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## References

In this reference list the arrangement is alphabetical by author surname for works by sole authors and dual authors. Where there are references that include the first-named author with others, the sole-author works are listed chronologically first, followed by the dual author references (alphabetically) followed by the references with three or more authors listed *chronologically*. Chronological order is used within each group of identical authors.

- Adams, A.E. and Wadsworth, W.J. (1993) The Humphrey Head Borehole: evidence for Carboniferous vulcanicity and Permian dolomitization in the southern Lake District. *Geological Journal*, 28, 159–69.
- Aitkenhead, N., Chisholm, J.I. and Stevenson, I.P. (1985) *Geology of the Country around Buxton, Leek and Bakewell*, Memoir of the British Geological Survey, Sheet 111 (England and Wales), HMSO, London, 168 pp.
- Alexander, R.W.S., Dawson, J.B., Patterson, E.M. and Hervig, R.L. (1986) The megacryst and inclusion assemblage from the Black Rock vent, Ayrshire. *Scottish Journal of Geology*, 22, 203–12.
- Allan, D.A. (1924) The igneous geology of the Burntisland district. *Transactions of the Royal Society of Edinburgh*, 53, 479–501.
- Allan, D.A. (1931) A nepheline-basanite sill at Fordell, Fife. *Proceedings of the Liverpool Geological Society*, 15, 309–17.
- Allan, T. (1812) On the rocks in the vicinity of Edinburgh. *Transactions of the Royal Society of Edinburgh*, 6, 405–33.
- Allport, S. (1874) On the microscopic structure and composition of British Carboniferous dolerites. *Quarterly Journal of the Geological Society of London*, 30, 529–67.
- Anderson, E.M. (1951) *The Dynamics of Faulting and Dyke Formation, with Applications to Britain*, 2nd edn, Oliver and Boyd, Edinburgh.
- Anderson, F.W. (1963) The Geological Survey bore at Rashiehill, Stirlingshire (1951). *Bulletin of the Geological Survey of Great Britain*, 20, 43–106.
- Anderson, T.B., Parnell, J. and Ruffell, A.H. (1995) Influence of basement on the geometry of Permo-Triassic basins in the northwest British Isles. In *Permian and Triassic Rifting in Northwest Europe* (ed. S.A.R. Boldy), *Geological Society Special Publication*, No. 91, The Geological Society London, pp. 103–22.
- Armstrong, D. (1957) Dating of some minor intrusions of Ayrshire. *Nature*, 180, 1277.
- Armstrong, M., Paterson, I.B and Browne, M.A.E. (1985) *Geology of the Perth and Dundee District*, Memoir of the British Geological Survey, sheets 48W, 48E and 49 (Scotland), HMSO, London, 108 pp.
- Arnold-Bemrose, H.H. (1894) On the microscopical structure of the Carboniferous dolerites and tuffs of Derbyshire. *Quarterly Journal of the Geological Society of London*, 50, 603–44.
- Arnold-Bemrose, H.H. (1899) On a sill and faulted inlier in Tideswell Dale (Derbyshire). *Quarterly Journal of the Geological Society of London*, 55, 239–50.
- Arnold-Bemrose, H.H. (1907) The toadstones of Derbyshire; their field relations and petrography. *Quarterly Journal of the Geological Society of London*, 63, 241–81.
- Arnold-Bemrose, H.H. (1910) On olivine nodules in the basalt of Calton Hill, Derbyshire. *Geological Magazine*, 57, 1–8.
- Aspen, P, Upton, B.G.J. and Dickin, A.P. (1990) Anorthoclase, sanidine and associated megacrysts in Scottish alkali basalts: high-pressure syenitic debris from upper mantle sources? *European Journal of Mineralogy*, 2, 503–17.

Avison, M.M. (1976) The stratigraphy and petrology of the tract of Carboniferous lavas covering the Black Hill region of southern Kintyre. Unpublished BSc thesis, University of Lancaster.

Ayles, H.M. (1977) A stratigraphical, petrological and geochemical study of the aphyric basal succession of the Carboniferous lavas, southern Kintyre, Scotland. Unpublished BSc thesis, University of Lancaster.

Bailey, E.B. (1923) Volcanic vent parasitic on St Leonard's sill. *Transactions of the Edinburgh Geological Society*, 11, 223–9.

