - 1ml.) (2½ pp.) [55]

The Lesmahagow Inlier.

"The Lesmahagow Inlier is the most important of the Silurian inliers of southern Scotland. This is due partly to the unique faunal assemblages found in the strata and partly because the overlying Old Red Sandstone sediments rest conformably on the Silurian."

"The palaeontological importance is due to two things, (a) the discovery by Robert Slinon, in the eighteen fifties of large numbers of well preserved crustacean fossils which later formed a large part of the material figured and

described by Woodward in his Monograph on the Merostomata; (b) the discovery of fossil fish in the Downtonian. The first fish was found by James Young of Lesmahagow, but the main collections are due to MacConnachie and Tait, the Geological Survey collectors and to the enthusiastic members of the Geological Society of Glasgow who, under the leadership of David Nimmo, set up the famous Camp Siluria."

(4 pp.) [56]

The Enoch valley, Eaglesham.

"The solid rocks [of the area south of Eaglesham] are extensively covered with boulder clay and fluvio-glacial deposits. The most interesting of these ... occur in the Enoch Valley south-south-east of Eaglesham, where there is a series of sand and gravel terraces which mark the stages of retreat of an ice-front."

(g.map: 2 $\frac{1}{2}$ in. - 1ml.) (4 pp.) [57]

Ballagioch and Bennan Hill.

"The ground south and west of Eaglesham forms part of the great horseshoe of high ground which partly encircles Glasgow and which is formed of Clyde Plateau Lavas. It is in this southern section of the outcrop that the greatest variety of rock types is found, because in addition to the macro- and micro-porphyrific basalts there are intercalations of mugearite, trachyte, trachyandesite and rhyolite lavas with associated ashes."

(2 pp.) [58]

The Arden Basin.

"The best sections in the Upper Limestone Group are exposed along the southern limb of the Arden Basin, which is a synclinal structure trending east-south-east from Barrhead to the White Cart. The Lower Limestone and Limestone Coal Group strata are nowhere exposed in this southern limb because the Upper Limestone is in faulted contact with the Calciferosus Sandstone or Clyde Plateau Lavas."

"The Upper Limestone Group is made up dominantly of arenaceous rocks, with two well-defined thick sandstone horizons and several bands of limestone. The most important limestones are the Index or Cowglen, the Lyoncross or Holeburn, the Orchard, the Arden or Calmy and the Castlecary or Levenseat."

(g.map: 2in. - 1ml.) (5 pp.) [59]

Garrion Gill.

"The Garrion Burn in the Overton district, one and a half miles south-west of Wishaw, is one of the two best natural sections in the Coal Measures of the Glasgow District. It exposes an almost continuous section from the base of the Modiolaris Zone upwards."

(g.map: 3 $\frac{1}{2}$ in. - 1ml.) (3 $\frac{1}{2}$ pp.) [60]

Tinto.

The stratigraphy of Ludlovian, Downtonian and Lower Old Red Sandstone sediments; the petrography and structure of the felsite.

(3 pp.) [61]

The Lugar Sill.

The composite Lugar Sill, "due mainly to the detailed investigations of Dr. G.W. Tyrrell, has become one of the best known and most closely studied sills in the world."

(g.map: lin. - 100yds.) (3½ pp.) [62]

The River Ayr, Howford Bridge.

The stratigraphy and sedimentation of the Mauchline Sandstone.

(½ p.) [63]

Toward Point to Dunoon.

The part of Argyllshire generally known as Cowal "embraces the south-western extension of the various bands of metamorphic rocks which form the southern edge of the Highlands. Bounded on three sides by coast-lines and penetrated by a number of sea-lochs it affords better and more continuous sections of these rocks than are generally to be met with in the interior of the country."

"From the detailed study of this part of the Highlands much information has been obtained by the Geological Survey regarding the structures of the schists and the successive movements by which these structures have been produced. Originally most of the rocks formed a thick series of sedimentary deposits, the geological age of which still remains to be determined. These strata have been found to have undergone a remarkable series of repeated movements. After being thrown into folds and having cleaved so as to acquire a first system of deformation, they have again suffered a repetition of the process more than once. They consequently present secondary and tertiary, perhaps even quaternary structures, probably due to mechanical movement with accompanying recrystallization" (Arch. Geikie in the Preface to the Geology of Cowal)."

(3 pp.) [64]

Glasgow City.

"The City of Glasgow is built partly on the alluvial flats of the Clyde, partly on the sands, gravels and brick-clays of the 100-foot raised-beach and partly on boulder clay drumlins. These superficial deposits form an extensive sheet which almost completely masks the underlying solid rock."

"Although rock outcrops within the city boundaries are few, the following are well worth visiting:- Fossil Grove; The Kelvin Gorge, Dawsholm Park; The Railway-Cutting, Cowlairst East Junction; Huntershill Quarries, Bishopbriggs; Garngad Road Quarry; Provanmill Recreation Ground; The Necropolis Hill; Linn Park; Giffnock Quarries.

(4 pp.) [65]

In addition to the itineraries, there are a number of suggestions for outward and inward routes from Glasgow and a large number of localities described. These are included in the index.

REPORT OF AN EXCURSION TO THE DISTRICT AROUND GLASGOW. APRIL 1st to 8th, EASTER, 1915. By J.W. Gregory, C.H. Dinham, A. Scott, W.R. Smellie, J. Stark and G.W. Tyrrell. Proc.Geol.Ass., Lond., v.26(1915), pp.276-286.

The excursions included: Kilsyth Hills and Campsie Fells (1 p.); Bute (1 p.); Kilpatrick Hills (1½ pp.); Garabal Hill, Ardlui (1 p.); Loch Long and Loch Lomond (1 p.); Lanark and Falls of Clyde (1 p.); The Kames of Carstairs (½ p.); Lugar and Mauchline (1 p.); Hamilton and Strathaven (1 p.).

In the same volume of the Proceedings there is a 43-page description of The geology of the Glasgow District, by the leaders of the excursion.

