

GEOLOGISTS' ASSOCIATION

SOUTH WALES GROUP

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**WELSH
GEOLOGICAL
QUARTERLY**

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THE GEOLOGISTS' ASSOCIATION: SOUTH WALES GROUP. The Group was formed in 1959 as a direct result of the interest shown by the teachers of geology from Welsh schools attending refresher courses at the University Colleges at Aberystwyth, Cardiff and Swansea. It is designed to further the study of geology, with particular reference to Wales, and to provide a link between the amateur, the student, the teacher and the professional geologist. At present all four groups are strongly represented in the membership of 160 or so. The members are drawn from a catchment area extending from Pembrokeshire to Gloucester.

The Group's session coincides with the academic year. Ordinary Meetings are held monthly from September to March, the Annual General Meeting in March or April, and up to six Field Meetings — including one week-end excursion — between April and September. The Ordinary Meetings take place alternately at Cardiff and Swansea in the Geology Departments of the University Colleges. They are held at 11.00 a.m. on Saturday — usually the third of the month.

The annual subscription is £1 (which includes the cost of *The Welsh Geological Quarterly*). Student membership is 2 shillings. Further details available from: The Secretary, c/o Department of Geology, National Museum of Wales, Cardiff.

THE WELSH GEOLOGICAL QUARTERLY

(Geologists' Association : South Wales Group)

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The appearance of the Welsh Geological Quarterly for Autumn 1967 in February 1968, albeit in new format, makes the Editor feel much as Percy F. Kendall, the Editor of the Glacialists' Magazine, must have felt when he read the following comment in the monthly review Natural Science (1895, pp.231-232).

"We all know that every geologist has his own opinion as to the date of the Glacial Period, and it is no doubt the charming uncertainty of the subject that attracts so many of our keener youth to its study. But why should the glacialists, as they delight to call themselves, introduce a similar uncertainty of date into the publication of their own magazine? Has not the cold of the past winter satiated them, that they must try to make us believe it is yet December, though March is drawing to its close? We can scarcely trust the chronology of writers who bring out a November number, we believe, in February, and at any rate containing a letter dated '27th December, 1894'. The October number, too, did not reach us from the publisher till January 23, and was found to contain the report of a meeting of the Belfast Naturalists' Field-Club, which, we have since learned, was held on November 10. Fortunately, the Glacialists' Magazine has not yet published any descriptions of new genera or species, so that we can hardly attribute this misdating to any evil intent. Nevertheless, such a practice is confusing to the worker, and is quite easily remedied by the insertion of the actual date of publication on the wrapper. See to it, Mr. Percy F. Kendall, before your glaciers all melt beneath the heat of a righteous indignation."

DIRECTORY OF BRITISH GEOLOGY

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

D. A. Bassett

This provisional bibliography and index to geological excursion guides is in three parts. The first, dealing with SCOTLAND, appeared in the third part of Volume 2, of the Quarterly. This, the second part, deals with WALES and the WELSH BORDERS. The third, covering the remainder of England, will appear in the third part of Volume 3. The indexes are designed to supplement the Regional Handbooks of the Institute of Geological Sciences.

B. WALES AND THE WELSH BORDERS.

The great majority of the excursion guides and the reports of excursions dealing with areas in Wales and the Borders are published by the Geologists' Association of London. The most important exceptions are the guides to the excursions organized for the International Geological Congress, held in London in 1948, the 6th International Congress of Carboniferous Stratigraphy and Geology held in Great Britain in 1967, and the 7th International Sedimentological Congress also held in Great Britain in 1967. The following annotated bibliography is based on the contents pages of these guides and reports.

GEOLOGY OF SOME CLASSIC BRITISH AREAS: SNOWDONIA. By David Williams and J.G. Ramsay. Geologists' Association Guides, No.28. 1959. 17pp. Price 2/6. [Second edition to be published shortly.]

The guide contains an Introduction or General Account (3pp.) - including a tabular summary of the succession - and the following three itineraries.

1 Nant Ffrancon: Llyn Idwal to Penrhyn Quarry.

"An almost continuous cross-section of the Lower Palaeozoic sequence of Snowdonia is exposed along the western flank of the Vale of Nant Ffrancon, between Bethesda and Llyn Idwal. The oldest outcropping rocks are of Lower Cambrian age, consisting of roofing slates which are well displayed in the Penrhyn Quarry, near Bethesda, at the northern end of Nant Ffrancon. Southwards from Bethesda for a distance of about four miles the rocks dip persistently southwards, as far as the waterfall immediately below Llyn Cgwen, where rhyolitic lavas and tuffs of Caradocian age are on view."

(Folding g.map: 2½in. - 1ml.* plus 4½pp., including diagrammatic section along ridge west of Nant Ffrancon, and g.map of Penrhyn Quarry.)

2 Cwm Idwal - Capel Curig.

"The very rugged tract of country between Cwm Idwal and Capel Curig is exceedingly well exposed and its geology is primarily concerned with the igneous activity revealed by sheets of rhyolite and pyroclastic deposits and by many intrusive masses of dolerite, spilite and granophyre. The major structures are simple, the Snowdon Volcanic Series forming the core of the Idwal syncline, while the oldest rocks are brought to the surface in an around Cwm Tryfan by a domed anticline."

*Astericks indicate maps with numbered localities.

(Folding g.map: 3in. - 1ml.* plus 3½pp., including line drawing of Glyder Fawr and Devil's Kitchen from north end of Llyn Idwal, and diagram illustrating behaviour, during folding, of the thick competent and thin incompetent beds.)

3 Snowdon - Llanberis.

An account of an itinerary from Pen-y-Pass to the summit of Snowdon - including both Pen-y-gwryd and 'Pony Track' routes - and thence to Llanberis. The material is adapted from the report of a field meeting to the Snowdon District by Howel Williams (Proc.Geol.Ass., Lond., 1930). See below.

(Folding g.map: 1½in. - 1ml.* plus 3½pp., including a line drawing of the syncline of Clogwyn Du'r Arddu with geological ornament.)

4 THE SNOWDON DISTRICT. REPORT OF THE EASTER FIELD MEETING, 1930. By Howel Williams. Proc. Geol.Ass., Lond., v.41(1930), pp.190-205.

Ascent of Snowdon via Pen-y-Gwryd and descent by Watkin Track (with brief references to two other ascent routes - the 'Pony Track' and Crib Goch - Crib -y-ddysgl - 5pp.). The Cambrian-Ordovician succession (Beddgelert, Pitt's Head, Rhydd-ddu, Llyn Quellyn, Bettws Garmon - 4pp.). The Thrust Zone from Rhydd-ddu to Cwm Clogwyn ("the structures along the northern limb of the Snowdon Syncline" - 2pp.). Succession in the Pass of Llanberis via the Syncline of Clogwyn Du'r Arddu ("the succession from the Snowdonian Volcanic Series down to the Middle Cambrian 'Slate Belt' compared with that in the more or less parallel dip-section from Beddgelert to Bettws Garmon" - 2½pp.). The geology of the Capel Curig district and Ogwen Valley ("the relation between the Snowdon Volcanic Series and the underlying Capel Curig Series and to visit the famous Devil's Kitchen, near Llyn Idwal" - 2pp.).

5 SUMMER FIELD MEETING TO WESTERN PART OF THE LLEYN PENINSULA. AUGUST 27th - SEPTEMBER 10th, 1938. Report by C.A. Matley, T.C. Nicholas and A. Heard. Proc.Geol.Ass., Lond., v.50(1939), pp.83-100.

Porth Dinllaen and Nevin (Pre-Cambrian pillow lava and glacial deposits - ½p.); Sarn and Llangwnadl (granite, Mona Complex - ½p.); Bardsey Island (Mona Complex - ½p.); St. Tudwal's peninsula (Cambrian and Lower Ordovician - 2pp.); Porth Caered and Abersoch (Cambrian and Lower Ordovician - 3½pp. including section along N.W. shore of Porth Caered); Aberdaron (Mona Complex, Arenigian, etc. - 1p.); Llithfaen, Nevin, Trevor (granite-porphry, etc. - 1p.); Abersoch to Crugan, near Llanbedrog (Arenigian to Ashgillian - ½p.); Moel y Penmaen and Bodfaen (Ordovician sediments and volcanics - 1½pp.); Pwllheli (Caradocian - ½p.); Aberdaron Bay (E.), Llanfaelrhys and Rhiw (Arenigian, Mona Complex, etc. - 2pp. including sk. of thrust plane in Aberdaron Bay); Madryn (augite-granophyre intrusion, etc. - 1½pp.); Carneddol and Carn Saethon (keratophyre, Caradocian, etc. - 1½pp.).

6 REPORT OF AN EXCURSION TO THE PORTMADOC AND CRICCIETH DISTRICT OF SOUTH-EAST CARNARVONSHIRE. APRIL 5th TO 11th (EASTER), 1912. By W.G. Fearnside. Proc.Geol.Ass., Lond., v.23(1912), pp.199-217.

Portmadoc (Ynys Towy, etc. - Tremadoc Slates, Lingula Flags, intrusions and caves - 3pp.); Penmorfa fault (2pp.); Dwyfawr valley (geomorphology - 1p.); Llanystumdwy (Upper Ordovician and Llandoveryan - 2½pp.); Moel-y-Gest (dolerite and Tremadocian - 2½pp.); Criccieth (felsite, glacial deposits, Tremadocian and Lower Ordovician - 2½pp.); Tremadoc (thrust planes and dolerite sills - 3pp.).

Accompanying the report there is a paper entitled: "Notes on the petrology of the decomposed brookite bearing rock of Prenteg near Tremadoc, North Wales", by W.G. Fearnside (pp.214-217).

7 EXCURSION TO NORTH WALES. JULY 28th TO AUGUST 7th (LONG EXCURSION), 1909. By W.G. Fearnside. Proc.Geol.Ass., Lond., v.21(1909-1910), pp.368-390.

The Arenig district (Upper Cambrian and general topography - 3pp.); The Arenig district (Tremadocian and Lower Arenigian rocks and their influence upon the topography - 2pp.); Arenig district (N. of railway - Tremadocian, Arenigian in Nant-ddu, Nant Rhos-ddu, hypersthene andesite at Arenig quarry, Derfel limestone, etc. - 2pp.); The Arenig district (Milltirgerig to Arenig Fawr - 2pp.); The Arans - Drws-y-nant to Aran Mawddwy and Aran Benllyn (Upper Cambrian,

Lower Ordovician and geomorphology - 2½pp.); Blaenau Ffestiniog (Llechweidd slate quarries - 5pp. including dip section of underground and opencast workings and chem. anal. of sample of Old Vein Slate); Tan-y-bwlch, Dduallt and Moelwyn Mawr (Lingula Flags, etc., and intrusives - 1½pp.); Tan-y-grisiau ('granite' - 1½pp.); Glaslyn estuary - Minfford etc. (Tremadocian - 1½pp.).

- 7A NORTH WALES AND SHROPSHIRE. GUIDE TO EXCURSION C.6. By W.G. Fearnside. International Geological Congress. XVIII Session - Great Britain, 1948. 22pp.

The excursions include: Nant Ffrancon and Snowdonia (1½pp.); Anglesey (1p.); Bala (1½pp.); Llanberis, Snowdon syncline and Caernarvon (1½pp.); Tremadoc to Criccieth (1½pp.); N.W. Harlech Dome (1p.); Arenig Station Quarry to Dolwyddelan syncline (1½pp.); Harlech Dome (1p.); Berwyn Dome (1p.); Ludlow anticline (1p.); Wrekin to Comley (1½pp.); Longmynd and the Onny River (2pp.); Shelve Inlier (2pp.).

- 8 THE SILURIAN GREYWACKES OF [NORTH AND CENTRAL] WALES. AUGUST 6th - 10th. By A. Wood, A.J. Smith and W. Cummins. VII International Sedimentological Congress. Excursion reports. 1967. Excursion A.1.

Aberystwyth area (1p.); New Quay to New Quay Head, Aberarth Cliffs, Aberystwyth to Clarach Beach to Wallog to Craig-yr-Wylfa (Aberystwyth Grits - 1½pp.); Penstrowed Quarry (Denbigh Grits - ½p.); Foel Quarry, Gro, Dolanog, etc. (Denbigh Grits and Nantglyn Flags - 1p.); Ercall Quarry, Five Chimneys, Dolyhir (Cambrian quartzites, Wenlock Limestone and Woolhope Limestone - 2pp.).

- 9 THE VISIT TO DOLGELLEY, NORTH WALES. EASTER, 1927. By A.H. Cox and A.K. Wells. Proc. Geol. Ass. Lond., v.38(1927), pp.319-331.