Bailey, E.B. and Maufe, H.B. (1960) *The Geology of Ben Nevis and Glencoe and the Surrounding Country*, 2nd edn, Memoir of the Geological Survey of Great Britain, Sheet 53 (Scotland), HMSO, Edinburgh, 307 pp.

Balsillie, D. (1920a) Description of some volcanic vents near St Andrews. *Transactions of the Edinburgh Geological Society*, 11, 69–80.

Balsillie, D. (1920b) Descriptions of some new volcanic vents in East Fife. *Transactions of the Edinburgh Geological Society*, 11, 81–5.

Balsillie, D. (1922) Notes on the dolerite intrusions of East Fife. *Geological Magazine*, 59, 442–52.

Balsillie, D. (1923) Further observations on the volcanic geology of East Fife. *Geological Magazine*, 60, 530–42.

Balsillie, D. (1927) Contemporaneous volcanic activity in East Fife. *Geological Magazine*, 64, 481–94.

Balsillie, D. (1936) Leucite-basanite in East Lothian. *Geological Magazine*, 73, 16–18.

Bamford, D. (1979) Seismic constraints on the deep geology of the Caledonides of northern Britain. In *The Caledonides of the British Isles, Reviewed* (eds A.L. Harris, C.H. Holland and B.E. Leake), *Geological Society of London Special Publication*, No. 8, Scottish Academic Press, Edinburgh, for The Geological Society of London, pp. 93–6.

Barnett, J.A.M. (1985) Fracture patterns related to volcanic necks and pipes in an Upper Limestone Group (Namurian) coal seam in the Kincardine Basin, West Fife, Scotland. *Proceedings of the Yorkshire Geological Society*, 45, 249–59.

Barrett, B.H. and Richey, J.E. (1945) *Economic Geology of Canonbie Coalfield (Dumfries and Cumberland)*, Wartime Pamphlet of the Geological Survey of Great Britain, No. 42, Geological Survey and Museum, London, 51 pp.

Bateman, R.M. and Scott, A.C. (1990) A reappraisal of the Dinantian floras at Oxroad Bay, East Lothian, Scotland. 2. Volcanicity, palaeoenvironments and palaeoecology. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 81, 161–94.

Bateman, R.M., Rothwell, G.W. and Cleal, C.J. (1995) Oxroad Bay. In *Palaeozoic Palaeobotany of Great Britain* (eds C.J. Cleal and B.A. Thomas), Geological Conservation Review Series, No. 9, Chapman and Hall, London, pp. 127–39.

Bateson, E. (1895) *A History of Northumberland, Volume 2: The parishes of Embleton, Effingham, Howick, Long Houghton and Lesbury*, A. Reid, Newcastle-upon-Tyne, for Northumberland County History Committee.

Batty, M.H. and Moss, A.A. (1962) Powellite from Traprain Law, Haddington, Scotland. *Mineralogical Magazine*, 33, 158–67.

Baxter, A.N. (1987) Petrochemistry of late Palaeozoic alkali lamprophyre dykes from N. Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 77, 267–77.

Baxter, A.N. and Mitchell, J.G. (1984) Camptonite-monchiquite dyke swarms of northern Scotland; age relationships and their implications. *Scottish Journal of Geology*, 20, 297–308.