[66]

GLASGOW DISTRICT. GUIDE TO EXCURSION C.15. By G.W. Tyrrell. International Geological Congress. XVIII Session - Great Britain, 1948. 9pp.

A general account of the geology (2 pp.) with guides to the following excursions: Glasgow, Fossil Grove, Bowling and Dumbarton (1 p.); Milngavie, Ballagan, Lennoxton, Fintry, Kilsyth (1 p.); the South-western Highlands (1 p.); Barrhead, Lugton, Kilwinning, Saltcoats (½ p.); Balmaha, Aberfoyle, Trossachs, and Callander (½ p.); Great Cumbrae Island, Firth of Clyde (1 p.); Bishopton, Gourrock, Inverkip, Wemyss Bay, Largs (1 p.).

[66A]

SUMMER FIELD MEETING, 1932; GIRVAN - BALLANTRAE. AUGUST 3rd to 13th. By G.W. Tyrrell, J.L. Begg and others. Proc.Geol.Ass., Lond., v.44(1933), pp.57-86.

The excursions included: Aldons and Barr ("the base of the Girvan succession in the upper part of the Stinchar valley" - the Barr Series), Rough Neuk (the Craighead inlier), Newlands, South Threave (1½ pp.); Craighead, Kilgrammie, Quarrel Hill, and Ailsa Craig (microgranite - 2 pp.); Stranraer and the Rhinns of Galloway (3½ pp.); Glen Trool including Loch Doon (granite - 1 p.); Shore sections south of Girvan - Mains Hill and Byne Hill (3 pp.); Maidens, Dunure, and the Heads of Ayr (2 pp.); Shore section - Kennedy's Pass to Ballantrae (2½ pp.); Girvan to Ballantrae, via Colmonell (2½ pp.); Penwhapple Glen (1½ pp.).

There are two appendixes to the report:- On three trilobites from Girvan, by A. Wood (pp.81-84); Transgression in the Craighead Limestone, by A. Lamont (pp.84-86, incl.g.sk.map: lin. - 200ft.).

[67]

EDINBURGH GEOLOGY: AN EXCURSION GUIDE. Edited by G.H. Mitchell, E.K. Walton and D. Grant [of the Edinburgh Geological Society]. Edinburgh: Oliver and Boyd. 222pp. Price 12/6.

The Introduction (8½ pp.) contains a very brief outline of the geology of the area and is accompanied by a glossary of common geological terms (4½ pp.) and a list of the common minerals and their composition (2 pp.).

[68 - 88]

Itineraries:

City of Edinburgh, by C.D. Waterston.

Five short itineraries illustrating features of geological interest within the city boundaries: Blackford Hill (4 pp.); Craiglockhart and Colinton (3 pp.); The Dean (2 pp.); Wardie and Granton Shore (2½ pp.); The Castle Hill (2½ pp.).

A short note (1½ pp.) is appended on the Royal Scottish Museum.

(g.sk.maps) (15 pp.) [68]

Arthur's Seat, by G.P. Black.

"Less than a mile from the city centre, the remnants of the long-extinct volcano of Arthur's Seat rise from the low ground on which Edinburgh is built. Part of the volcano has been lost through erosion and part has been buried under younger rocks; enough, however, is exposed to allow us to study the vulcanicity in some detail, especially as the removal of much of the super-structure has laid bare the internal parts of the volcano. The largest volcanic remnant lies within the Holyrood Park where it culminates in Arthur's Seat (823 ft.), the hill from which the volcano takes its name. To the north and west smaller remnants build the Calton Hill and the Castle Rock. The volcano was active early in the Carboniferous Period. The volcanic rocks rest on strata high in the Cementstone Group and are covered by the lowermost sedimentary member of the Oil-Shale Group - the Abbeyhill Shales."

(g.map: 4in. - 1ml.) (15 pp.) [69]

Joppa Shore, by W. Tulloch.

"The strata exposed on the shore at Joppa provide an excellent section of the upper part of the Upper Limestone Group, almost the whole of the Passage Group (formerly known as the Roslin Sandstone Group) and the lower part of the Productive Coal Measures. All the beds belong to the Upper Carboniferous."

(g.map: 12in. - 1ml.) (9 pp.) [70]

Gosford Bay - Aberlady Point, by P.McL.D. Duff.

"This excursion is intended primarily to illustrate the rhythmic pattern of some of the sediments of the Lower Limestone Group which are well exposed between Craighielaw Point and Aberlady Point."

(g.map: 5in. - 1ml.) (6 pp.) [71]

Garleton Hills and Traprain Law, by A.G. MacGregor.

"The main objects of this excursion are to see typical examples of the Lower Carboniferous trachytic volcanic rocks of East Lothian, and some of the associated basalts and mugearites. The route is chosen so as to illustrate the geological structure of the area. Incidentally attention is directed to a hematite vein, to a Permo-Carboniferous quartz-dolerite dyke, and to the effects of glaciation. To cover the area in a short time motor transport is essential."

"The volcanic area is of particular interest for the following reasons: (1) here F.H. Hatch (1892) initiated petrological description of Scottish Carboniferous igneous rocks on modern lines; (2) Hatch recognized the alkaline character of the rocks and the presence of nepheline in the Traprain Law intrusion; he thus proved the existence of volcanic rocks of Palaeozoic age, essentially similar in character to alkaline rocks of modern volcanic districts. As a result Rosenbusch, the great German petrographer, was convinced that the Continental age-classification of volcanic rocks was artificial and misleading."

(g.map: 2mils. - lin.) (9 pp.) [72]

North Berwick, by G. Kelling.

"The rocks which occur in the vicinity of North Berwick belong to the volcanic facies of the Scottish Lower Carboniferous. These beds, which have been more precisely assigned to the Calciferous Sandstone Measures, are poorly exposed in the inland area, but there are excellent exposures on the shores of the Firth of Forth both east and west of North Berwick."