The foot-hills of the Cader Range - Gwynant valley, Crogenen Lakes, etc. (Upper Cambrian, Lower Ordovician - 2½pp.); Penmaenpool, Diphwys and Bontddu (Cambrian and gold mines - 1½pp.); Cader Idris (2pp.); Llyn Gwernan to Crogenen Lakes (minor intrusions - 1p.); Craig-y-Benglog and Rhobell Fawr (Ordovician volcanics - 1½pp.); Tyn-y-Groes (Gamlan valley), Gwynfynydd and the Mawddach valley (Cambrian, gold mining - 1½pp.); Moel Cynwch and Moel Offrwm (Lower Ordovician - 1½pp.).

Accompanying this report there is an "Appendix on the English equivalents and quasi-equivalents of certain Welsh place names" (6½pp.). In the same volume of the Proceedings there is a paper entitled: "The geology of the Dolgelly district, Merionethshire", by A.H. Cox and A.K. Wells (Pp.265-318; g.map, lin. - 1ml.) and "compiled with a view to furnishing a summary of the geology of the area ..."

- 10 SUMMER FIELD MEETING, 1944. (AUGUST 24th - SEPTEMBER 2nd.) THE DOLGELLEY DISTRICT. BY A.H. Cox and H.P. Lewis. Proc. Geol. Ass., Lond., v.56(1945), pp.59-81.

Barmouth (Lower and Middle Cambrian - 4pp.); Gwynant valley and Arthog (the foothills of the Cader Idris Range - Upper Cambrian and Lower Ordovician - 3pp.); Cader Idris (2½pp.); Corris and Aberllefenni (Upper Ordovician - 2pp.); Aran Range - Celynog valley and Craig-y-Ffynnon (Upper Cambrian, Lower Ordovician - 3pp.); Gwynfynydd Gold Mines (3pp.); Diphwys and Bont Ddu (Cambrian - 2pp.); Bontnewydd to Bwlch Oer Drws (Upper Cambrian, Lower Ordovician - 2½pp.).

- 11 REPORT OF FIELD EXCURSION TO CROGENEN LAKES. By John Phillips. Welsh Geological Quarterly, v.2(1967), no.2, pp.7-8.

The itinerary is an appendix to a paper entitled: "The movement and consolidation of magmas - illustrated with reference to the succession of Ordovician strata and igneous rocks in the Arthog - Dolgellau district" (pp.3-7).

(G.map: lin. - 300ft.★)

GEOLOGY AROUND THE UNIVERSITY TOWNS: LIVERPOOL. Geologists' Association Guides, No.6. By R.G.C. Bathurst, J.C. Harper, R.M.C. Eagar, E. Neaverson, A. Bannerjee, P.J. Brenchley, A.E. Oldershaw, J.K. Shanklin and J. Starkey. 1965. 40pp. Price 4/6.

The Guide contains a very brief introduction (½p.) and the following ten itineraries for areas in Wales and the Border counties. The remaining three itineraries, for areas in Lancashire, will be incorporated in the third part of this provisional bibliography.

- 12 Thurstaston, Wirral, by J.C. Harper and R.G.C. Bathurst.
 "The rocks to be examined in this itinerary lie in the north-western part of the Wirral. Boulder clay covers the lower ground and forms cliffs along the Dee shore; the higher ground shows good exposures of the Trias, in particular the Upper Mottled Sandstone of the Bunter. The Waterstones of the Keuper are also exposed."
 (3pp. including 3 g.sk.maps of the north-west Wirral.)
- 13 The Buckley area, Flintshire, by J.K. Shanklin.
 "The itinerary includes three clay-pits on the east side of the village of Buckley [Buckley Junction (or Metallio), Lane End and Standard (Buckley) clay pits] and has been planned to commence from Buckley Junction Station on the Seacombe-Wrexham Central line.
 (2½pp. including g.sk.map: lin. - 1ml.,* and Coal Measures succession.)
- 14 The Eastern side of Halkyn Mountain, by R.G.C. Bathurst, J.C. Harper and A.E. Oldershaw.
 "East of the Clwyd Range the typical succession within the Carboniferous consists of limestones, overlain by sandy passage-beds and the Cefn-y-fedw Sandstone followed by Coal Measures. At the northern end of Halkyn Mountain the passage-beds are represented by dark limestones and the Sandstone by bedded cherts. There is a wide variation in lithology particularly amongst the upper limestones." The localities described are: Ruby Brickworks; Hendre Quarry and Gorge; Waen-Brodlas Quarry.
 (5pp. including g.sk.map of the northern part of Halkyn Mountain, and Carboniferous succession.)
- 15 The Lower Carboniferous succession between Prestatyn and Dyserth, Flintshire, by E. Neaverson.
 "The object of this traverse is to demonstrate the succession in the Carboniferous Limestone of north Flintshire. The facies differs considerably from the standard succession at Llangollen, and also from that at Llandudno."
 (3½pp. including g.sk.map: 2in. - 1ml.*)
- 16 The Mynydd Farm Slump, Colwyn Bay, North Wales, by R.G.C. Bathurst.
 "In 1940 O.T. Jones described slumped beds in the Colwyn Bay district. One of the better group of exposures lies in the Mochdre area 2000 yards south-west of the town."
 (1½pp. including locality map: lin. - 400yds.*)
- 17 The Avonian D₂ Limestones of Great Orme's Head, Llandudno, North Wales.
 Two itineraries are given: (a) Marine Drive Traverse, describing roadside exposures from the Toll-gate via Pen Trwyn, Pigeon's Cave to Trwynygogarth; (b) Railway Traverse - from terminus to the golf house.
 (3pp. including locality map: lin. - ¾ml.)
- 18 Trefor Rocks and Bron Heulog Quarry.
 This and the succeeding itinerary are prefaced with a note entitled: "Geological setting of the district north-east of Llangollen, Denbighshire" by J. Starkey and A. Bannerjee.
 (2½pp. including g.sk.map: lin. - 1ml.)
- 19 Ty-Canol and Trevor Hall Area, by J. Starkey.
 A traverse across the "Silurian-Carboniferous" unconformity (1p.).
- 20 The Ludlow Siltstones of Dinas Bran, by R.G.C. Bathurst.
 "The Ludlow siltstones are of two kinds. In the scree and in the lowest exposures south-west of the ruins there are current-bedded, laminated siltstones. In the higher beds under the ruins lamination in the siltstones seems to have been largely destroyed, giving a disturbed appearance to the distribution of mica in the sediment." (1p.)
- 21 The Caradoc rocks of the Llansantffraid - Glyn Ceiriog area, Denbighshire, by P.J. Brenchley.
 "The valley of the River Ceiriog south of Glyn Ceiriog provides an excellent dip-section through the Caradoc and Ashgill rocks on the northern flanks of the Berwyn Dome. The itinerary

includes localities in the fossiliferous Caradoc rocks, the interbedded volcanics, and at the Caradoc-Ashgill junction."

(4pp. including table of succession and g.sk.map of Pandy area 4in. - 1ml.*)

- 22 EASTER FIELD MEETING, 1935. NORTH-WESTERN DENBIGHSHIRE. Report by P.G.H. Boswell. Proc. Geol.Ass., Lond., v.46(1935), pp.193-202.

Nantglyn Quarries, etc. (Wenlockian, Ludlovian zones - 1p.); Head of the Vale of Clwyd, etc. (facies and tectonics of the Ludlow and Upper Wenlock Beds and the Carboniferous Limestone - 1½pp.); Fernant Dingle, Llanfair Talhaiarn, Garthewin (basal Carboniferous, *M.scanicus* and *M.nilssoni* facies, cleavage-fan - 1½pp.); Head of the Vale of Clwyd, Mynydd Cricor and Cynrny-brain (Valentian, Wenlockian, etc. - 3½pp.); Llangerniew (area of imbrication - 1p.); S.W. Denbighshire Moors - Capel Garmon (Upper Ordovician and Lower Silurian - 1p.).

The report is accompanied by two papers written for the Field Meeting: "The geology of north-western Denbighshire" by P.G.H. Boswell (pp.152-186) and "The Mynydd Cricor Inlier" by B. Smith (pp.187-192).

- 23 LONG EXCURSION TO LLANGOLLEN. AUGUST 16th - 23rd, 1919. By L.J. Wills. Proc.Geol.Ass., Lond., v.31(1920), pp.16-25.

Llangollen - Barber's Hill (general topography - ½p.); Dee valley - Berwyn, Llantysilio and Pentre dwfr (glacial diversion, slate and slab quarries - 1½pp.); Eglwyseg - Trevor scarp, etc. (Carboniferous, Silurian and Ordovician - 2pp.); Whitehurst Halt to Chirk (Millstone Grit, Coal Measures, Superficial and Geomorphology - 2pp.); Trevor (Millstone Grit and Carboniferous Limestone - 2pp.); Glyn Ceiriog (Upper Ordovician and Lower Silurian - 1½pp.); Vivod valley (*M.leintwardinensis* Beds - ½p.).

In the same volume of the Proceedings there is a paper by L.J. Wills entitled: "The geology of the Llangollen district - written with special reference to the localities visited by the Association in August 1919" (pp.1-15).

- 24 EXCURSION TO THE BERWYNS. JULY 31st - AUGUST 7th (LONG EXCURSION) 1908. By J. Lomas. Proc.Geol.Ass., Lond., v.21(1909-1910), pp.48-56.

Llangollen (Carboniferous - 2pp.); Selattyn to the Ceiriog valley (2½pp.); Oswestry (Carboniferous, glacial, Upper Ordovician - 1½pp.); Llanrhaiadr-yn-Mochnant (Ordovician, Silurian - 1p.); Llangynog (rhyolite boss - ½p.); Llanywnech, Llansantffraid-ym-Mechain, etc. (Llandeilian, etc. - ½p.); Sweeney Mountain to Porth-y-Waen (Carboniferous - ½p.).

- 25 EASTER FIELD MEETING, 1937. OSWESTRY. By W.B.R. King. Proc.Geol.Ass., Lond., v.48(1937), pp.399-404.

Pen-y-Garnedd and Llanfyllin (Upper Ordovician and Valentian - 1p.); Llanfyllin district: south (Upper Ordovician and basal Silurian - 1½pp.); Area north-west of Oswestry and Llawnt (glacial, Carboniferous Limestone - 1p.); Meifod (Ashgillian, Valentian - 1p.); Bryn and area north of Llansantffraid (Carboniferous Limestone, Llandoveryan, Caradocian - 1p.).

- 26 FIELD MEETING AT WELSHPOOL. MIDLAND GROUP. 4th MAY, 1951. By Miss E.M. Hignett. Proc. Geol.Ass., Lond., v.64(1953), pp.100-104.

Buttington Brickworks, Breidden Hill, Bragginton Dingle, Long Mountain (Buttington Shales, dolerite, Ordovician volcanic conglomerates and tuff, Silurian - 1½pp.); Vale of Powys - "Trilobite Dingle", Guilsfield, Gaer Fawr, Sarn Bridge (bostonite, Trilobite Dingle Shales, Powys Castle Conglomerate - 2½pp.).

- 27 FIELD MEETING AT WELLINGTON, SHROPSHIRE. 1st and 2nd SEPTEMBER, 1945. By R.W. Pocock and G.H. Mitchell. Proc.Geol.Ass., Lond., v.56(1945), pp.238-239.

Steeraway, Little Wenlock, Doseley quarries (Carboniferous Limestone, basalt, etc. - 1p.); Er-call, Buckatree Glen, Maddocks Hill, Forest Glen, Wrekin (granophyre, Cambrian quartzite, Camp-tonite intrusion, Uriconian - 1p.).

- 28 MIDLAND GROUP FIELD MEETING: THE WREKIN. SATURDAY, APRIL 27th, 1940. By F. Raw. Proc. Geol.Ass., Lond., v.52(1941), pp.208-209.

Visits were made to outcrops of: Cambrian quartzite, rhyolitic tuffs, granophyre, rhyolites, Comley Sandstone, etc.

GEOLOGY OF SOME CLASSIC BRITISH AREAS: GEOLOGICAL ITINERARIES FOR SOUTH SHROPSHIRE. By W.F. Whittard. Geologists' Association Guides, No.27. [n.d. 1958?] 24pp. Price 3/-. [Temporarily out of print.]

"Shropshire geology attracts a few hundred students each year and consequently many of the well-known exposures have suffered through over-much attention. Indeed, the present position is disquietening; unless some localities are less enthusiastically hacked away in the future than they have been since the end of the war, many standard sections will become worked out and others will be obscured by the debris left by collectors, all to the detriment of those geologists who visit the area in the future."

The Guide contains a very brief introduction ($\frac{1}{2}$ p.) - which includes the above paragraph - and the following ten itineraries.