- Beckinsale, R.D. and Obradovich, J.D. (1973) Potassium-argon ages for minerals from the Ross of Mull, Argyllshire, Scotland. *Scottish Journal of Geology*, 9, 147–56.
- Benard, F., Mascle, A., Le Gall, B., Doligez, B. and Rossi, T. (1990) Palaeo-stress fields in the Variscan foreland during the Carboniferous from microstructural analysis in the British Isles. *Tectonophysics*, 117, 1–13.
- Bennett, J.A.E. (1945) Some occurrences of leucite in East Lothian. *Transactions of the Edinburgh Geological Society*, 14, 34–52.
- Bentley, M.R. (1988) The Colonsay Group. In *Later Proterozoic Stratigraphy of the Northern Atlantic Regions* (ed. J.A. Winchester), Blackie and Son, Glasgow, pp. 119–30.
- Benton, M.J., Cook, E. and Turner, P. (2002) *Permian and Triassic Red Beds and the Penarth Group of Great Britain*, Geological Conservation Review Series, No. 24, Joint Nature Conservation Committee, Peterborough, 337 pp.
- Besly, B.M. (1998) Carboniferous. In *Petroleum Geology of the North Sea: Basic Concepts and Recent Advances*, 4th edn (ed. K.W. Glennie), Blackwell Scientific Publications, Oxford, pp. 104–36.
- Black, G.P. (1966) *Arthur's Seat: A History of Edinburgh's Volcano*, Oliver and Boyd, Edinburgh, 226 pp.
- Blackburn, E.L., Wilson, L. and Sparks, R.S.J. (1976) Mechanisms and dynamics of strombolian activity. *Journal of the Geological Society of London*, 132, 429–40.
- Bluck, B.J. (ed.) (1973) *Excursion Guide to the Geology of the Glasgow District*, Geological Society of Glasgow, Glasgow, 181 pp.
- Bonney, T.G. (1878) Note on the relations of the igneous rocks of Arthur's Seat. *Proceedings of the Geologists' Association*, 5, 1–12.
- Bott, M.H.P. (1964) Formation of sedimentary basins by ductile flow of isostatic origin in the upper mantle. *Nature*, 201, 1082–4.
- Boué, A. (1820) *Essai Géologique sur l'Ecosse*, Ve Courcier, Paris, 519 pp.
- Boulton, W.S. (1904) On the igneous rocks at Spring Cove, near Weston-super-Mare. *Quarterly Journal of the Geological Society of London*, 67, 158–69.
- Boulton, W.S. (1911) On a monchiquite intrusion in the Old Red Sandstone of Monmouth. *Quarterly Journal of the Geological Society of London*, 67, 460–76.
- Boyd, WW (1974) Geochemical investigation of composite bodies involving intermediate members of the alkali basalt-trachyte suite. Unpublished PhD thesis, University of Edinburgh.
- Boyle, R. (1908) The occurrence of ultra-basic rocks in the igneous intrusions of the Lugar and Cumnock district. *Transactions of the Geological Society of Glasgow*, 13, 202–23.
- Bridgwater, D. and Harry, W.T. (1968) Anorthosite xenoliths and plagioclase megacrysts in Precambrian intrusions of South Greenland. *Grönlands Geologiske Undersøgelse Bulletin*, 77 (also *Meddelelser om Grønland*, 185, 2), 243 pp.
- Brindley, S. and Spinner, E. (1987) Spores from Lower Carboniferous deposits at Burntisland, Fife, Scotland. *Pollen et Spores*, 28, 435–50.
- Brindley, S. and Spinner, E. (1989) Palynological assemblages from Lower Carboniferous deposits, Burntisland district, Fife, Scotland. *Proceedings of the Yorkshire Geological Society*, 47, 215–31.