"The pyroclastic rocks in this volcanic assemblage are of particular interest, for besides bedded tuffs and agglomerates there are exposed, in the nine miles of coastline between Gullane and Peffer Sands, twelve large volcanic vents dissected by marine erosion. Five of these occur on the shore between Tantallon and North Berwick Pier; they pierce a series of bedded rocks and are themselves cut by a number of basic intrusions."

(g.map: $1\frac{1}{2}$ in. - 1ml.) (10 pp.) [73]

Dunbar, by E.B. Bailey.

"Dunbar ... is well known to non-geologists for its beauty, historical associations, dry climate, red-soil potatoes, and golf. To geologists it offers, in its immediate neighbourhood, exceptionally interesting exposures of Calciferous Sandstone volcanic necks"

(g.map: 3in. - 1ml.) (8 pp.) [74]

Granthouse, Siccar Point, Cove, Catcraig, by G.Y. Craig.

Folded Llandoveryian sediments; Hutton's classic unconformity; Upper Old Red Sandstone and Lower Carboniferous; Lower Limestone Group.

(3 g.maps) (12 $\frac{1}{2}$ pp.) [75]

Eildon Hills, by R.J.A. Eckford and W. Manson.

"Geologically, the Eildons have been regarded as the remnant of a large composite laccolite consisting of several sheets of intermediate and acid rocks intruded into sedimentary strata of the Upper Old Red Sandstone ..."

(g.map: lin. - 1ml.) (13 pp.) [76]

Middleton and Heriot, by E.K. Walton.

"This excursion is designed to show a variety of rock types (Carboniferous limestones and shales, granite, Lower Palaeozoic greywackes, shales, cherts and tuffs) and their associated structures; it allows of some good fossil collecting varying from abundant Carboniferous forms to rarer Silurian graptolites; and it affords an excellent opportunity for the appreciation of the geological control over the local topography."

(g.map and g.sk.map) (10½ pp.) [77]

Eddleston gravel-moraine, by E.B. Bailey and R.J.A. Eckford.

A belt of glacial gravel which extends, almost without interruption, for over nine miles.

(outline drift map) (8 pp.) [78]

Noble House, Lamancha, by A. Lamont.

An anticline of siltstones and greywackes, including the "Haggis Rock" covering a core of Llandeilo sediments and igneous layers and truncated by the Southern Upland Boundary Fault.

(g.sk.map: 3in. - 1ml.) (9 pp.) [79]

Dobb's Linn, Moffat, by I. Strachan.

Silurian and Ordovician graptolite shales in the locality made classic as a result of Charles Lapworth's work.

(g.map: lin. - 150ft.) (8 pp.) [80]

Leadhills district, by G.W. Borthwick.

"The Leadhills-Wanlockhead district is of considerable geological interest from two aspects. Firstly, it contains the largest lead-zinc deposit that has been worked in Scotland. It also has the longest history of production and by far the greatest output of all the lead-zinc mining areas of Scotland. Secondly, the district includes part of one of the belts of inliers of Arenig rocks in upper Ordovician strata extending right across the Southern Uplands."

(locality map) (10 pp.) [81]

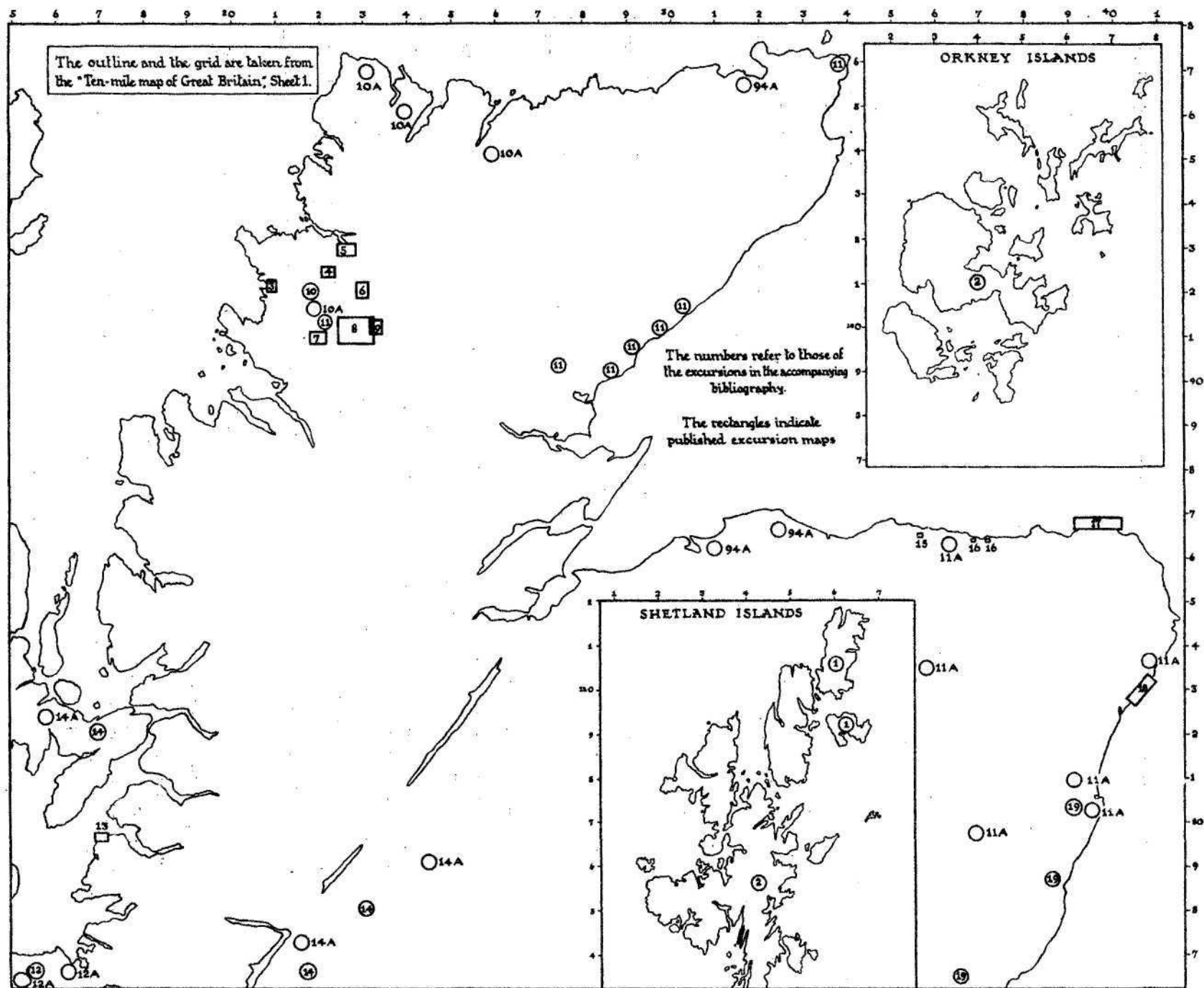
The North Esk Inlier, by W. Mykura.