29 The Wrekin District.

The itinerary includes very brief references to localities in Uriconian agglomerate, Cambrian Quartzite, Shineton Shales, Wenlock Limestone, Pentamerus Beds, Clonograptus tenellus Zone, vesicular basalt and camptonite.

($3\frac{1}{2}$ pp. including 3 locality maps: * Wrekin, Harper's Dingle and Shineton Brook.)

30 The Longmynd and Norbury.

"The structure of the Eastern Longmyndian has been determined by mapping the several marker-horizons which appear in the succession. Four of these are exposed in the valley of The Batch, All Stretton; the fifth, and stratigraphically the oldest, is that of the Helmeth Grits exposed towards the top of the Hazler Old Road, Church Stretton."

($1\frac{1}{2}$ pp. including locality map. *)

31 Comley, Caer Caradoc and Hazler.

"At Comley, situated between the Lawley and Caer Caradoc, east of All Stretton and approximately three miles north-north-east of Church Stretton, Cambrian strata occur in complexly faulted outcrops. Exposures are uncommon and much of the detailed stratigraphical detail was obtained by [E.S.] Cobbold from trial-holes and trenches dug under his supervision."

(2pp. including locality map. *)

32 Shelve Inlier, lower succession.

The itinerary includes very brief references to localities in Purple Shales, Hope Shales, Mytton Flags, Stiperstones Quartzite, Tremadoc Shales, chinastone, Pentamerus Beds.

($3\frac{1}{2}$ pp. including 3 locality maps: * Graham's Moor, Bog Mine Outliers, Hope valley.)

33 Shelve Inlier, middle and upper succession.

The itinerary includes very brief references to localities in the Stapeley Volcanic Group, Stapeley Shales, Weston Beds, Betton Beds, Meadowtown Beds, Rorrington Beds, Spy Wood Grit, Aldress Shales, Hagley Volcanic Group, Whittery Shales, Hagley Shales, and barytes.

(2pp. including locality map: * Rorrington to Bromlow Callow.)

34 Onny River to Hillend.

"Classic section for the Caradoc Series exposed along the valley of the River Onny"

($2\frac{1}{2}$ pp. including locality map. *)

35 Wenlock Edge.

The itinerary includes very brief references to localities in the Buildwas Beds, Purple Shales, Wenlock Limestone, coral-reef rock, Ludlow Bone Bed, Aymestry Limestone, Lower Ludlow Shales.

($1\frac{1}{2}$ pp. including locality map: * the Hungerford area.)

36 Onibury, Weo Edge and Ludlow.

The itinerary includes very brief references to localities in Aymestry Limestone, Dayia Shales, Camarotoechia Beds, Chonetes Beds, Downton Sandstone, Temeside Shales, Ludlow Bone Bed.

(2pp. including locality map.*)

37 Long Mountain.

The itinerary includes brief references to localities in rocks of Wenlockian and Ludlovian age.

(2½pp. including locality map.*)

38 Clee Hills. (D.L. Dineley)

The itinerary includes very brief references to localities in Red Downtonian, Psammosteus Limestone, cornstones, Abdon Limestones, Clee Series, Ditton Series, Farlovian, etc.

(2½pp. including locality map.*)

39 EXCURSION TO SOUTH SHROPSHIRE. JULY 23rd - 30th, 1925. By W.W. Watts. Proc.Geol.Ass., Lond., v.36(1925), pp.394-405.

Clee Hills syncline (1½pp.); Comley (2pp.); Eastern Longmynd (1½pp.); Snailbeach, Shelve, etc. (1½pp.); Long Mountain (1p.); Breidden Hills (2pp.); Wrekin (2pp.).

In the same volume of the Proceedings there are nine papers dealing with the geology of the area: "The geology of South Shropshire" by W.W. Watts (pp.321-363, including g.map, lin. - lml.); "Unconformities in South Shropshire" by E.S. Cobbold (pp.364-367); "Notes on the Cambrian area of Comley" by E.S. Cobbold (pp.367-374); "Notes on the Shineton Shales" by O.M.B. Bulman (pp.374-376); "Notes on Sheet 48 N.W. (Shropshire)" by W.H. Tyler (pp.377-378); "Notes on Valentian rocks in Shropshire" by W.F. Whittard (pp.378-381); "Notes on the highest Silurian rocks of the Long Mountain" by J.E. Austin (pp.381-382); "Notes on the 'Old Red Sandstone' of Shropshire by W.W. King (pp.383-389); "Notes on the lowest Carboniferous rocks of the Wrekin district" by S. Bracewell (pp.389-393).

40 REPORT ON THE SUMMER FIELD MEETING IN SOUTH SHROPSHIRE, 1952. By W.F. Whittard, with contributions by H.W. Ball, F.G.H. Blyth, D.L. Dineley, J.H. James, G.H. Mitchell, R.W. Pocock and C.J. Stubblefield. Proc.Geol.Ass., Lond., v.64(1953), pp.232-250.

Onny River, Onibury, Coston (Aymestry Limestone, Dayia Shales, Hoar Edge Grit - 1p.); Buckatree Glen, Wrekin, Maddock's Hill and Doseley (Uriconian, Cambrian Quartzite, camptonite, basalt - 1½pp.); Charlton Hill, Dryton Brook, Rushton, Eaton Constantine, Cherme's Dingle and Shineton (Uriconian, Cambrian Quartzite, Comley Sandstone, Rushton Schists, glacial boulders, Shineton Shales - 1½pp.); Comley, Comley quarry, The Cwms, Hazler Hill (Cambrian, Caradocian, neptunian dykes - 1½pp.); Longmynd, Deadman's Batch, Catsbatch, etc. (Brockhurst Shales, Huckster Conglomerate, Darnford Conglomerate - 1p.); Chittol Wood; Cwm-mawr, Brithdir, Simon's Castle, Squilwer (Western Longmyndian, Tremadocian, Arenigian, augite-picrite, Hope Shales, pyroxene andesite, dolerite - 2pp.); Traverse across part of the northern portion of the Shelve Inlier (1½pp.); Onny valley (visits to several of B.B. Bancroft's localities in the Ordovician succession - 1½pp.); Buildwas, Stretton Westwood, Millichope (Valentian, Wenlock Limestone, Aymestry Group - 1½pp.); Long Mountain (Wenlockian, Ludlovian - 1p.); Long Lane (Craven Arms), Longmynd (Longvillian, Valentian, etc. - 1p.); Breidden Hills, Bausley Hill (dolerite, Ordovician, Coal Measures - 1p.); Baucott, Tugford, Nordybank Camp, Brown Clee Hill, Wheathill (Psammosteus Limestone, Old Red Sandstone - 1½pp.).

In v.63(1952) of the Proceedings there is a paper by W.F. Whittard entitled: "A geology of South Shropshire" (pp.143-197 including table of succession and correlation charts).

41 SUMMER FIELD MEETING AT LUDLOW. 2 - 9 AUGUST, 1958. Report by the directors R. Allender, C.H. Holland, J.D. Lawson, V.G. Walmsley, J.H.McD. Whitaker. Proc.Geol.Ass., Lond., v.71(1960), pp.209-232.

The report contains a correlation chart of the Ludlovian, a key map of areas visited and an introduction (4pp.). The scope of the excursions differs "from the more familiar South Shropshire itineraries in concentrating attention on the higher Silurian rocks which had been intensively studied in recent years by the Ludlow Research Group." .. "One purpose of the field excursion was to demonstrate the need for a revised classification of the Ludlovian rocks of

the type area." Each itinerary is prefaced with a brief note on the geology.

Ludlow area - Pitches Coppice, Mary Knoll, Bringewood Chase, Dinham Bridge (2½pp.); Knighton area - Bailey Hill, Cwm Jenkin, Knucklas, Llan-wen Hill, Meeting House Lane (3pp.); Leintwardine area - Quarry Plantation, Bromfield, Mocktree, Martin's Shell, Trippleton Lane, Church Hill, "Lake Wigmore", River Teme, Downton-on-the-Rock (4pp.); Bishop's Castle area - Flowden, Totterton, Upper Broughton, Cwm Hopton Dingle, Bank Wood, Pulletts, Cefn Einion (2½pp.); Aymestrey area - Yatton gravel pit, Yatton Hill, River Lugg, Mere Hill Wood (3½pp.); Pedwardine inlier - Brampton Bryan, Pedwardine Farm (1p.); Builth area - Llanfaredd road cutting, White Hall, Aberedw, Aberedw Rocks, Erwood Bridge, Ynys Wye, Llandderi'r Cwm (3pp.)

- 41A WEST MIDLANDS. GUIDE TO EXCURSION A.7. By L.J. Wills. International Geological Congress. XVIII Session - Great Britain, 1948. 12pp.

The excursions include: Pre-Cambrian, Cambrian, Carboniferous sediments and igneous rocks of the Wellington - Wrekin district (½p.); Pre-Cambrian (Longmyndian), Caradocian, Wenlockian of the Church Stretton - Wenlock Edge district (½p.); Old Red Sandstone, Lower Carboniferous, Coal Measures and basalts of the Titterstone Clae district (½p.).

- 42 LONG EXCURSION TO CENTRAL WALES. JULY 24th - JULY 29th, 1905. By W.W. Watts, H. Lapworth, Miss G.L. Elles. Proc.Geol.Ass., Lond., v.19(1905-1906), pp.229-235.

Llandrindod, Builth Road (zonal succession, Wenlock Shales - 1p.); Cerig Gwynion and Rhayader (Lower Llandovery - 1p.); Elan valley (½p.); Steddfa Gurig (½p.); Llandovery - Horeb (1p.).

- 42A CENTRAL AND SOUTH-WEST WALES. GUIDE TO EXCURSION C.7. By O.T. Jones, W.J. Pugh and A.H. Cox. International Geological Congress. XVIII Session - Great Britain, 1948. 23pp.

The excursions include: Ordovician rocks north of Builth (the Llanvirn, Llandeilo and lowest Silurian rocks of the inlier - 2½pp.); Welfield and Llandrindod (the dolerite intrusions of laccolithic form - 1½pp.); the Wye section (Silurian - 1½pp.); Central Wales - Builth to Aberystwyth (1½pp.); Llandovery district (Llandoveryan - 1p.); Builth to Fishguard (½p.); Cardiff to Fishguard (3pp.); St. David's and Solva (the type areas for Lower and Middle Cambrian rocks of St. David's - 1p.); St. David's Head, Llanvirn and Abereiddy (the Pre-Cambrian to Ordovician succession of Whitesand Bay and the type localities for the Llanvirnian Series - 2pp.); Newgale and Broadhaven (the complicated tectonics of the Pembrokeshire Coal Measures as seen in St. Bride's Bay and the great overthrust of Gaultrop Roads - Pre-Cambrian over Carboniferous - 1p.); Marloes and Wooltack (the classic section of fossiliferous Silurian rocks and overlying Old Red Sandstone of Marloes Bay, and the Skomer volcanic rocks of Wooltack Point - 1p.); Fishguard, Goodwick and Trefasser (the Ordovician sequence at Fishguard and the igneous rocks of Strumble Head - 2½pp.); Fishguard, Prescelly Hills, Carmarthen (general structure of the Prescelly Hills - ½p.).

- 43 A SUMMER FIELD MEETING TO THE ABERYSTWYTH DISTRICT. JULY 31st TO AUGUST 8th, 1935. By O.T. Jones and W.J. Pugh. Proc.Geol.Ass., Lond., v.46(1935), pp.413-428.

Borth and Aberystwyth (superficial geology and Aberystwyth Grits - 2½pp.); Steddfa Gurig and Plynlimon (Upper Ordovician and Lower Silurian - 1p.); Pont Erwyd, Rheidol Section and Devil's Bridge (incised meander and Llandoveryan - 2pp.); Derwenlas, Llyfnant valley and Machynlleth (Llandoveryan; wrench faulting - 2½pp.); Tal-y-Llyn, Corris and Aberllefenni (Upper Ordovician - 2pp.); Minllyn, Dinas Mawddwy and Llanyawddwy (Ashgillian and Llandoveryan - 2½pp.); Bwlch-y-Groes (Upper Ordovician and Llandoveryan - 2pp.); High Plateau of Central Wales (Pennant valley, Llanbrynmair - 1p.).

In this same volume of the Proceedings there is a paper entitled: "The geology of the district around Machynlleth and Aberystwyth" by O.T. Jones and W.J. Pugh (pp.247-300, including g.map, 2mls. - 1in.).

- 44 WHITSUN FIELD MEETING AT ABERYSTWYTH. 7th - 11th JUNE, 1957. By A. Wood. Proc.Geol.Ass., Lond., v.69(1958-59), pp.28-31.