- Brookfield, M.E. (1978) Revision of the stratigraphy of Permian and supposed Permian rocks of southern Scotland. *Geologische Rundschau*, 67, 110–49.
- Brookfield, M.E. (1980) Permian intermontane basin sedimentation in southern Scotland. *Sedimentary Geology*, 27, 167–94.
- Brookfield, M.E. (1981) Field guide to the Permian rocks of the Thornhill and Moffat basins. *Transactions of the Dumfries and Galloway Natural History and Antiquarian Society*, 56, 1–9.
- Brooks, C.K. and Jakobsson, S.P. (1974) Petrochemistry of the volcanic rocks of the North Atlantic ridge system. In *Geodynamics of Iceland and the North Atlantic Area* (ed. L. Kristjansson), *NATO Advanced Study Institutes Series, Series C: Mathematical and Physical Sciences*, No. 11, Reidel, Dordrecht, pp. 139–54.
- Brown, J.F. (1975) Potassium-argon evidence of a Permian age for the camptonite dykes: Orkney. *Scottish Journal of Geology*, 11, 259–62.
- Browne, M.A.E. and Thirlwall, M.P. (1981) An occurrence of Lower Carboniferous lavas at Monksgrave (Powmill) near Dollar. *Scottish Journal of Geology*, 17, 275–9.
- Browne, M.A.E. and Woodhall, D.G. (1999) *Geology of the Kirkcaldy District - a brief explanation of the Geological Map*, Sheet Explanation of the British Geological Survey, 1:50 000 Sheet 40E (Scotland), British Geological Survey, Keyworth, 30 pp.
- Browne, M.A.E. and Woodhall, D.G. (2000) *Geology of the Kirkcaldy District*, Sheet Description of the British Geological Survey, 1:50 000 Series Sheet 40E (Scotland), British Geological Survey, Keyworth, 50 pp.
- Browne, M.A.E., Dean, M.T., Hall, I.H.S., McAdam, A.D., Monro, S.K. and Chisholm, J.I. (1996) A lithostratigraphical framework for the Carboniferous rocks of the Midland Valley of Scotland. *British Geological Survey, Onshore Geology Series, Technical Report, WA/96/29*.
- Burgess, I.C. (1982) The stratigraphical distribution of Westphalian volcanic rocks in the area east and south of Nottingham, England. *Proceedings of the Yorkshire Geological Society*, 44, 29–44.
- Burgess, P.M. and Gayer, R.A. (2000) Late Carboniferous tectonic subsidence in South Wales: implications for Variscan basin evolution and tectonic history in SW Britain. *Journal of the Geological Society, London*, 157, 93–104.
- Cadell, H.M. (1925) *The Rocks of West Lothian: an Account of the Geological and Mining History of the West Lothian District*, Oliver and Boyd, Edinburgh, 390 pp.
- Cameron, I.B. and Stephenson, D. (1985) *British Regional Geology: The Midland Valley of Scotland*, 3rd edn, HMSO, London, 172 pp.
- Cameron, I.B., Aitken, A.M., Browne, M.A.E. and Stephenson, D. (1998) *Geology of the Falkirk District*, Memoir of the British Geological Survey, Sheet 31E (Scotland), The Stationery Office, London, for the British Geological Survey, 106 pp.
- Campbell, R. (1914) On the occurrence of petrified plant remains in the Lion's Head Vent, Arthur's Seat. *Transactions of the Edinburgh Geological Society*, 13, 148–73.
- Campbell, R. and Lunn, J.W. (1925) Chlorophaeite in the dolerites (tholeiites) of Dalmahoy and Kaimes Hill, Edinburgh. *Mineralogical Magazine*, 20, 435–40.
- Campbell, R. and Lunn, J.W. (1927) The tholeiites and dolerites of the Dalmahoy Syncline. *Transactions of the Royal Society of Edinburgh*, 15, 489–505.

- Campbell, R. and Stenhouse, A.G. (1908) The geology of Inchcolm. *Transactions of the Edinburgh Geological Society*, 9, 121–34.
- Campbell, R. and Stenhouse, A.G. (1933) The occurrence of nepheline and fayalite in the phonolitic trachyte of the Bass Rock. *Transactions of the Edinburgh Geological Society*, 13, 126–32.
- Campbell, R., Day, T.C. and Stenhouse, A.G. (1932) The Braefoot Outer Sill, Fife: Part I. *Transactions of the Edinburgh Geological Society*, 12, 342–75.
- Campbell, R., Day, T.C. and Stenhouse, A.G. (1934) The Braefoot Outer Sill, Fife: Part II. *Transactions of the Edinburgh Geological Society*, 13, 148–73.
- Capewell, J.G. (1954) The basic intrusions and an associated vent near Little Mell Fell, Cumberland. *Transactions of the Leeds Geological Association*, 6, 243–8.
- Capewell, J.G. (1955) The post-Silurian, pre-marine Carboniferous sedimentary rocks of the eastern side of the English Lake District. *Quarterly Journal of the Geological Society of London*, 111, 23–46.
- Carr, M.K. (1976) The petrography and stratigraphy of the Old Red Sandstone and volcanic rocks of southern Kintyre, Scotland. Unpublished BSc thesis, University of Lancaster.
- Carruthers, R.G., Dinham, C.H., Burnett, G.A. and Maden, J. (1927) *The Geology of Belford, Holy Island, and the Fame Islands*, 2nd edn, Memoir of the Geological Survey of Great Britain, Sheet 4 (England and Wales), HMSO, London, 195 pp.
- Carruthers, R.G., Burnett, G.A. and Anderson, W (1930) *The Geology of the Alnwick District*, Memoir of the Geological Survey of Great Britain, Sheet 6 (England and Wales), HMSO, London, 138 pp.
- Cas, R.A.F. and Wright, J.V. (1987) *Volcanic Successions: Modern and Ancient: a Geological Approach to Processes, Products and Successions*, Allen and Unwin, London, 528 pp.
- Cave, R., Cornwell, J.D. and Evans, A.D. (1989) The Mathry Dyke, a quartz-dolerite intrusion of probable Carboniferous age in southwest Wales. *Geological Magazine*, 126, 715–21.
- Chadwick, R.A. and Holliday, D.W. (1991) Deep crustal structure and Carboniferous basin development within the Iapetus convergence zone, northern England. *Journal of the Geological Society, London*, 148, 41–53.
- Chadwick, R.A., Holliday, D.W., Holloway, S. and Hulbert, A.G. (1995) *The Structure and Evolution of the Northumberland–Solway Basin and Adjacent Areas*, Subsurface Memoir of the British Geological Survey, HMSO, London, 90 pp.
- Chapman, N.A. (1974) Ultrabasic inclusions from the Coalyard Hill Vent, Fife. *Scottish Journal of Geology*, 10, 223–7.
- Chapman, N.A. (1975) An experimental study of spinel-clinopyroxenite xenoliths from the Duncansby Ness Vent, Caithness, Scotland. *Contributions to Mineralogy and Petrology*, 51, 223–30.
- Chapman, N.A. (1976) Inclusions and megacrysts from undersaturated tuffs and basanites, East Fife, Scotland. *Journal of Petrology*, 16, 29–35.
- Chapman, N.A. and Powell, R. (1976) Origin of anorthoclase megacrysts in alkali basalts. *Contributions to Mineralogy and Petrology*, 58, 29–35.
- Cheshire, S.G. and Bell, J.D. (1977) The Speedwell vent, Castleton, Derbyshire; a Carboniferous littoral cone. *Proceedings of the Yorkshire Geological Society*, 41, 173–84.