"... the largest and most important of the three Silurian inliers in the Pentland Hills ..."

(g.map: lin. - 1ml.) (12 pp.) [82]

The Pentland Hills, by W. Mykura.

"The Pentland Hills are made up of Lower Old Red Sandstone lavas and sediments with a core of Silurian rocks. The latter are generally steeply dipping and are exposed in three distinct inliers known as the North Esk, Bavelaw Castle and Loganlee-Craigenterrie inliers. The Lower Old Red



Sandstone lavas consists of ten distinct groups of lava flows, which include olivine-basalts, andesites, trachytes, dacites and rhyolites, as well as acid and basic tuffs. They attain a thickness of over 6000 ft. in the north, but thin rapidly to the south. Near the southern end of their outcrop up to 2000 ft. of Lower Old Red Sandstone conglomerate and grit are present between the lavas and the underlying Silurian strata. Upper Old Red Sandstone, composed mainly of pink sandstone, rests unconformably on an eroded and undulating land surface of the older rocks. It forms the East and West Cairn Hills in the south-western part of the range, but near the northern end of the Pentlands, at Torphin Hill, it is very thin and in places completely overlapped by basal Carboniferous beds."

"The present topographic pattern of the Pentland Hills was initiated in the Tertiary era, and was later modified by the Highland ice which overwhelmed the area in Pleistocene times. Thus some of the Pentland passes, such as the Cauld Stane Slap and the Bore Stane, are sited on the beheaded courses of Tertiary rivers which drained to the south-east, while other major through-routes were formed as late-glacial overflow channels carrying melt-waters from ice-dammed lakes on the north-west slopes of the range into the Midlothian Basin."

Excursion A. Bavelaw Castle to Loganlee Reservoir.

(g.map: $2\frac{1}{2}$ in. - 1ml.) (4 $\frac{1}{2}$ pp.) [83]

Excursion B. Torphin Quarry - White Hill - Bonally Tower.

(g.map: $1\frac{1}{2}$ in. - 1ml.) (4 pp.) [84]

Cramond - Queensferry, by W. Tulloch.

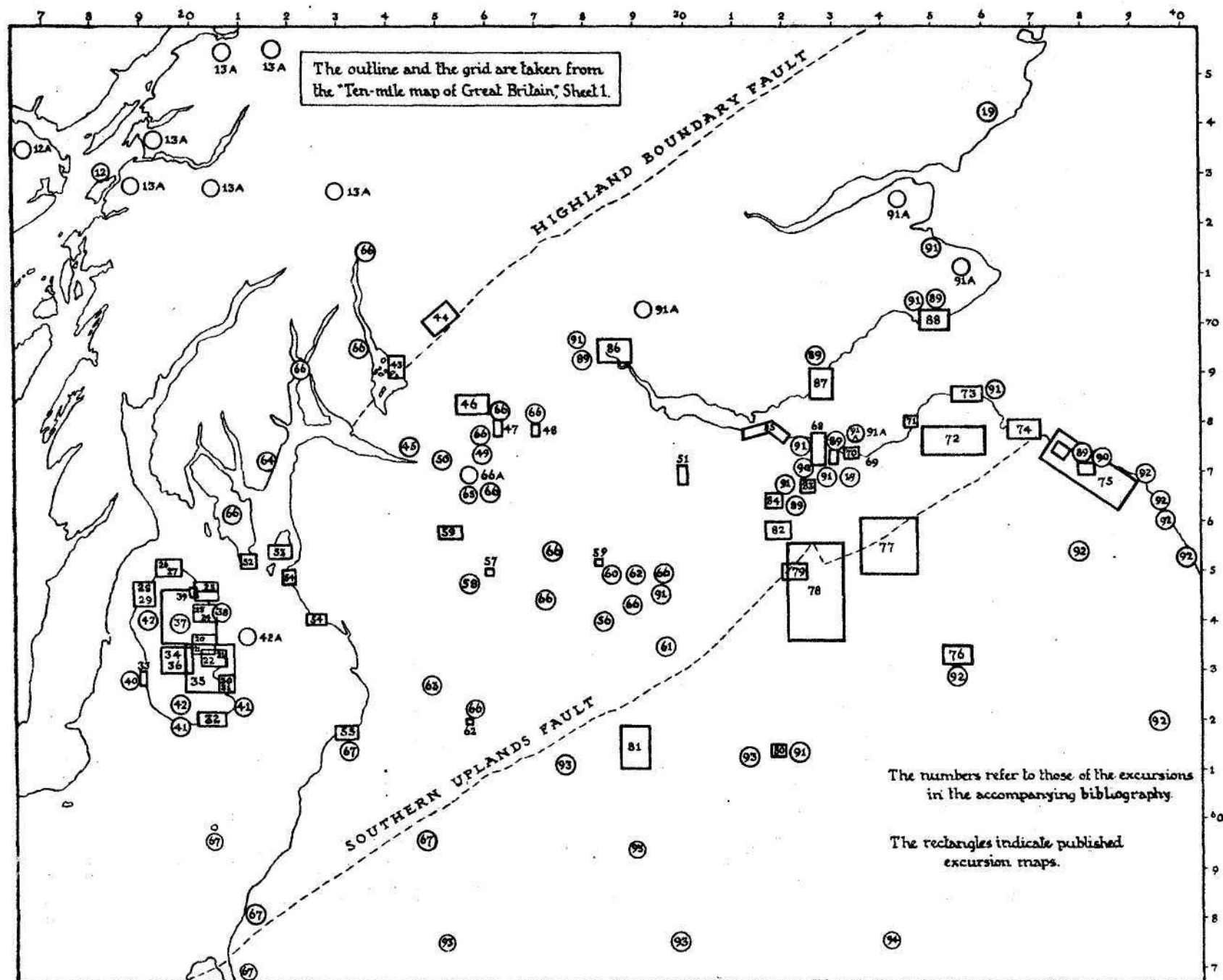
"The sedimentary rocks to be seen in the course of this excursion belong to the Lower and the Upper Oil-Shale groups of the Lower Carboniferous, the dividing line between the two being taken at the base of the Burdiehouse Limestone. Exposures are discontinuous from Cramond to Peatdraught Bay, but thereafter a fairly continuous section can be seen as far as Port Edgar. Good examples of teschenite and quartz-dolerite sills and their associated contact phenomena can be seen; the teschenite sills are probably of Carboniferous age, and the quartz-dolerite sills probably of Permo-Carboniferous age. Near Queensferry the Pumpherston Oil-Shales and the Pumpherston Shell-Bed are well exposed."