Cader Idris (Llyn Gwernan to Llyn-y-gafr), Llyn-y-Gader, Llyn Aran, etc. (Ordovician sediments and volcanics - ½p.); Aberystwyth to Wallog (sedimentary and tectonic structures of the

Aberystwyth Grits - $\frac{1}{2}$ p.); Aberystwyth to New Quay (coastal geomorphology and sedimentation of the southern facies of the Aberystwyth Grits - $\frac{1}{2}$ p.); Devil's Bridge and Monk's Cave (glacial phenomena, sedimentary and tectonic structures of the Aberystwyth Grits - $\frac{1}{2}$ p.).

- 45 EXCURSION TO THE ST. DAVID'S DISTRICT, SOUTH WALES. APRIL 13th TO 22nd. EASTER, 1911. By J.F.N. Green. Proc.Geol.Ass., Lond., v.22(1911), pp.215-234.

Pre-Cambrian and Cambrian rocks of the City, Whitesand Bay and Porth Sele (2pp.); Lower and Middle Cambrian of the Solva valley (2pp.); Carn Llidi, Porth Melgan, etc. (gabbro, etc.; glacial sediments - 1p.); The Dimetian granophyre and its relations to the Cambrian and Pre-Cambrian at Porth-clais and Porth-lisky (3pp.); Cambrian rocks of the southern coast (2pp.); St. David's Cathedral ($\frac{1}{2}$ p.); The Ordovicians of Llanvirm and Abereiddy (1 $\frac{1}{2}$ pp.); The Pre-Cambrian axis of Newgale and Brawdy (2pp.); Fishguard (volcanics - $\frac{1}{2}$ p.).

- 46 THE ST. DAVID'S DISTRICT. REPORT OF THE SUMMER MEETING, 1930. By A.H. Cox, J.F.N. Green, O.T. Jones and J. Pringle. Proc.Geol.Ass., Lond., v.41(1930), pp.412-438.

Caerfai Bay to Treginnis (Pre-Cambrian and Cambrian - 2pp.); Caerbwly to Porth-y-rhaw (Cambrian - 2pp.); The Cambrian succession of the Solva valley (1 $\frac{1}{2}$ pp.); Abereiddy and Porth Gain (Cambrian and Ordovician - 4pp.); Ramsey Island (Lingula Flags, Arenigian, etc. - 1 $\frac{1}{2}$ pp.); Ramsey Island (structure - 1p.); The Pen Caer coast section (Cambrian, Ordovician; intrusions - 3 $\frac{1}{2}$ pp.); Garn Fawr and Pen Caer coast (continued - 2pp.); Bishops and Clerks (basic intrusions - $\frac{1}{2}$ p.); Whitesand Bay and St. David's Head (Cambrian and Ordovician - 1 $\frac{1}{2}$ pp.); The Marloes Section (Silurian - 1p.); Coal Measures of Broad Haven and Little Haven (1 $\frac{1}{2}$ pp.); The Trefgarn Section (Roch Rhyolites, etc.) and the Silurian rocks of Haverfordwest (3 $\frac{1}{2}$ pp.).

Accompanying this report there are two papers: "The geology of the St. David's District, Pembrokeshire", by A.H. Cox and others (pp.241-253, with g.map lin. - 1ml.); and "Preliminary note on the geological structure of Pen Caer and Strumble Head, Pembrokeshire", by A.H. Cox (pp.274-289, with g.map).

47. EXCURSION TO TENBY, EASTER, 1909. April 8th - 15th. By A.L. Leach. Proc.Geol.Ass., Lond., v.21(1909-1910), pp.177-194.

Tenby to Giltar Point - shore section (Upper and Lower Carboniferous - 6 $\frac{1}{2}$ pp.); Manorbier to Lydstep (Old Red Sandstone and Carboniferous Limestone - 3pp.); Wiseman's Bridge and Saundersfoot (Coal Measures - 1 $\frac{1}{2}$ pp.); Caldey Island (Old Red Sandstone and Carboniferous Limestone - 2pp.); The Hoyle and Longbury Bank and Freshwater East (Bone caves; Silurian and Old Red Sandstone - 2pp.); St. Govan's and the Stack Rocks (Triassic pipes, Carboniferous Limestone - 2pp.).

- 48 EASTER FIELD MEETING, 1933. TENBY AND THE SOUTH PEMBROKESHIRE COAST. By A.L. Leach and E.E.L. Dixon. Proc.Geol.Ass., Lond., v.44(1933), pp.391-401.

Freshwater East, Swanlake and Manorbier (Silurian, Old Red Sandstone and coastal morphology - 1 $\frac{1}{2}$ pp.); Old Castle Head, Skrinkle Haven, Lydstep Head (Old Red Sandstone and Carboniferous Limestone - 2pp.); Amroth and Saundersfoot (Coal Measures - 1p.); North Shore, Tenby and Giltar Cliffs (Coal Measures and Carboniferous Limestone - 1p.); Freshwater West, Linney Head and Stack Rocks (Carboniferous Limestone - 1 $\frac{1}{2}$ pp.); Tenby (south cliffs) and vicinity (Carboniferous Limestone - 1p.); St. Govan's Head to Stack Rocks (Carboniferous Limestone and Gash Breccias - 1p.); Freshwater West and West Angle Bay (Bifidus Beds, Ludlow Series, Old Red Sandstone, Carboniferous Limestone - 2pp.).

In the same volume of the Proceedings there are the following papers: "The geology and scenery of Tenby and the south Pembrokeshire coast", by A.L. Leach (pp.187-216); "Some recent stratigraphical work in its bearing on south Pembrokeshire problems [written for the Easter Field Meeting, 1933]", by E.E.L. Dixon (pp.217-225); "Notes on the geological succession in south Pembrokeshire", by E.E.L. Dixon (pp.402-411); "The Carboniferous goniatites of the neighbourhood of Tenby", by W.S. Bisat (pp.412-414).

- 49 REPORT OF AN EXCURSION TO CARMARTHEN, EASTER, 1925. By D.C. Evans and O.T. Jones. Proc.Geol.Ass., Lond., v.37(1926), pp.107-115.

Carmarthen - Pensarn, Penlan Hill (Arenig shales, Llanvirm rocks - 2pp.); Abergwili, Felinwen,

Nantgaredig, Dryslwyn, Llanarthney (*D.urchisoni* shale, etc. - 1½pp.); Pendine (Carboniferous Limestone - 1½pp.); St. Clears, Llanddowror (Ordovician, southern limb of anticline - 1½pp.); St. Clears (northern limb of anticline - 1p.); Conwil Elved (Valentian - ½p.).

- 50 FIELD MEETING IN SOUTH WALES. 23rd - 27th MARCH, 1951. By Brian Simpson. Proc.Geol.Ass., Lond., v.65(1954-1955), pp.328-337.

The Ordovician-Carboniferous succession on the North Crop of the South Wales coalfield - Swansea, Gwaun-cae-Gurwen, Black Mountains, Pont-ar-llechau (3pp.); Gower - Oystermouth, Caswell (Carboniferous Limestone, Old Red Sandstone - 1p.); Port Talbot and Bridgend (Pennant Sandstone, etc. - ½p.); Sutton and Southerndown (Carboniferous Limestone, Lias - 1p.); Eastern end of the South Wales coalfield (1½pp.); Neighbourhood of Cardiff and Penarth (Trias, Carboniferous Limestone, Old Red Sandstone, Mesozoic and glacial sediments - 1½pp.).

- 51 SUMMER (1964) FIELD MEETING SOUTH WALES, 11th - 18th JULY, 1964. By T.R. Owen, F.H.T. Rhodes, D.G. Jones and G. Kelling. Proc.Geol.Ass., Lond., v.76(1965), pp.463-496.

The Tenby district - North Sands, Tenby, Waterwynch, Saundersfoot (Coal Measures - 5pp. including guide-map of the Amroth-Tenby coast); The Vale of Glamorgan via Earlswood - The Earlswood sections, Ogmere area, Pont-y-Slade, Dancing Stones, Seamount and Witches Point (Pennant Measures, Carboniferous Limestone, Trias, Jurassic - 8½pp. including locality map, Ogmere district); The Llandeilo district - Pfairfach Railway Cutting, Carreg Cennen Castle, Quarry near Halfway, Pont-ar-llechau (Old Red Sandstone, Silurian, Ordovician - 3pp.); The Gower Peninsula (Old Red Sandstone and Carboniferous Limestone - 1½pp.); Pontsticill and the Brecon Beacons - Storey Arms quarry (3½pp. including general succession of Devonian and Carboniferous strata); Neath, Rhondda and Avan valleys - Vale of Neath, The Glynneath Bank, Blaen-rhondda (Carboniferous - 6pp. including section across Craig-y-Dinas area); Brynmawr (Carboniferous - 2pp. including map of localities along 'Head of the Valleys' road).

- 51A SOUTH WALES. GUIDE TO EXCURSION A.10. By A.H. Cox. International Geological Congress. XVIII Session - Great Britain, 1948. 25pp.

The excursions include National Museum of Wales; Caerphilly and Risca (traverses of the South and East crops of the Coalfield, and of the Caerphilly and Blackwood basins in the Rhymney, Sirhowy and Ebbw valleys. The intra-Coal Measure unconformity beneath the Pennant Sandstone - 2pp.); Taff and Rhondda valleys and North Crop of the Coalfield (complete north-south traverses of the Coalfield for study of structure and zonal sequence. The Neath disturbance - its tectonic and physiographic effects in the area north of the Coalfield - 2pp.); Cardiff to Swansea via Barry and Southerndown coast (the Mesozoic rocks of the Vale of Glamorgan and their relation to the older formations - 2½pp.); Gower (2pp.); Ystalyfera, Llandeilo and Llangadock (2½pp.); Neath and Llanelly to Fishguard (studies en route of the Ordovician rocks of Carmarthen and St. Clears, the very fossiliferous Silurian rocks of Haverfordwest and the complicated and overthrust Trefarn section - 2½pp.); St. David's and Solva (as in Excursion 42A); St. David's Head, Llanvirn and Abereiddy (as in Excursion 42A); Amroth and Tenby (the sequence and complicated tectonics of the Carboniferous rocks along the south margin of the Pembrokeshire Coalfield - 1p.); Marloes and Wooltack (as in Excursion 42A); Fishguard, Goodwick and Trefasser (as in Excursion 42A).

GEOLOGY AROUND THE UNIVERSITY TOWNS: SWANSEA, SOUTH WALES. By T.R. Owen and F.H.T. Rhodes. Geologists' Association Guides, No.17, 1960. 20pp. Price 3/-. [Second edition to be published shortly.]

- 52 Pembrokeshire: an itinerary incorporating very brief references to localities at Robeston Wathen ('Bala' Limestone), Haverfordwest (Llandoveryan), Shoalshook Farm ('Bala' Limestone), Newgale (storm beach), Broadhaven, Solva (Menevian), Caerbwdi Bay (Lower Cambrian), St. David's (Pre-Cambrian), Whitesands Bay (Lingula Flats, Tetragraptus Shales), Abereiddy Bay (Llanvirnian), Trwyn Castell (Llanrian Volcanic Series), Trefgarne Bridge, etc.
(5pp. including locality map.*)

- 53 Llandilo - Llandovery Region.

"includes the area north of Swansea, extending to Llandilo and Llandovery, with outcrops of Ordovician, Silurian, Devonian and Carboniferous strata, together with various tectonic and

and glacial features."

(7pp. including two stratigraphical tables and g.sk.map: Ffairfach railway cutting.)

54 Gower Peninsula.

"Armorican structures and Carboniferous (Avonian) successions are magnificently displayed in the Gower Peninsula. Marine platforms, of late-Tertiary origin, and the Submerged Forest indicate relatively recent oscillations of land- or sea-level."

(3½pp. including folding g.sk.map.*)

55 Vale of Neath.

"The Neath is a south-westward-flowing river whose valley has been eroded along one of the major belts of the South Wales coalfield. This narrow zone of intense folding and wrench-faulting is believed to be of Armorican origin. The river is a subsequent, which in late Pliocene times captured the headwaters of southward or south-eastward-flowing consequents." The itinerary includes references to localities in a recessional moraine, deltaic fans, Coal Measures, Carboniferous Limestone, caves, etc.

(1½pp. including locality map: Pont-nedd-fechan.*)

56 EXCURSION TO THE SWANSEA DISTRICT. APRIL 18th - 23rd, 1924. By T.N. George and A.E. Trueman. Proc.Geol.Ass., Lond., v.35(1924), pp.308-315.

Tawe valley - Ystalyfera, Penwyllt (Coal Measures, Millstone Grit and Carboniferous Limestone - 1½pp.); Cystermouth, Newton, Caswell Bay, etc. (Carboniferous Limestone - 1½pp. including g. sk. map of Mumbles Head); Garn Goch Collieries, Gorseinon (½p.); Vale of Neath - Melyncourt Fall, Pont Neath Vaughan (Coal Measures, Carboniferous Limestone - 1p.); Llandeibie - Cil-yrychen Limeworks, Cross Hands - New Cross Hands Anthracite Collieries (1p.); Bishopston, Pwll du (Carboniferous Limestone - 1p.).