- Chough, S.K. and Sohn, Y.K. (1990) Depositional mechanics and sequences of base-surges, Songaksan tuff ring, Cheju Island, Korea. *Sedimentology*, 37, 1115–35.
- Claoue-Long, J.C., Compston, W, Roberts, J. and Fanning, C.M. (1995) Two Carboniferous ages: a comparison of Shrimp zircon dating with conventional zircon ages and  $^{40}\text{Ar}/^{39}\text{Ar}$  analysis. In *Geochronology, Time Scales and Global Stratigraphic Correlation* (ed. W.A. Berggren), *Society of Economic Palaeontologists and Mineralogists Special Publication*, No. 54, Society of Economic Palaeontologists and Mineralogists (SEPM), Tulsa, pp. 3–21.
- Clark, R.H. (1956) A petrological study of the Arthur's Seat volcano. *Philosophical Transactions of the Royal Society of Edinburgh*, 63, 37–70.
- Cleal, C.J. and Thomas, B.A. (1995) *Palaeozoic Palaeobotany of Great Britain*, Geological Conservation Review Series, No. 9, Chapman and Hall, London, 295 pp.
- Cleal, C.J. and Thomas, B.A. (1996) *British Upper Carboniferous Stratigraphy*, Geological Conservation Review Series, No. 11, Chapman and Hall, London, 339 pp.
- Clough, C.T. (1876) The section at the High Force, Teesdale. *Quarterly Journal of the Geological Society of London*, 32, 466–71.
- Clough, C.T. (1880) The Whin Sill of Teesdale as an assimilator of the surrounding beds. *Geological Magazine*, 7, 433–47.
- Clough, C.T., Barrow, G., Crampton, C.B., Maufe, H.B., Bailey, E.B. and Anderson, E.M. (1910) *The Geology of East Lothian, including parts of the counties of Edinburgh and Berwick*, 2nd edn, Memoir of the Geological Survey of Great Britain, Sheet 33 and parts of 34 and 41 (Scotland), HMSO, Edinburgh, 226 pp.
- Clough, C.T., Hinxman, L.W, Wilson, J.S.G., Crampton, C.B., Wright, W.B., Bailey, E.B., Anderson, E.M. and Carruthers, R.G. (1911) *The Geology of the Glasgow District*, Memoir of the Geological Survey of Great Britain, parts of sheets 30, 31, 22 and 23 (Scotland), HMSO, Edinburgh, 270 pp.
- Clough, C.T., Hinxman, L.W., Wilson, J.S.G., Crampton, C.B., Wright, W.B., Bailey, E.B., Anderson, E.M. and Carruthers, R.G. (1925) *The Geology of the Glasgow District*, 2nd edn, Memoir of the Geological Survey of Great Britain, parts of sheets 30, 31, 22 and 23 (Scotland), HMSO, Edinburgh, 299 pp.
- Colvine, R.J.L. (1968) Pyrope from Elie, Fife. *Scottish Journal of Geology*, 4, 283–6.
- Coombs, D.S. and Wilkinson, J.F.G. (1969) Lineages and fractionation trends in under-saturated volcanic rocks from the East Otago Volcanic Province (New Zealand) and related rocks. *Journal of Petrology*, 10, 440–501.
- Cooper, A.H., Millward, D., Johnson, E.W. and Soper, N.J. (1993) The early Palaeozoic evolution of northwest England. *Geological Magazine*, 130, 711–24.
- Cooper, D.C., Lee, M.K., Fortey, N.J., Cooper, A.H., Rundle, C.C., Webb, B.C. and Allen, P.M. (1988) The Crummock Water aureole: a zone of metasomatism and source of ore metals in the English Lake District. *Journal of the Geological Society, London*, 145, 523–40.
- Cope, F.W. (1933) The Lower Carboniferous succession in the Wye Valley region of North Derbyshire. *Journal of the Manchester Geological Association*, 1, 125–45.
- Cope, F.W. (1937) Some features in the D<sub>1</sub>-D<sub>2</sub> limestones of the Miller's Dale region, Derbyshire. *Proceedings of the Yorkshire Geological Society*, 23, 178–95.
- Corfield, S.M., Gawthorpe, R.L., Gage, M., Fraser, A.L. and Besty, S.M. (1996) Inversion tectonics of the Variscan foreland of the British Isles. *Journal of the Geological Society, London*, 153, 17–32.