(g.map: $1\frac{1}{2}$ in. - 1ml.) (9 pp.) [85]

The Ochils from Stirling, by E.H. Francis.

"The object of the excursion is to view some of the Lower Old Red Sandstone rocks of the Ochil Hills, starting near Bridge of Allan and ending near Menstrie after descending through a succession of mainly volcanic strata amounting in thickness to some 2000 ft."

(g.map: 1in. - 1ml.) (7 $\frac{1}{2}$ pp.) [86]



Burntisland to Kirkcaldy, by E.H. Francis.

"The rocks between Burntisland and Kirkcaldy belong to the Oil-Shale and Lower Limestone groups. They form part of the north-eastern flank of the Burntisland Anticline - the dominant geological structure in S.E. Fife - and are well-exposed along the shore, where they dip to the east-north-east at 20° to 30° . Many exposures lie below high-water mark and advance reference to tide tables should be made to ensure that the section is seen to best advantage."

Much of the succession consists of basalt lavas which, with subordinate intercalations of tuffs and sediments, amount in thickness to about 1500 ft. The lowest lava is 600 ft. above the Burdiehouse Limestone, which forms the base of the Upper Oil-Shale Group, while the two highest lavas overlies the First Abden Limestone at the base of the Lower Limestone Group. The lavas are olivine-basalts of Dalmeny, Hillhouse and intermediate types but they are not differentiated on the route-map or in the following account. Individual flows are 8 to 40 ft. thick: some show pillow-form; others display columnar jointing: some are vesicular throughout, while others are slaggy only at tops and bases where vesicles are either spheroidal or elongated parallel to the upper and lower surfaces of the lava. The fresher, central parts of the flows vary in coarseness: many pass up into red bole. The tuffs and tuffaceous sediments are normally green, but many of them also pass up into red boles indistinguishable from those at the tops of the lavas. Many of the boles are underlain by patchy semi-laterized rock which has a fragmental aspect and which is often difficult to identify as either altered tuff or lava."

(g.map: 1in. - 1ml.) (8 pp.) [87]

Elie to St. Monance, by E.H. Francis.

"Along this coast a series of necks breaks through the Lower Carboniferous sedimentary rocks and 'furnish an unrivalled body of material for the study of ... the structure of volcanoes' (Geikie 1902, p.200). The necks are filled with fragments of the surrounding strata, brought up from no great depth; they include coal, sandstone, shale, limestone and ironstone and range in size from particles of dust to blocks several yards long. There is, in addition, a varying proportion of basalt in the form of both small, pale lapilli and large crystalline and vesicular blocks. Dykes and veins of basalt and fine-grained tuff traverse the necks and also the adjacent strata which are usually fractured and tilted in towards the neck margins."

(g.map: 2in. - 1ml.) (9 pp.) [88]

The Geologists' Association of London have visited the Edinburgh District on three occasions - in 1897 (their first visit to Scotland), 1913 and 1927. Reports of the various excursions are given as follows:-

LONG EXCURSION TO EDINBURGH AND DISTRICT. JULY 26th to 31st, 1897. By J. Geikie, H.W. Monkton and R.S. Herries. Proc.Geol.Ass., Lond., v.15(1897-98), pp.197-206.

The excursions included: Bathgate Hills (2 pp.); Pentland Hills (1 p.); Stirling (2 pp.); Burntisland and Kinghorn ($1\frac{1}{2}$ pp.); Cockburnspath (1 p.); Elie and St. Monans ($1\frac{1}{2}$ pp.).

Descriptions of the geology of these areas, by J.G. Goodchild and others, are given on pp.117-156 of the same volume.

[89]

REPORT OF AN EXCURSION TO THE EDINBURGH DISTRICT. AUGUST 1st to 9th, 1913. By J.S. Flett. Proc.Geol.Ass., Lond., v.25(1914), pp.45-50.

The excursions included: Arthur's Seat and Portobello ($\frac{1}{2}$ p.); Castle Rock, Calton Hill, Blackford and Braid Hills ($\frac{1}{2}$ p.); Pentland Hills ($\frac{1}{2}$ p.); Dalmeny and Queensferry ($\frac{1}{2}$ p.); Kirkcaldy, Kinghorn and Burntisland ($\frac{1}{2}$ p.); Cockburnspath and Siccar Point ($\frac{1}{2}$ p.); Bilston Burn and Roslin ($\frac{1}{2}$ p.).

Accompanying the report there are elaborate descriptions of the geology of the areas by J.S. Flett and others.

[90]

REPORT OF VISIT TO EDINBURGH AND DISTRICT. JULY 29th to AUGUST 8th, 1927. By R. Campbell and others. Proc.Geol.Ass., Lond., v.38(1927), pp.511-517.