The report is accompanied by a paper entitled: "The geology of the Swansea district", by A.E. Trueman (pp.283-308).

57 EXCURSION TO THE GOWER PENINSULA, SOUTH WALES. EASTER, 1902. MARCH 28th - APRIL 2nd. By R.H. Tiddeman. Proc.Geol.Ass., Lond., v.17(1901-1902), pp.366-367.

6th INTERNATIONAL CONGRESS OF CARBONIFEROUS STRATIGRAPHY AND GEOLOGY. EXCURSION Nos. A2 AND B2. SOUTH WALES. Edited by T.R. Owen. 25pp. (excluding illustrations). Cyclostyled.

The Guide has an Introduction by the Editor, including a key map showing the positions of the localities to be visited, a geological map illustrating the structure of the South Wales Coal-field and a chart illustrating the old and new classifications of the Carboniferous rocks in South Wales. Twelve itineraries are described. They are:-

58 Gower Peninsula: Stratigraphy and palaeontology of the Dinantian sequence. Prof.T.N. George.

(5pp. including (a) generalized geological map of Gower; (b) Section across Cefn Bryn, Gower; (c) Vertical sections showing the Lower Carboniferous succession in Gower and, for comparison, that on the north crop; (d) Geological map of the Rhossili area (scale 6in. - 1ml.).)

59 Gower Peninsula: Namurian succession. Dr. W.H.C. Ramsbottom.

(2pp. including sketch map and section of the Namurian beds on Barland Common.)

60 Pont-Nedd Fechan: Namurian succession. D.G. Jones and T.R. Owen.

Descriptions of the Mellte Bridge and Craig-y-ddinas locality (Namurian and Upper Viséan) and the Nant Gwineu (high Namurian) locality.

(4pp. including vertical sections at Craig-y-ddinas and the Sychryd valley, illustrating the Namurian succession.)

61 Vale of Neath: Westphalian A and lower Westphalian B. D.G. Jones.

Description of section in Cwm Gwrelech.

(3pp. including plan and vertical section of Cwm Gwrelech showing exposures of marker-bands and their stratigraphical positions respectively.)

- 62 Rhondda Fawr: marine horizons in Westphalian C. W.B. Evans.
(5pp. including (a) generalized section of the Measures between the Cefn Coed and Upper Cwm-gorse marine bands in the Llynfi and Rhondda valleys, showing lithology and principal faunal elements; (b) geological maps of Ton Pentre district and of Treherbert district - both maps at scale 6in. - 1ml.)
- 63 Penllergaer: Grovesend Beds. A.A. Archer.
"The highest Coal Measures in South Wales, the Grovesend Beds (the Upper Coal Series of the old classification) are poorly exposed, for they consist mainly of argillaceous rocks and form areas of low relief with an extensive cover of Pleistocene deposits. Most of the coal seams in these beds are thin. The highest, the Grovesend Veins, are present only in the core of the Llanelli Syncline between the major Grovesend faults. They have been largely worked out and are now nowhere accessible."
"The Lougher Little and Penyscallen veins lie towards the base of the Grovesend Beds and are exposed in a railway cutting near Penllergaer."
(2pp. including the 6in. to the mile map of the succession in the cutting.)
- 64 Briton Ferry: Pennant sedimentation. T.R. Owen.
Localities described are: Ferry Boat Inn Quarry and Earlswood Roundabout and road cutting.
(5pp. including (a) generalized succession in the Coal Measures of South Wales; (b) maps showing orientation and geometry of the channels in the Basal Coal Measures and the Rhondda Beds, with modal current directions obtained from associated cross-bedding; (c) sections of Lower Pennant Measures exposed in road-cutting at Briton Ferry.)
- 65 Cwmavon: low Westphalian B. W.B. Evans.
(2pp. including generalized section of the measures between the Amman and the Cefn Coed marine bands showing lithology and faunas.)
- 66 Llynfi Valley: high Westphalian B and low Westphalian C. W.B. Evans.
(2pp. including geological map of Nantffyllon district, scale 6in. - 1ml.)
- 67 Tondy: Tondy Brick-pit. A.W. Woodland.
(2pp. including section illustrating thrusts and lag faults between the Amman Rider and the Lower Nine-Foot seams.)
- 68 North-eastern outcrops: Dinantian, Namurian and lowest Westphalian. T.N. George, D.G. Jones and T.R. Owen.
Localities described are: Abercriban Grit Quarry (Dinantian - Devonian contact); Pontsticill (mid-Dinantian unconformity); Clydach valley (Namurian).
(4pp. including (a) pre-Seminular Main Limestone successions in the Merthyr Tydfil - Brynmawr area; (b) locality map for the excursion to Brynmawr, scale approximately 6in. - 1ml.)
- 69 The east crop of the coalfield: Dinantian and Westphalian. T.N. George and H.C. Squirrell.
Localities described are: Risca Quarry (Dinantian); Waun Fawr Quarry (Lower Coal Measures); Coed-y-Darren (Coal Measures); the Henllys landslip.
(8pp. including (a) location map and geology of the Risca area showing localities visited; (b) comparative vertical sections showing the easterly attenuation of the Coal Measures in the south-east part of the coalfield; (c) section in Lower Coal Measures exposed at southern end of Waun Fawr Quarry, near Risca; (d) Coed-y-darren near Risca, vertical section showing condensed section of Coal Measures.
- GEOLOGY AROUND THE UNIVERSITY TOWNS: THE CARDIFF DISTRICT. By J.G.C. Anderson. Geologists' Association Guides, No.16. 1960. 12pp. Price 2/-.
- 70 Rumney and Pen-y-lan - mainly Silurian ($\frac{1}{2}$ p.).
- 71 Cefn On and Caerphilly - Old Red Sandstone and Carboniferous.
(1 $\frac{1}{2}$ pp. including g.sk.map: 3in. - 1ml.)

- 72 Radyr, Penttyrch and Garth Hill - Old Red Sandstone, Carboniferous and Glacial.
(2pp. including g.sk.map: 3.5in. - 1ml.)
- 73 Eastern margin of the South Wales coalfield - Carboniferous.
(2pp. including g.sk.map: 1in. - 4mls.)
- 74 Coast from Barry Island to Penarth - Mesozoic and Carboniferous.
(2pp. including g.sk.map: 2½in. - 1ml.)
- 75 Southerndown, Llanharry and Llanharan - Mesozoic and Carboniferous.
"The main object of this excursion is to examine the littoral deposits of the Triassic and Liassic and the overlap of the Liassic on to the Carboniferous Limestone." (1½pp.)
- 76 EXCURSION TO CARDIFF. MARCH 31st - APRIL 8th. EASTER, 1920. By A.H. Cox, T. Sibly and A.E. Trueman. Proc.Geol.Ass., Lond., v.31(1920), pp.200-214.
The Taff Gorge and the coalfield rim (Lower Carboniferous - 3½pp. including section through Garth Ironstone Mine); The Penarth and Lavernock coasts (Trias, Rhaetic and Lias - 1p.); The Barry coast (Carboniferous Limestone, Keuper and Lias - 1p.); Cefn On to Caerphilly (Carboniferous - 1p.); The Southerndown coast (Carboniferous Limestone, Rhaetic and Lias - 1½pp.); Coal mines of Gylfach Goch (2½pp. including section of an overthrust in Britannic Colliery); Penderyn and the North Crop of the Carboniferous Limestone (1½pp.); The Silurian rocks of Cardiff (1p.).
In the same volume of the Proceedings there are three papers on the geology of the district: "The geology of the Cardiff district", by A.H. Cox (pp.45-75); "The Carboniferous Limestone of the Cardiff district", by T.F. Sibly (pp.76-92); "The Liassic rocks of the Cardiff district", by A.E. Trueman (pp.93-107, with col.g.map of the Liassic zones of the Lavernock district, 6in. - 1ml., and detailed succession of Lavernock outlier).
- 77 WEEK-END FIELD MEETING IN THE CARDIFF DISTRICT. JUNE 20th AND 21st, 1936. By A.H. Cox and A. Heard. Proc.Geol.Ass., Lond., v.48(1937), pp.52-60.
Penarth and St. Mary's Well Bay (Keuper, Rhaetic, Lias - 1p.); Cefn On, Caerphilly and Rhiwbina, for South Crop of coalfield (3pp.); Taff and Rhondda valleys and North Crop (4pp.).
- 78 EASTER FIELD MEETING, HEREFORD. APRIL 6th - 12th, 1939. By R.W. Pocock, A. Brammall and W.N. Croft. Proc.Geol.Ass., Lond., v.51(1940), pp.52-62
Silurian inlier, Woolhope (2pp.); Quelly Quarry, Llanvihangel Crucorney, Llanthony valley, Primrose Cottage Quarry, etc. ("Psammosteus" limestones, moraine, rock slips, Senni Beds - 1p.); Pembridge, Presteign, Nash Scar, Gore Quarry, Dolyhir Quarry, Hanter Hill (Llandoveryian, Woolhope Limestone, Longmyndian, gabbro - 1p.); Knightsford Bridge, Brockhill Quarry, Shavers End, Hunthouse Colliery (geomorphology, dyke, Aymestry Limestone, with notes on coal mining near Mable, Worcs. - 2½pp.); Wyche cutting and Tolgate Quarry, Malvern, etc. (4pp. including outcrop maps).
- 79 FIELD MEETING AT HEREFORD: MIDLAND GROUP. 7th - 9th MAY, 1954. By J.D. Lawson. Proc.Geol. Ass., Lond., v.65(1954-1955), pp.374-376.
Bartestree, Shucknall Hill, Ledbury, Frith Farm Quarry (dyke, Dayia Shales, Upper Ludlovian - 1½pp.); Woolhope inlier (1p.).
- THE SILURIAN INLIERS OF THE SOUTH-EASTERN WELSH BORDERLAND. By M.L.K. Curtis, J.D. Lawson, H.C. Squirrell, E.V. Tucker and V.G. Walmsley. Geologists' Association Guide, No.5, 1967. 32pp. Price 4/-.
There is a general introduction (3pp.) including a geological sketch map and a correlation table of the Ludlovian of the inliers, and a brief introduction to each of the four itineraries concerned with areas in Wales and the Borders. The remaining itinerary, for the Tortworth inlier, will be incorporated in the third part of this provisional bibliography.

80 The Usk inlier. V.G. Walmsley.

"The Usk inlier enables some 2000ft. thickness of upper Silurian rocks of the shelf facies to be examined in an area considerably south-east of the main Silurian outcrops. Completely surrounded by Old Red Sandstone country and forming the axial part of an area of uplift between the Carboniferous basins of South Wales and the Forest of Dean, the inlier has ... a complex and much faulted periclinal structure of mainly Armorican age."

"The northern half of the inlier is mostly covered with glacial drift and river alluvium so that the succession is best studied in the southern portion, using as a base the town of Usk, situated about the mid-point on the eastern perimeter."

(5pp. including locality map: 2mls. - lin. approximately.)

81 Woolhope and Gorsley. H.C. Squirrell and E.V. Tucker.

"Upper Llandovery, Wenlock and Ludlow beds are represented [in the Woolhope inlier] and are succeeded by rocks of Downtonian age. They are folded into a north-west to south-east trending pericline with a steeper western limb. A broad vale separates the Woolhope Inlier from the small Shucknall Inlier to the north. A link with the Silurian inlier of May Hill to the south-east is provided by the scattered exposures of Wenlock and Ludlow beds near Gorsley Common."

Two itineraries are described: (a) North Woolhope (8pp. including route map showing localities and g.map of Tower Hill section, Perton: 9in. - 1ml. approximately); (b) South Woolhope and Gorsley (5pp. including locality map of Bodenham Farm and Upton Court Farm areas).

82 The May Hill inlier. J.D. Lawson.

"The Upper Llandovery rocks [1100ft. thick] consist of conglomerates and coarse sandstones in the lower division, passing upwards into finer sandstones and siltstones with the Petalocrinus Limestone at the top. The Woolhope Limestone comprises thin nodular argillaceous limestones with calcareous shales succeeded by the pale olive mudstones of the Wenlock Shale division. The Wenlock Limestone includes a Lower Limestone unit with frequent 'ballstone' reef structures and an upper division which is fragmental and ferruginous. Dolomitic and oolitic limestone also occur. The Ludlovian rocks are remarkable for their thinness; the maximum thickness of 250ft. is about one-fifth of the normal thickness at Ludlow, Malvern, Usk and north Woolhope."

(5½pp. including outline g.map of part of the inlier.)