- Cornwell, J.D. and Evans, A.D. (1986) Magnetic surveys and structures in the Whin Sill, northern England. In *Geology in the Real World: the Kingsley Dunham Volume* (eds R.W. Nesbitt and I. Nichol), The Institution of Mining and Metallurgy, London, pp. 65–74.
- Cossey, P., Adams, A.E., Wright, V.P., Whiteley, M.J., Whyte, M. and Purnell, M. (in press) *British Lower Carboniferous Stratigraphy*, Geological Conservation Review Series, Joint Nature Conservation Committee, Peterborough.
- Cotton, W.R. (1968) A geological survey of the Campsie and Kirkpatrick Hills. Unpublished PhD thesis, University of Glasgow.
- Coward, M.P. (1990) The Precambrian, Caledonian and Variscan framework to NW Europe. In *Tectonic Events Responsible for Britain's Oil and Gas Reserves* (eds R.F.P. Hardman and J. Brooks), *Geological Society Special Publication*, No. 55, The Geological Society; London, pp. 1–34.
- Coward, M.P. (1993) The effect of Late Caledonian and Variscan continental escape tectonics on basement structure, Palaeozoic basin kinematics and subsequent Mesozoic basin development in NW Europe. In *Petroleum Geology of Northwest Europe, Proceedings of the 4th Conference held at the Barbican Centre, London, 29 March-1 April, 1992* (ed. J.R. Parker), The Geological Society London, pp. 1095–108.
- Coward, M.P. (1995) Structural and tectonic setting of the Permo-Triassic basins of northwest Europe. In *Permian and Triassic Rifting in Northwest Europe* (ed. S.A.R. Boldy), *Geological Society Special Publication*, No. 91, The Geological Society; London, pp. 7–39.
- Coward, M.P. and Gibbs, A.D. (1988) *Structural Interpretation with Emphasis on Extensional Tectonics, Joint Association for Petroleum Exploration Courses (UK) Course Notes*, No. 75, The Geological Society London.
- Cox, A.H. (1954) The Usk monchiquite — a 'pipe intrusion'. *Geological Magazine*, 91, 519.
- Craig, G.Y. (1991) *Geology of Scotland*, 3rd edn, The Geological Society London, 612 pp.
- Craig, P.M. (1980) The volcanic geology of the Campsie Fells area, Stirlingshire. Unpublished PhD thesis, University of Lancaster.
- Craig, P.M. and Hall, I.H.S. (1975) The Lower Carboniferous rocks of the Campsie-Kilpatrick area. *Scottish Journal of Geology*, 11, 171–4.
- Creaney, S. (1980) Petrographic texture and vitrinite reflectance variation on the Alston Block, north-east England. *Proceedings of the Yorkshire Geological Society*, 42, 553–80.
- Creer, K.M., Irving, E. and Nairn, A.E.M. (1959) Palaeomagnetism of the Great Whin Sill. *Geophysical Journal of the Royal Astronomical Society*, 2, 306–23.
- Crump, L.A. and Donnelly, R. (1994) Opencast coal mining: a unique opportunity for Clee Hill Quarry. In *Mineral Resource Evaluation H: Methods and Case Histories* (eds M.K.G. Whateley and P.K. Harvey), *Geological Society Special Publication*, No. 79, The Geological Society, London, pp. 219–32.
- Cumming, G.A. (1928) The lower limestones and associated volcanic rocks of a section of the Fifeshire coast. *Transactions of the Edinburgh Geological Society*, 12, 124–40.
- Cumming, G.A. (1936) The structural and volcanic geology of the Elie–St Monance district, Fife. *Transactions of the Edinburgh Geological Society*, 13, 340–65.
- Cunningham, R.J.H. (1838) On the geology of the Lothians. *Memoir of the Wernerian Natural History Society*, 7, 3–160.