The excursions included: The City ($\frac{1}{2}$ p.); Pentland Hills ($\frac{1}{2}$ p.); Stirling (1 p.); North Berwick coast ($\frac{1}{2}$ p.); St. Andrews ($\frac{1}{2}$ p.); Carstairs and Tinto ($\frac{1}{2}$ p.); Elie and St. Monans ($\frac{1}{2}$ p.); Bilston Burn ($\frac{1}{2}$ p.); North Berwick ($\frac{1}{2}$ p.); Dobb's Linn ($\frac{1}{2}$ p.).

The description given by J.S. Flett in 1913 is reissued in a revised form in the Proceedings for 1927, pp.405-510.

[91]

EDINBURGH AND ST. ANDREWS. GUIDE TO EXCURSION C.13. By A.G. MacGregor, D.E. Innes and others. International Geological Congress. XVlll Session - Great Britain, 1948. 20pp.

Edinburgh district (with stratigraphical table and structural summary): Royal Scottish Museum; Arthur's Seat Volcano (2 pp.); City of Edinburgh ($\frac{1}{2}$ p.); Geological Survey Office and Grant Institute of Geology ($\frac{1}{2}$ p.); Pentland Hills - Carlops and North Esk reservoir ($\frac{1}{2}$ p.); Forth Bridge and Winchburgh (1 p.); Straiton, Borthwick, Roman Camp Ridge and Gilmerton (1 p.); Traprain Law, Garleton Hills and Gullane - Dirleton Coast (1 p.); Cockburnspath (Siccar Point), Cove and Catcraig (2 pp., map); Dobb's Linn and Melrose tour (1 p.);

St. Andrews district (with a stratigraphical table and summary of the geology of the area): Wormit and St. Fort (1 p.); Rock and Spindle vent and shore section to St. Andrews ($\frac{1}{2}$ p.); Drumcarrow and Dura Den (1 p.); Glen Devon, Gleneagles, Comrie (1 p.); Randerstone to Kingsbarns shore section (1 p.); St. Monance and Elie (1 p.); Burntisland, Kinghorn and Kirkcaldy (1 p.).

[91A]

The area covered by the Edinburgh Guide is covered in very small part by the report of the Geologists' Association visit to the coast north and south of Berwick-on-Tweed:

EXCURSION TO THE COAST NORTH AND SOUTH OF BERWICK-ON-TWEED, COCKBURN LAW, THE CHEVIOTS, AND THE EILDON HILLS. LONG EXCURSION, JULY 28th to AUGUST 4th, 1903. By J.G. Goodchild. Proc.Geol.Ass., Lond., v.18(1903-1904), pp.307-321.

The excursions included: St. Abb's Head ($3\frac{1}{2}$ pp.); Cheviot Hills (3 pp.); Burnmouth (2 pp.); Duns and Cockburn Law ($2\frac{1}{2}$ pp.); Eildon Hills ($\frac{1}{2}$ pp.); Scremerston ($1\frac{1}{2}$ pp.); Eyemouth (1 pp.).

[92]

SUMMER FIELD MEETING, 31st JULY to 11th AUGUST, 1937. THE DUMFRIES DISTRICT. By J. Pringle and others. Proc.Geol.Ass., Lond., v.49(1938), pp.213-224.

The excursions included: Birkhill and Loch Skene (1 p.); Hartfell and Glenkiln (1 p.); Dumfries and Annan (1 p.); Kirkbean, Southernness and Arbigland (1 p.); Thornhill Basin (1 p.); Sanquhar coalfield ($1\frac{1}{2}$ pp.); Dalbeattie, Balcary and Torr ($1\frac{1}{2}$ pp.); River Esk (1 p.); Kirkmabreck and Clatteringshaws Bridge ($\frac{1}{2}$ p.); Leadhills and Dalveen Pass ($\frac{1}{2}$ p.).

[93]

SCOTLAND (GENERAL TOUR). GUIDE TO EXCURSION A.19. By T.C. Phemister and A.G. MacGregor. International Geological Congress. XVlll Session - Great Britain, 1948. 17pp.

The excursions included: Fossil Grove and Kilpatrick Hills (1 p.); Lennoxton, Campsie Glen and Ballagan Glen (1 p.); Glasgow to Fort William ($1\frac{1}{2}$ pp.); Fort William (1 p.); Fort William to Strathpeffer (1 pp.); North-west Highlands excursion ($1\frac{1}{2}$ pp.); Strathpeffer to Aberdeen (2 pp.); Deeside (1 p.); Aberdeen to Perth ($1\frac{1}{2}$ pp.); Perth to Dundee ($\frac{1}{2}$ pp.); St. Andrews District (1 p.); Dundee to Edinburgh ($\frac{1}{2}$ p.); The City of Edinburgh ($\frac{1}{2}$ p.); Peebles - Melrose - Lauder Tour (1 p.).

[93A]

VERTEBRATE PALAEONTOLOGY. GUIDE TO EXCURSION C.16. By T.S. Westoll. International Geological Congress. XVlll Session - Great Britain, 1948.

The Scottish itineraries are:- Carlisle to Lanark (Solway basin, Canonbie Coalfield and Lower Eskdale, etc., $1\frac{1}{2}$ pp.); Across Silurian inliers (Lesmahagow, Hagshaw Hill, $1\frac{1}{2}$ pp.); Lanark to Forfar (Airdrie, Stirling, Perth, $1\frac{1}{2}$ pp.); Forfar, Arbroath and Brechin ($1\frac{1}{2}$ pp.); Forfar to Elgin via Stonehaven and Rhynie ($1\frac{1}{2}$ pp.); Scaat Craig, Dipple and Tynet Burn, Lossiemouth and Spynie (2 pp.); Elgin (2 pp.); Alves, Findhorn section, Boghole, Lethen Bar, Nairn and Drum Mossie Muir ($1\frac{1}{2}$ pp.); Thurso, Dingwall, Aultnamain, Golspie, Helmsdale and Wick ($1\frac{1}{2}$ pp.); Thurso, Murkle Bay ($1\frac{1}{2}$ pp.).