83 THE OLD RED SANDSTONE OF SOUTH-EAST WALES AND THE WELSH BORDERLAND. AUGUST 7th - 10th. By J.R.L. Allen. VII Sedimentological Congress. Excursion reports. Excursion A.5.

The excursion report is prefaced by a brief introduction including a correlation chart of stratigraphical units.

Upper Silurian rocks of Ludlow (quarries at Aymestry - 8 lines); Early Downtonian and Breconian-Sedimentation in the Clee Hills (Ludford Lane, Bringewood Forge, Abdon Liberty, Clee Liberty - 1p.); Downtonian and early Dittonian Sedimentation in the Southern Clee Hills and the Forest of Dean (River Rea, Lydney Harbour - ½p.); Breconian-sedimentation in the Forest of Dean (Wilderness Quarry, Mitcheldean - ½p.).

83A VERTEBRATE PALAEOLOGY. GUIDE TO EXCURSION C.16. By D.M.S. Watson, T.S. Westoll and E.I. White. International Geological Congress. XVIII Session - Great Britain, 1948. 29pp.

The guide contains an introduction by D.M.S. Watson and a series of itineraries for England and Wales by E.I. White and H.A. Toombs, and for Scotland by T.S. Westoll. The latter were included in the first section of this Preliminary Bibliography (Welsh geol.Qtly., v. 2, no.3).

The Welsh and Welsh Border itineraries are:- (i) Mitcheldean, Monmouth, Abergavenny. (ii) Abergavenny, Crickhowell (Primrose Hill Quarry - Senni Beds), Pool Quarry (Dittonian), Clodock (Castle Matlock Quarry - Dittonian), Wern Genny Quarry (Dittonian), Clay House (Downtonian), Bradnor Green (basal Downtonian); Church Hill "starfish" Quarry. (iii) Ludlow, Gardener's Bank ('Psammosteus' Limestone), Farlow, Prescott Mill (Farlow Sandstone), Oretton Limeworks (Carboniferous Limestone), Upper Overton Quarry ('Brownstones'), Morville (Dittonian), Lye Stream, Ludford (Ludlow Bone-bed). (iv) Ludlow, Clive Cottages Quarry (Upper Ludlovian), River Teme, Whitbatch (Pteraspis crouchi zone, Dittonian), Hopton Gate (Dittonian), Bouldon (Old Furnace Quarry - Psammosteus Limestone).

- 84 MIDLAND GROUP FIELD MEETING AT THE FOREST OF DEAN AND MAY HILL, GLOUCESTERSHIRE. 2nd to 4th MAY, 1947. By H.B. Whittington. Proc.Geol.Ass., Lond., v.59(1948), pp.58-61.
Cinderford, Drybrook, Puddlebrook, Mitcheldean (Pennant Sandstone, Carboniferous Limestone, etc. - 1p.); Huntley, Dursley Cross, etc. (Pre-Cambrian, Silurian, Trias - 1p.).
The following note accompanies the report: "Notes on rocks from Huntley Quarry, May Hill, Gloucestershire", by E.D. Lacy.
- 84A LONDON TO WALES (GEOMORPHOLOGY). GUIDE TO EXCURSION A.11. By S.W. Wooldridge and A.A. Miller. International Geological Congress. XVIII Session - Great Britain, 1948. 24pp.
The excursions include: The Welsh Borders (4½pp.); Church Stretton district (1p.); The South Wales Coalfield plateau (2pp.); The coast and coastal plateaux of South Wales (1½pp. including sk. map); Forest of Dean (3pp. including outline g.map).
- 85A ECONOMIC GEOLOGY OF ENGLAND AND WALES. GUIDE TO EXCURSION A.1. By K.C. Dunham and J.H. Taylor. International Geological Congress. XVIII Session - Great Britain, 1948. 68pp.
The itinerary includes descriptions of the following: Halkyn Mine, Flintshire (lead and zinc ores - 2pp. including g.sk.map); Penmaenmawr Quarries, Conway (roadstones, quartz-enstatite diabase - 1p.); Penrhyn Quarries, Bethesda (slate - 1p.); the Mersey tunnel (2½pp. including cross-section); and a brief reference to Lake Vyrnwy.
- 86A HYDROGEOLOGY OF ENGLAND AND WALES. GUIDE TO EXCURSION A.18. By S. Buchan. International Geological Congress. Section XVIII - Great Britain, 1948. 41pp.
Twenty-two pages are devoted to an introduction to hydrogeology covering: sources of supply; water-bearing characteristics of the rocks; quality of the waters; recent legislation; collection of data and research work; selected literature.
The descriptive itinerary includes descriptions of visits to: Llangollen, Lake Vyrnwy, Lake Bala, Dolgarrog, Snowdonia, Maentwrog, Transfynydd Lake, Elan valley reservoirs, Brecon Beacons, Chepstow.

GUIDES IN PREPARATION

- NORTH WALES: THE COASTS OF NORTHERN CAERNARVONSHIRE AND ANGLESEY. By R.M. Shackleton. Geologists' Association Guides, No.21.
- NORTH WALES: THE COASTS OF MERIONETHSHIRE AND SOUTHERN CAERNARVONSHIRE. By R.M. Shackleton. Geologists' Association Guides, No.20.
- GEOLOGY OF THE CADER IDRIS AREA (MERIONETHSHIRE) - FIELD ITINERARY WITH THEORETICAL EXPLANATIONS. By R.G. Davies. Welsh geol.Qtly., v.3, no.2.
- THE GEOMORPHOLOGY OF NORTHERN PEMBROKESHIRE. By C. Embleton. Welsh geol.Qtly., v.3, no.2.

INDEXES

All three indexes - name, place and subject - are based on names and items in the titles, quotations and abstracts cited in the bibliography, excluding those of the Guides in Preparation (p.17). The numbers in the indexes refer to those of the excursions in the accompanying bibliography. The suffix A is designed to help in distinguishing the International Geological Congress guides from the others because the former are less accessible.
No attempt has been made to standardize the spelling of Welsh place-names. Readers are referred to: "A Gazetteer of Welsh Place-Names" (University of Wales Press, 1957).

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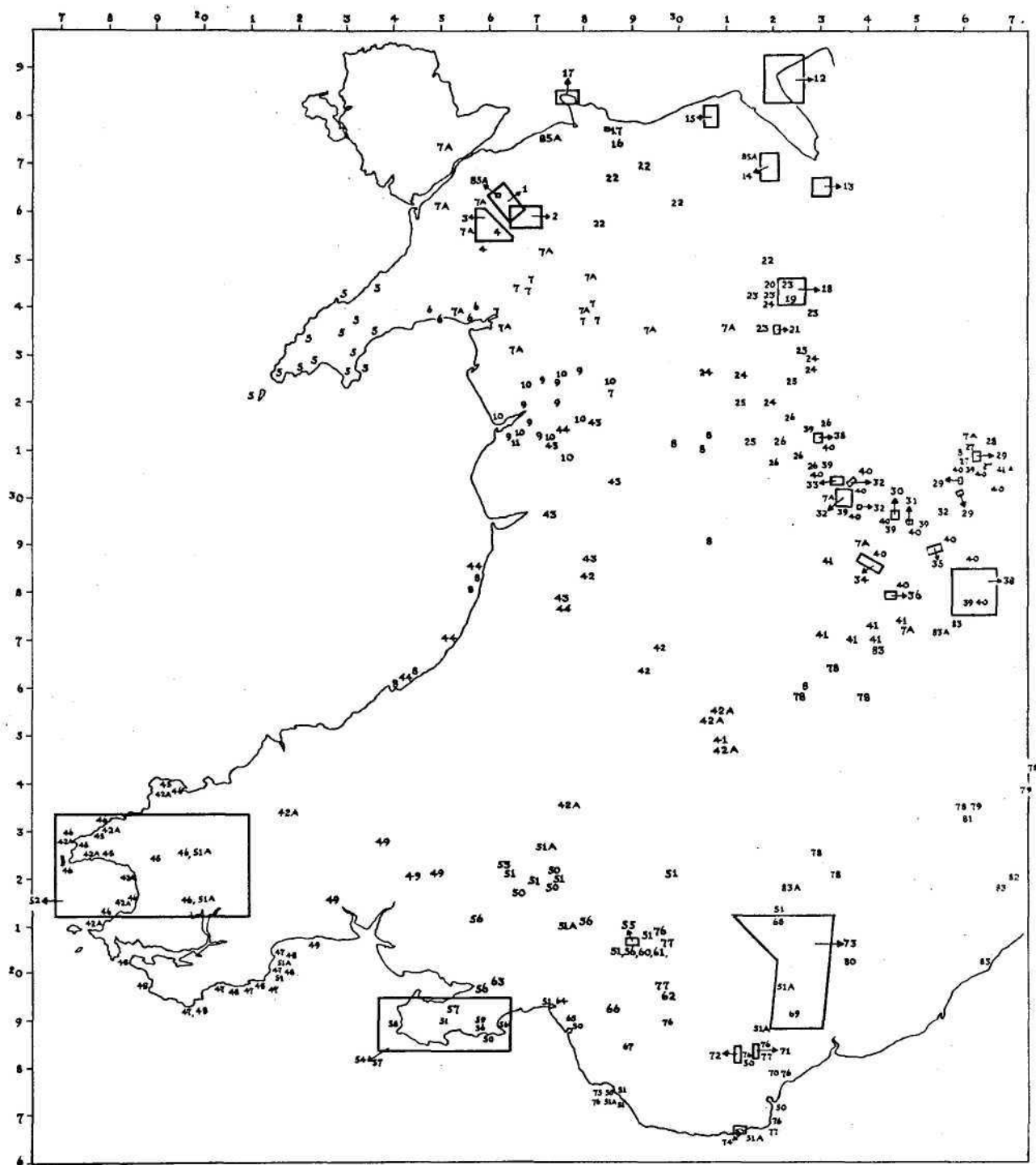
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ADDENDUM:

NORTH WALES AND SHROPSHIRE. GUIDE TO EXCURSION C.6. By W.G. Fearnside. International Geological Congress. XVIII Session - Great Britain, 1948. 22pp.

The excursions include: Nant Ffrancon and Snowdonia (1½pp.); Anglesey (1p.); Bala (1½pp.); Llanberis, Snowdon Syncline, Caernarvon (1½pp.); Tremadoc to Criccieth (2pp.); North-western fringe of the Harlech dome (1½pp.); Dolwyddelan Syncline (1p.); The Harlech Dome (1½pp.); Berwyn Dome (1½pp.); Ludlow Anticline (1p.); Wrekin, Wenlock, Comley (1½pp.); Longmynd and East Shropshire (2pp.); West Shropshire (2pp.).



WELSH COAST BORING MAY BE VITAL CLUE IN GAS QUEST

Alan Wood

The discovery of a commercial gas field in the North Sea has aroused considerable interest and speculation in Wales since there seems no obvious reason why gas or oil should not be found between Wales and the Irish coast. The industry of Wales could well be transformed by such a discovery.

On my suggestion a borehole is at present being put down at Mochras, south of Harlech. The information gained will be used to test certain theories and the rock succession found in the borehole will serve as an essential guide to future investigations. The venture is an integral part of the Cardigan Bay and Southern Irish Sea research at present being carried out at the University College of Wales, Aberystwyth. The purpose of this article is to make clear the geological reasoning that led to the siting of the borehole.

Both the North Sea and the Irish Sea are part of the Continental Shelf which here is essentially a part of the land submerged below the sea. In both areas the rock strata extend below the sea and can be picked up again on the opposite shore. In the Irish Sea the red sandstones and white limestones of Milford and Tenby are found again in Eire, around Cork and Bantry Bay, and the darker - and older - rocks of Cardigan Bay occur between Wicklow and Waterford.

Only if the material below Cardigan Bay and the Irish Sea is different from that seen in the bordering lands is there a chance of finding gas and oil.

From the Ten-mile geological map of Britain an important feature can be observed. Cardigan Bay resembles closely, both in shape and size, the Cheshire Basin, composed of Triassic rocks - in which thick beds of salt occur - overlying Coal Measures.

In the North Sea the gas comes from buried coalfields and is, in fact, the same as the "fire damp" of coal mines, contained at immense pressure, some 9,000 below the sea bed. The gas has been sealed in after its formation by a thick impermeable layer of salt. Other rocks, similar to those of the English Midlands, were then laid down. During much of its history the area has been subsiding relatively to the lands around so that the total thickness of sediment is very great.

As is well known, the gas is suitable for domestic and industrial use, consisting mainly of methane with a small percentage of ethane. The absence of heavier hydrocarbons unfortunately makes it likely that the gas will not be useful as a raw material for the manufacture of chemicals. Also this absence is an indication that there is little chance of finding large quantities of oil unless oil is found from some other horizon.