[94A]

INDEXES

The name and place indexes are based on items in the titles, quotations and abstracts given in the bibliography. The subject index, on the other hand, is based on the contents of the Assynt, Arran, Glasgow, Edinburgh and the Geologists' Association guides as well as on the items in the bibliography.

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The index is designed to supplement the volumes of British Regional Geology (H.M.S.O.) and the standard work "The Geology of Scotland", edited by G.Y. Craig, Oliver and Boyd, 1965. Another useful work of reference is: Stanford's Geological Atlas of Great Britain, 1964.

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NEWS AND NOTES

PREHISTORIC MAN. - DISCOVERY OF "KENYAPITHECUS AFRICANUS".

Dr. Louis S.B. Leakey, the internationally-known British palaeontologist, announced in Nairobi on Jan.15 the discovery of fossilized remains of a 20,000,000-year-old pygmy-sized "pre-man" in the Lake Victoria region of Kenya. He named his discovery Kenyapithecus Africanus and said that it was "far and away" the oldest representative of stock which gradually gave rise to true man.

Six years earlier Dr. Leakey had published his discovery of Kenyapithecus Wickeri, which was dated as 14,000,000 years old and had been accepted as the oldest member of the family from which man was descended. His latest discovery of Kenyapithecus Africanus put the ancestry of man back another 6,000,000 years.

Eleven fragments of jawbone belonging to men, women, and children were found by Dr. Leakey in Rusinga Island, on Lake Victoria, and at Songhor, on the edge of the Kenyan part of the lake. They were dated by British and American scientists at the Universities of Cambridge and California at about 20,000,000 years old - that is, to Lower Miocene times. "There is nothing surprising", said Dr. Leakey, "about this establishment of the presence of hominidae [the family to which man belongs] in deposits of Lower Miocene if we remember that nearly all other principal mammalian families were already established, although primitive, by that time. Until recently textbooks suggested that the family of man was of relatively recent development, perhaps about 5,000,000 years ago. This view is now shown to be false."

Dr. Leakey also pointed out that there was clear evidence that by Lower Miocene times true apes (pongidae) were already evolved in East Africa and were heading in the direction of gorillas and chimpanzees. "Thus", he added, "in terms of evolutionary history, man's separation from his closest cousins the apes is now carried back more than a million generations - we are cousins a million or more times removed."

Jaw and teeth fragments, Dr. Leakey explained, showed that Kenyapithecus Africanus was more omnivorous than apes and lived on meat and vegetable matter; he was also very small and had no weapons or tools to defend himself against carnivorous predators. Dr. Leakey added that it was now the general view that man originated in Africa.

Dr. Leakey stressed that the Lake Victoria fossils were not of man himself but of "pre-man". On the other hand they were not those of the so-called "missing link" - Dr. Leakey explaining that there was no such thing as the "missing link" because "there is nowhere along the line of evolution where one can stop and say 'this is it.'"

NUTCRACKER MAN ON SHOW

Londoners will today get their first chance to see - at the British Museum (Natural History), South Kensington - what manner of creature was Nutcracker Man, discovered in the Olduvai Gorge, East Africa, by Dr. Mary Leakey, wife of Dr. L.S.B. Leakey, in July, 1959, and announced a month later.

He had a heavily-boned skull, topped by a bony crest, and massive jaws, and was of formidable appearance. He has been said by two independent methods which agree to be within the range from about 1,600,000 to about 2,400,000 years old.

Originally named Zinjanthropus boisei, he is now correctly described as Australopithecus (Zinjanthropus) boisei.

On view will be a cast of the skull as received, shown as part of a re-arranged exhibition of early man. The cast has been waiting for public showing until a monograph, giving a full scientific description and discussion had been published. A cast made after restoration prepared by Professor P.V. Tobias has been sent to the museum, and will shortly be added to the exhibit.

The Times, 10th August, 1967.

IGUANODON TRACT ON DISPLAY

A 21ft.-long track of dinosaur footprints discovered in late 1965 in Dorset has been put on display in the Hunterian Museum of Glasgow University. This is the first indoor exhibit of any such track in Britain. It was made by an Iguanodon about 120 million years ago.

The slab of limestone bearing the three-toed footprints weighs two tons and was acquired for the museum with the aid of a Treasury grant.

The Times, 18th March, 1967.

£30,000 GRANTS FOR GEOLOGICAL STUDY

The geology department of Aberystwyth University College has been awarded grants totalling £30,000 to bore a hole 2,000 ft. deep into the shore of an island in Cardigan Bay.

Professor Allan Wood, who will be in charge of the project at Shell Island, Mochras, off the Merioneth coast, said it was not connected with any search for oil or gas. They would be trying to solve anomalies they had discovered during their research into the unusual rock formations below the bay. The work will take three years to complete. The grants were made by the National Environment Research Council and the Institute of Geological Sciences.

The Times, 18th August, 1967.

SOVIET PROJECT FOR DRILLING OF 11-MILE BOREHOLES IN EARTH'S CRUST

Details were released in Moscow on March 7 of a Soviet research programme involving the drilling of five boreholes into the earth's crust to depths of up to 11 miles - a project similar to but more extensive than the American "Mohole" project launched in 1961. It was stated that each drilling would be nine to 11 miles deep, and that plans had been finalized for the following boreholes in different parts of the Soviet Union:

(1) A site north of the Caspian Sea had been selected for the first borehole, which had already been sunk through oil-bearing strata to a depth of nearly two miles. It was hoped that it would be possible to determine the lower limits of the oil-bearing strata and also, perhaps, to check the hypothesis concerning the inorganic origin of oil.

(2) The second borehole would be sunk in the north of the U.S.S.R. with the aim of piercing the ancient granite platform and throwing light on the formation of continents. [The location was not given, but Soviet press reports in 1966 had stated that the Kola Peninsula, which is granitic, had been chosen as a borehole site.]