The evidence from the North Sea shows that essential factors for the accumulation of gas in commercial quantities are a source rock (in this case the coal itself), and an impermeable capping to seal in the gas. A further essential factor is subsequent gentle folding of the whole series of strata, producing domes and basins. Gas rises to the crest of the domes, whose position can be discovered, and remains there trapped as in a bell-jar.

There is evidence that much of the area between Anglesey and Pembroke may have been above sea level and thus unfavourable for the accumulation of swamp vegetation in Coal Measure times. Fortunately, there is plenty of evidence that the Irish Sea has been a subsiding area during later periods. The similarity of shape between Cardigan Bay and the Cheshire Basin has already been mentioned.

Recent evidence shows that the coastline of Cardigan Bay is bordered by a geological fault along much of its length, with a down-throw of thousands of feet to the west. If the rocks seen along the coast are thousands of feet below the sea floor they must have been covered by other materials, which can only be similar strata to some of those below the North Sea.

A specimen of chalk has recently been dredged from the sea floor between Pembrokeshire and Southern Ireland indicating that the rock which is found in Norfolk and Denmark is present here also. In the northern part of the Irish Sea, off the Lancashire coast, oil or gas probably occurs in depth since a boring at Formby has discovered oil which has probably migrated from an as yet unknown source.

To sum up, the Southern Irish Sea has been a subsiding area and may contain rocks in which gas may

be found, but the detailed structure and even the rock succession is completely unknown. In consequence, the considerable expense of drilling at sea cannot at present be justified.

In Northern Merioneth, however, the land has gained upon the sea in relatively recent times. It is well-known that Harlech Castle was provisioned from the sea - probably only tidal creeks - though now the Royal St. David's golf course lies between it and the sea. To the south, at Mochras, west of Llanbedr, the present coastline is nearly two miles west of the boundary fault and the coastline of earlier times.

A boring here should penetrate the ancient marine sediments and will give the first clear indication of what lies below the floor of Cardigan Bay.

The borehole which has been started at Mochras, with the financial support of the Natural Environment Research Council and the Institute of Geological Sciences, is designed to yield a continuous sample of the strata down to 2,000 feet below the surface. These samples will be studied and their importance evaluated in the Department of Geology at Aberystwyth.

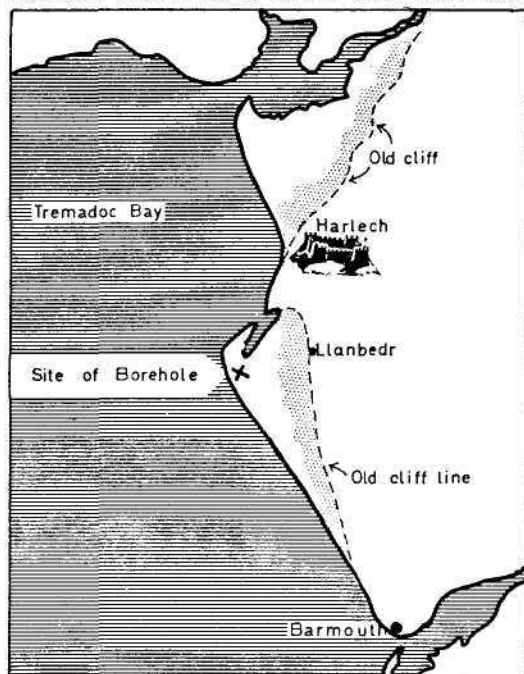
Conditions at this spot are such that oil and gas are unlikely to be found, but the information obtained, at relatively low cost, will enable geologists to predict with a much greater degree of certainty the economic potential of the Southern Irish Sea.

* For fuller details of this evidence the Reader should consult the paper "Geophysical investigations in Tremadoc Bay, North Wales" by D.H. Griffiths and others (Quart.J.geol.Soc.Lond., volume 117 (1961), and the discussion following the reading of the paper. The following quotation from the summary of the paper reflects some of the problems awaiting solution:-

"The results of a gravity survey of North Wales (Powell, D.W. 1956, Quart.J.geol.Soc.Lond., volume 111 [for 1955]) suggested that Tremadoc Bay, off North Wales, might be a Triassic basin, the eastern boundary being a major fault coinciding in part with the coastline, but nowhere exposed. To test these ideas a seismic refraction survey has been made of Tremadoc Bay A survey of the bay with a proton magnetometer was also undertaken and some closely spaced gravity and magnetic measurements have been made on Morfa Dyffryn."

"The results of the seismic work indicate the presence of three layers. The top layer has a maximum thickness of about 1800 feet It is considered to be late Mesozoic or Tertiary in age. All the evidence indicates the eastern boundary of this layer to be a major fault or a scarp. The middle layer has a maximum thickness of 6000 feet and a velocity of 13,000 feet/sec. The form and magnitude of the gravity anomaly in the area, after allowing for the effect of the top layer, make it most unlikely that this second layer has a low enough density to be Mesozoic. It is probably Ordovician. The third and lowest layer identified is thought to be Cambrian."

"The form of the regional gravity low over Cardigan Bay points to a structural origin for the bay, though the alternative theory that the anomaly is due to a major granitic intrusion is considered possible."



Editor: The article is reproduced, with minor editorial modification, from the Commercial and Industrial Review of the Western Mail for January 17th, 1968. Acknowledgement is made to the Author and to the Editor of the Review for granting permission to reproduce the material.

CHRISTMAS ACTIVITIES FOR VERY YOUNG GEOLOGISTS

During the week January 1st-5th, 1968 (during the schools' Christmas holidays), the Schools Service of the National Museum of Wales held as an experiment a series of holiday activities for children in junior schools. Three subjects were involved, Archaeology, Geology and Zoology, each making its own separate arrangements for the activities that took place.

In Geology a display was mounted on three afternoons of specimens of rocks, minerals, fossils, photographs, maps and models of the Cardiff district. Quiz sheets based on parts of the display and simple guides to the collecting of specimens and to the geology of the district were distributed and some 200 prizes (in the form of small mounted and labelled geological specimens) were awarded. A fifteen minute programme of colour transparencies with taped commentary illustrating the geology of the district was presented, in the form of a quiz, at frequent intervals during each afternoon.

Children who attended were encouraged to handle the specimens, which were laid out in an easily accessible form, and to ask questions freely. A numbered list of localities of geological interest was linked to a map and a relief model, both on the scale 1:25000, on which the localities were indicated by labels numbered to coincide with the list.

No prior contact had been made with schools, but an announcement was made in the Western Mail on two occasions some days previously. Forty-four schools were represented, mainly from the Cardiff district but ranging as far as Staffordshire, and it is estimated that 300 children attended. A number of sixth form students of geology from a local school volunteered to act as helpers and gave valuable aid.

Alun J. Thomas.

MARINE MINERALS IN PERSPECTIVE ...

Of all the potential resources of the sea which have caught the imagination of the world in recent years, minerals seem to have caused the most excitement. An article by John S. Tooms, Reader in Applied Geochemistry at Imperial College, in the first issue of the new journal HydroSpace (November, 1967) puts neatly into perspective those many unfathomable - wealth - on - the - sea - floor reports by assessing the six main types of marine mineral deposits and the problems associated with recovering them. Dr. Tooms emphasises that the costs of mining and prospecting marine mineral deposits are always likely to be higher than for most equivalent operations on land, and must therefore be considered in terms of the economics of land based sources. He makes a plea for Government assistance for obtaining the basic geophysical information which is often freely available to companies operating on land, and develops an interesting case for priority to be given to the development of phosphatic deposits on the continental shelves of underdeveloped countries. These deposits occur in areas of strong upwelling waters along arid coastlines where detrital precipitation is at a minimum, and from them, supplies of fertilisers could be developed, permitting underdeveloped territories to increase their food supplies at lower cost.

A 'GUIDE' TO THE BRECON BEACONS NATIONAL PARK

The Brecon Beacons National Park, designated in 1957, covers large areas of Breconshire, Carmarthenshire, and Monmouthshire. It has great beauty and variety of scene, with high mountains cut by broad valleys. This is the fifth National Park Guide promoted by the National Parks Commission (volumes on Dartmoor, Snowdonia, the Peak District, and the North York moors have already appeared). It is intended to encourage country-lovers to come to the Park, and to appreciate the landscape. Chapters in the guide cover the geology and scenery, flora and vegetation, recreation, and many other topics. (116pp. including 16pp. of appendices plus 16pp. of plates. Price 7s. 6d. H.M.S.O.)

ENTHUSIASM FOR GEOLOGY (IN 1849)

Our Society was founded on an amateur enthusiasm which it is difficult for us to imagine possible today. One could hardly in 1958 write as in the opening words of the original prospectus issued

in 1858, that 'There is no branch of Science which attracts so general - it may be said so popular - an interest as Geology ...' A very remarkable illustration of this mid-nineteenth century popular enthusiasm comes from a report of the British Association meeting at Birmingham in 1849, when Sir Roderick Murchison conducted an excursion to Dudley and the Wren's Nest.

"The Bishop, then taking a gigantic speaking-trumpet ... called upon all present to repeat after him the words ... Hail - King - of - Siluria! Then, after a pause, the words were repeated a second and a third time.

The vast assembly thrice responded with stentorian voices and most hearty hurrahs, and ever afterwards Sir Roderick was proud to be acknowledged 'King of Siluria'. About 25,000 persons visited the Dudley caverns on that day in 1849 ..."

(From "The Association today and tomorrow" by D.V. Ager, in The Geologists' Association 1858-1958. A history of the first hundred years, edited by G.S. Sweeting, 1958, pp.131-143.)

GEOLOGICAL RESEARCH IN SCHOOLS

The following geological subjects are listed in the Ninth Annual Report (1966) of the Royal Society's "Scientific Research in Schools Committee":-

Pollen analysis and stratigraphy of Wem Moss, Shropshire. F.M. Slater, Darlaston Comprehensive School, Staffs.

Study of the minerals and quantitative formation of the Pre-Cambrian rocks of the Malverns. A.F. Vyvyan-Robinson, Malvern College, Worcs.

Petrology of Lakeland intrusive rocks (mainly granites). Dr. J.R. Harpum, Queen Elizabeth Grammar School, Penrith.

Anatomical study of fossil cones from the Cretaceous. G.T. Creber, University College School.

Time relationships of the different members of the Pleistocene succession in Cheshire. J.A.G. Thomas, Verdin Grammar School, Winsford, Cheshire.

History of the sedimentation of the Cromer Forest bed series in East Anglia. C.E. Ranson, Wycombe High School, Buckinghamshire.

The following masters have published papers in connection with their projects:-

C.E.J. Dorwick (Dover College). The heavy minerals of the Blackheath Beds. Proceedings of The Croydon Natural History and Scientific Society, 1965.

A.G. Long (late Berwickshire High School). Some Lower Carboniferous fructifications from Berwickshire, together with a theoretical account of the evolution of Ovules, Cupules and Carpels. Transactions of the Royal Society of Edinburgh, Vol. LXVI, no.14, 1964-65.

GEOLOGY 1966: A GUIDE TO FIRST DEGREE COURSES

In June 1966 The Careers Research and Advisory Centre issued the first of a series of annual bulletins on geology as a subject in first degree courses in the Universities and Colleges of the United Kingdom. The bulletin contains the following sections: The courses (1½pp.); What the courses have in common (½p.); Differences in the character of the courses (½p.); Differences in the content of the courses (2½pp.); Point of decision (1p.); Additional subjects (4pp.); Entrance requirements (2pp.); Selection interviews (1p.); Introductory reading list and further information (1p.). It also contains four appendices:- Environmental studies courses (8 lines); Combined courses (1½pp.); Other courses (½p.); Heads of Departments and Numbers of Students.

NATIONAL MUSEUMS WEEK, 1968

The theme of National Museums Week - to be held from 1st-7th April - is "The Museum behind the Scenes". Individual museums will be organizing special events with the intention of illustrating to the general public what museum work is about and the Museums Association will be publishing a special booklet to help publicize museums and galleries. The Foreword of the booklet is to be written by Miss Jennie Lee, M.P., P.C., Patron of the Week.

SIR WILLIAM EDMOND LOGAN. SCIENTIST AND CANADIAN.

The following note is a slightly abbreviated condensation by C.G. Winder, University of Western Ontario (in the Geological Association of Canada's Newsletter, v.4, no.1, Dec.1965) of an address given by him at the G.A.C. Annual Meeting, Winnipeg, October 19th, 1965.

Sir William Edmond Logan lived in South Wales for ten years between 1831 and 1841 and during that time made a geological map which compares favourably with maps of the present day. Subsequent to his retirement as Provincial Geologist of Canada in 1869, he went to live with his sister at Castle Malgwyn, near Llechryd, Cardiganshire, Wales. He died in June, 1875 and was buried at Cilgerran, Pembrokeshire, Wales. The present condition of his gravestone has been described as "unmarked" because lichen has covered the inscription on the sloping top of a grey granite marker and the grave site, in general, is unkempt (Winder, 1965).