(3) The third borehole would be drilled in the Urals, and was expected to reach the channels by which molten streams carrying metallic ores from the earth's interior flowed upwards hundred of millions of years ago.

(4) The fourth borehole, in the Caucasus, was expected to help in solving the problems of using heat from the interior of the earth as a source of power.

(5) Experts had expressed the opinion that the best site for the fifth borehole would be the volcanic Kuriles range, where the earth's crust was relatively thin.

The name "Anti-Cosmos" has been given to the Soviet boreholes project.

Keesing's Contemporary Archives, April 1 - 8, 1967.

THE FIRST EXAMINATION IN GEOLOGY (?)

Mr. Buckland had the pleasure of hearing Mr. Wm. Strangways acquit himself honourably at his public examination on Thursday last at which the logical questions proposed to him were on geological subjects, a science which hitherto has been unheard of in the schools, and much to the astonishment of the illustrious geologist Von Buch whom Mr. B. introduced to see the form of our public examinations.

Extract from a letter (in the M.H. Gordon collection at the National Museum of Wales) from William Buckland to Lady Mary Cole of Penrice Castle, on 3rd June 1816.

WELSH PRONUNCIATION : THE SEDGWICK WAY

The miserably damp weather made me rheumatic and low-spirited, so I nursed one day at Carnarvon, and then drove to Pwllheli. What a charming name! In order to pronounce the first part (Pwll), you must blow out your cheeks just as you do when you are puffing at a very obstinate candle; then you must rapidly and cunningly put your tongue to the roof of your mouth behind the fore teeth, and blow hard between your cheeks and your tongue, holding your tongue quite steady all the while, as a man does a spade just before he is going to give a good thrust with his right foot. With such a beautiful direction you cannot fail to pronounce Pwll quite like a genuine Celt. Should the word be Bwlch, take care to observe the previous directions, only, in addition, while the wind is whistling between your rigid tongue (sticking forwards spade-fashion), and your distended cheeks, contrive by way of finale to give a noise with your throat such as you make when an intrusive fishbone is sticking in it. So much for my first Welsh lesson. Take care, dear Fan, that it be not thrown away.

I remained two days at Pwllheli. Yesterday I packed my baggage, and drove to this place. I have now been eleven days in Wales, and have not seen the tops of the mountains; they are covered by trailing clouds.

If you write by return of post you may address me at Dolgelly, North Wales. (N.B. this word is by no means to be sounded like our maid Doll's jelly-bag. The ll must always be blown, in the way I told you, between the tongue and the cheeks.) If you put off writing for a day or two, why then address me at Post Office, Machynlleth, North Wales. What a charming word again! Mach has the bone-in-the throat sound; yn is sounded as the grunt given by a broken-winded pavier, when he is using his rammer; lleth you already know how to sound, if you have cared for my lessons.

Extract from a letter dated July 23rd, 1846,
from Adam Sedgwick to Miss Fanny Hicks. In
The Life and Letters of the Reverend Adam
Sedgwick by J.W. Clark and T.McK. Hughes.
Vol.11. Cambridge, 1890. (pp.105-106.)

TENNESSEE REPEALS BAN ON TEACHING OF EVOLUTION. - BAN UPHELD BY ARKANSAS SUPREME COURT

The Tennessee Legislature voted on May 16 to repeal the so-called "monkey law" of 1925 which prohibited the teaching of the theory of evolution in tax-supported colleges and schools in that State. The Tennessee House of Representatives had approved the repeal on April 12, but in the State Senate there was a tie vote of 16-16. In a second vote, however, which was taken without a debate, the Senate passed the repeal measure on May 16 by 20 votes to 13.

The repeal of the 1925 Act, which was signed on May 17 by the Governor of Tennessee, Mr. Buford Ellington, led to the vindication of a high school science teacher in Jacksboro, Mr. Gary L. Scott, who had been dismissed for teaching the evolution theory. Mr. Scott's law suit contesting this action

had been dismissed on April 15, but Mr. Scott had subsequently been re-instated.

In Arkansas, on the other hand, the State Supreme Court upheld on June 5 the constitutionality of the State's law of 1928 prohibiting the teaching of evolution in State public schools. The Arkansas law had been challenged by Mrs. Susan Epperson, a former biology teacher at Little Rock Central High School, and a ruling of the Pulaski Chancery Court had accepted her claim. The Supreme Court, however, reversed the lower court ruling, saying that the evolution law was a "valid exercise of the State's power to specify the curriculum in its public schools."

The only other State still having a statute forbidding the teaching of the theory of evolution is Mississippi.

The New York Times, May, 1967.

REVIVAL OF TIN PROSPECTING ACTIVITY IN CORNWALL

During the past year or so a number of British, Canadian and American companies have been exploring old tin mining areas and off-shore areas for locating new deposits of tin.

Consolidated Gold fields has embarked an ambitious exploration programme in a previously mined area near Truro with activities centering on the Wheal Jane and West Wheal Jane mines.

Union Corporation has three projects in hand. The most advanced is a dredging operation off the mouth of the Red River in St. Ives Bay. During the years an accumulation of tin has been washed down to the river mouth where it has settled in the sand. It has found enough reserves to persuade it to build a processing plant on the Lelant Quay and equip a 300 ton coaster, the Baymead, to dredge the sand. Though production is not yet started, it is expected it will be a four to five year operation. The company is also opening Cornwall's first new underground mine for many years at Pendarves. The third project of the company is the joint venture with Geevor to open up the undersea Levant mine.

Amalgamated Roadstone has concessions in Mounts Bay, off Penzance, where it runs a large quarry operation. The Marine Mining Corporation has a 2,600 sq miles prospecting licence off the Cornwall coast and the company is testing the area up to 30 fathom line.

Johannesburg Consolidated, Tehidy Minerals, International Mine Services of Toronto and Penwith Minerals are other companies interested in this renewed activity.

Commonwealth Geological Liaison Office
Newsletter for June, 1967, pp.5-6.

Welsh Geological Quarterly, vol.2, no.3, pp.44-48.