Logan was a distinguished and extraordinary man who has passed into a background of oblivion. The general public of Canada have never heard of him. Even some geologists with a Canadian background know little about him. Logan's contribution to the science of geology and a world reputation established during the middle part of the last century would seem sufficient to warrant more than a memorial which has become camouflaged by nature. Logan was a geologist and scientist of undisputed eminence and the following can be cited:

- 1) He was self-taught, and although at the time such an achievement could be gained in no other way, there were few others who gained a comparable reputation.
- 2) He conceived the in situ origin of coal from his mapping in South Wales. In general, his concept is still valid.
- 3) He started geological mapping in Canada at the age of 44 without the background of any previous work and without extensive precise topographic maps. The means of transportation were primitive. He eventually produced a geological map which covered a sizeable area of eastern North America; parts of it were gained from other sources.
- 4) He initiated the second federal survey in the world. When financial conditions were tenuous, he was willing to provide funds from his own pocket; fortunately he did have private means. He realized that geological studies required both field and laboratory investigations; he engaged capable field assistants, a chemist and a paleontologist. His objective was regional mapping and the evaluation of potential economic mineral deposits.
- 5) He laid the foundation for Precambrian stratigraphy. His interpretation may not be entirely correct in light of present knowledge but it would appear that much work is yet to be done.
- 6) He took a strong stand for the occurrence of life in the Precambrian and although his so-called fossils are now considered inorganic, the evidence for abundant life in the Precambrian is well established.
- 7) He considered that Lake Superior was of glacial origin even though Louis Agassiz, the father of the glacial theory, thought at the same time that it was of structural origin.

In 1856, Logan was knighted by Queen Victoria purely for his service and devotion to his country. Bestowing knighthood on soldiers, financiers and politicians is not unusual but for a scientist, the honour must indeed be significant. He drew attention by his displays at the international exhibitions in London 1851 and Paris 1855. At the latter, the American display did not materialize so Logan not only occupied his own space but the 7000 square feet left by the Americans. He worked himself almost to exhaustion; the display of minerals was cited as outstanding. There can be little doubt that his activities drew attention to Canada which resulted in the development of the vast mineral resources of this country.

I would make the following proposals:

- 1) The life, writings and contributions to Canadian society be adopted as a permanent project of the Geological Association of Canada with the objective of making Sir William Logan better known to both geologists and laymen alike.
- 2) That every Canadian geologist make an effort to draw attention to this man. The annual presentation of the Geological Association's Logan Medal should provide an opportunity to honour a worthy recipient and remind geologists of a man who attained a high level of achievement.
- 3) His picture should be given the widest possible circulation and I would suggest a reproduction of the painting made in 1856 just after receiving the knighthood.
- 4) I suggest that his grave at Cilgerran, Wales be provided with a marker which will not be obliterated by the elements and a standard which, even a century from now, will tell the "pilgrims" that

Sir William Logan was a scientist and a Canadian who devoted his life to his country. This man should not rest in an unmarked and unkempt grave. This proposal should have first order priority.

Reference: Winder, C.G., 1965, Logan and South Wales: Geol.Assoc.Canada Proceedings, vol.10, p.103-24, 2 pl.

GEOLOGY AT THE UNIVERSITY COLLEGE OF NORTH WALES, BANGOR

Earth Sciences is one of three Inter-departmental courses available to First Year science students at the University College of North Wales, Bangor. These courses are financed by the College, but staffed and materially supported by Departments with a common interest in providing for their students essential background knowledge lying outside individual departmental specialisations.

The Inter-Departmental Course in Earth Sciences, probably the first of its kind in the U.K., was instigated in October 1965 with the support of the Departments of Biochemistry and Soil Science and of Physical Oceanography. Its general aim is to provide students of the natural sciences with the essential knowledge of the environmental framework of their studies, notably the composition and morphology of the earth and the processes acting at, and beneath, its surface. The course is complete in itself, comprising an integrated programme of some 70 lectures and 25 laboratory and field classes. It assumes no previous knowledge of the subject.

Topics covered include: the Earth as a planet, its shape and internal structure as derived from geophysical observations (12 lectures); the chemistry, mineralogy, and modes of formation of crustal rocks, historical geology, structural geology, and the geological map (24 lectures); land-forms, surface processes and the surface sculpture of the crust, Quaternary geology, soils and soil formation (12 lectures); solar radiation, the atmosphere, weather and weather types, climatic types and their distribution (20 lectures).

The course had four lecturers drawn from the Departments of Physical Oceanography and Biochemistry and Soil Science, one of whom was appointed in September 1966 specifically to lecture in the Earth Sciences. Fortunately, the research interests of the lecturers - geophysics and marine geology; meteorology and oceanography; weathering and soils; stratigraphy and sedimentology - ensure a close acquaintance with most aspects of the Earth Sciences taught.

The enrolment of 23 students in the first year of the Earth Sciences course ('65 - '66) has subsequently almost doubled, and to date the great majority of those taking the course have been proceeding to degrees in the natural sciences, notably in Agriculture; Biochemistry and Soil Science; biological subjects, including Marine Biology with Oceanography; Forestry; and Mathematics or Chemistry with Oceanography.

For the future, the intention is first to consolidate the course. A recent financial grant will allow the purchase of additional teaching aids such as slide and film projectors, extra microscopes, meteorological equipment and charts, and geological maps and models. Grants from the College have provided a well-stocked Earth Sciences library, which continues to grow. At present, the course is conducted in the lecture theatre and geological laboratory of the Department of Biochemistry and Soil Science, but it is hoped that Earth Sciences will soon have its own teaching accommodation. This will allow further expansion and extension of the course.

(Dr. R.J. Bailey, Department of Biochemistry and Soil Science, Memorial Buildings, Bangor, in Commonwealth Geological Liaison Office Newsletter for October and November, 1967, pp.6-7.)

THE FOSSIL RECORD. A SYMPOSIUM WITH DOCUMENTATION.

The Fossil Record. A Symposium with Documentation (Geological Society of London, 1967, xii + 828pp. Price £8) sets out to depict, document and analyse the published stratigraphical range of all fossil taxa, conveniently grouped for the purpose so as to cover comprehensively the whole range of plants and animals in the fossil record. It is arranged in three parts and contains contributions from more than a hundred specialists.

Part 1 contains eleven papers which were read at the Symposium held in the Department of Geology, University College, Swansea, in December 1965, and jointly organised by the Geological Society of London and the Palaeontological Association for discussion of factors related to the distribution of life in time. The titles of the papers are:-

Life in Pre-Cambrian and early Cambrian times. J.W. Cowie.
 The significance of certain trace-fossil ranges. R. Goldring.
 Fluctuations in the evolution of Palaeozoic invertebrates. M.R. House.
 The origins of some Silurian enteleletean brachiopods. V.G. Walmsley.
 Permo-Triassic extinction. F.H.T. Rhodes.
 Changes in terrestrial vertebrate faunas during the Mesozoic. C.B. Cox.
 Some Cretaceous-Tertiary marine faunal changes. J.M. Hancock.
 Major features of the evolution of echinoids. G.M. Philip.
 Plant-insect relationships in Palaeozoic and later time. N.F. Hughes and J. Smart.
 Biochemical evolution and the fossil record. L.B.H. Tarlo.
 Fossil birds and their adaptive radiation. J. Fisher.

Part 2 is the main body of the volume with systematic coverage of taxa in thirty chapters, each by one or more specialist contributors. They have attempted to document fully up to 1965 the published occurrences of the stratigraphically earliest and latest representatives of the chosen taxa. Each contributor has been left to decide how to divide his allotted range of taxa and at what precise level (order, family, etc.) to treat them. For each such taxon the first and last occurrences are stated in terms of a single stratigraphical scale, standardised for the purposes of the volume, plus formational names and references, with or without comment.

The information is plotted uniformly on charts in each chapter, so that the ranges of all taxa used are depicted graphically for comparison. Emphasis is placed on terminal rather than intermediate evidence, with the implication that the range of each taxon must be continuous between the first and last records. The volume thus provides a convenient stratigraphical and systematic summary of the fossil record with sufficient reference to pursue any part in greater detail.

Part 3 contains a computer analysis of the data in Part 2, plotting frequencies of kinds of taxonomic record against stratigraphical divisions. The methods of analysis and the limitations of the data are discussed and the results are shown graphically in twenty-two full-page diagrams.

"THE STRUCTURE OF THE BRITISH ISLES"

This is the title of a new book by Prof. J.G.C. Anderson and T.R. Owen published by the Pergamon Press at 45 shillings. The work aims to provide a background to the geological structure of the British Isles in sufficient detail to suit the needs of students studying for a university degree in geology and geography. The broad tectonic evolution of the whole area is first described, followed by regional descriptions of the major structural units. An attempt has been made to describe structures in an order of decreasing age.

ENGINEERING GEOLOGY: A NEW JOURNAL

The Geological Society of London recently issued the first number of The Quarterly Journal of Engineering Geology. The purpose of the journal is to provide room for the publication of papers "which deal with any of the subjects within the field of geology as applied to civil engineering and mining practice, including rock mechanics, soil mechanics and geotechnics; applied sedimentology, pedology, mineralogy and petrology; geohydrology and hydrogeology; and engineering applications of geophysics".

In his Foreword to the Journal Prof. J.E. Richey states: "The adventure of starting a new scientific journal is associated in the present case with the interest involved in bringing together two of the great practical sciences of creative value for mankind. Geology and engineering, and geologists and engineers, have for a long time now been more or less closely associated in the British Isles and elsewhere, and that connexion may perhaps be suitably illustrated by the old photograph which is shown here as a frontispiece [Contortions in Yoredale shales and sandstones uncovered in an excavation for the Puddle-trench for the Howden reservoir, Derby, May 1904]. It is appropriate too that the picture's place of origin, the Geological Survey and Museum, should have had its distant beginnings under the aegis of the Geological Society, both institutions being the first of their kind in the world."

GEOLOGISTS' ASSOCIATION: SOUTH WALES GROUP

ANNUAL REPORT. Session 1966-1967

Ordinary Meetings (held alternately at the University Colleges in Cardiff and Swansea)

- 24th September, 1966. (Cardiff) "Aspects of Ordovician vulcanicity", by Dr. W.J. Phillips, University College of Wales, Aberystwyth.
- 29th October, 1966. (Swansea) "Expedition to Spitsbergen", by Dr. H.C. Squirrell, Institute of Geological Sciences.
- 19th November, 1966. (Cardiff) "The geology of the moon", by Dr. C.R.K. Blundell, University College, Cardiff.
- 10th December, 1966. (Swansea) Members' Meeting:
"Sedimentological studies and their application to the Pembrokeshire Coal-field", by P.F. Williams, University College, Swansea.
"Specimen collecting and the conservation of sites of geological interest", by A.J. Thomas, National Museum of Wales.
"Digging for a cave", by J.C. Jones, Midland Silicones Limited, and D. Kemp, Kodak Limited.
Exhibition of colour slides.
- 21st January, 1967. (Cardiff) "The genesis of coal seams", by Dr. F.M. Trotter, late Institute of Geological Sciences.
- 18th February, 1967. (Swansea) "Symposium on applied geology":
"The geology of hydro-electric and water storage schemes", by Professor J.G.C. Anderson, University College, Cardiff.
"The geology of oil and natural gas deposits with particular reference to the North Sea area", by Dr. R. Lakeman, British Petroleum Limited.
"Economic geology", by Dr. R. Cummings, Robertson Research Company Limited, Llanddulas.
- 11th March, 1967. (Cardiff) Annual General Meeting and lecture on: "Geological aspects of water supply in Wales", by Dr. J. Ineson, Water Resources Board.

Field Meetings

- 8th April, 1967. "Millstone Grit of the Rhymney Bridge area" - D.E. Evans, National Museum of Wales.
- 22nd April, 1967. "Upper Bala and Llandovery rocks of the Rhayader, Elan valley and Claerwen areas" - Dr. G. Kelling, University College, Swansea.
- 27th May, 1967. "The Old Red Sandstone of the area lying north and northwest of the Forest of Dean coalfield" - Dr. J.R.L. Allen, The University, Reading.
- 10th September, 1967. "Geology of the central section of the Vale of Glamorgan" - T.M. Thomas, Welsh Office, Cardiff (joint excursion with Bristol Naturalists' Society).
- 16th and 17th September, 1967. (Week-end excursion) "Geology of the Mendip Hills" - R. Bradshaw, The University, Bristol.

Membership

During the year the membership was 144.

Publications

Four numbers of The Welsh Geological Quarterly were issued.

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1967-1968

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