- Cunningham Craig, E.H., Wright, W.B. and Bailey, E.B. (1911) *The Geology of Colonsay and Oronsay with Part of the Ross of Mull*, Memoir of the Geological Survey of Great Britain, Sheet 35 and part of 27 (Scotland), HMSO, Edinburgh, 109 pp.
- Curtis, C.D. (1976) 'Unmixed'  $\text{Ca}^{2+}/\text{Mg}^{2+}$  saponite at Calton Hill, Derbyshire. *Clay Minerals*, 11, 85–9.
- Dakyns, J.R., Tiddeman, R.H. and Goodchild, J.G. (1897) *The Geology of the Country between Appleby, Ullswater and Haweswater*, Memoir of the Geological Survey of Great Britain, Sheet 30 (England and Wales), HMSO, London, 102 pp.
- Dalrymple, G.B. (1979) Critical tables for conversion of K-Ar ages from old to new constants. *Geology*, 7, 558–60.
- Davidson, K.A.S., Sola, M., Powell, D.W. and Hall, J. (1984) Geophysical model for the Midland Valley of Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 75, 175–81.
- Davies, A. (1974) The Lower Carboniferous (Dinantian) sequence at Spilmersford, East Lothian, Scotland. *Bulletin of the Geological Survey of Great Britain*, 45, 1–38.
- Davies, A., McAdam, A.D. and Cameron, I.B. (1986) *Geology of the Dunbar District*, Memoir of the British Geological Survey, Sheet 33E and part of 41 (Scotland), HMSO, London, 69 pp.
- Davison, C. (1924) *A History of British Earthquakes*, Cambridge University Press, Cambridge, 416 pp.
- Day, J.B.W. (1970) *Geology of the Country around Bewcastle*, Memoir of the Geological Survey of Great Britain, Sheet 12 (England and Wales), HMSO, London, 357 pp.
- Day, T.C. (1912) Some observations on the Long Row and the Dasses, Arthur's Seat. *Transactions of the Edinburgh Geological Society*, 10, 40–8.
- Day, T.C. (1914) Notes on the Hummell Rocks, Gullane. *Transactions of the Edinburgh Geological Society*, 10, 114–19.
- Day, T.C. (1923) Note on the exposure of St Leonard's Craig, at No. 39 St Leonard's Hill. *Transactions of the Edinburgh Geological Society*, 11, 266–7.
- Day, T.C. (1925) Two unrecorded volcanic vents on the shore east of North Berwick. *Transactions of the Edinburgh Geological Society*, 11, 338–45.
- Day, T.C. (1928a) The volcanic vents on the shore between North Berwick and Tantallon Castle. *Transactions of the Edinburgh Geological Society*, 12, 41–52.
- Day, T.C. (1928b) Chemical analyses of quartz-dolerites and segregation veins at Hound Point, North Queensferry and Inverkeithing. *Transactions of the Edinburgh Geological Society*, 12, 80–6.
- Day, T.C. (1930a) Chemical analyses of white trap from Dalmeny, Granton, Weak Law, and North Berwick. *Transactions of the Edinburgh Geological Society*, 12, 189–94.
- Day, T.C. (1930b) Volcanic vents on the coast, from Tantallon Castle eastwards to Peffer Sands, and at Whitberry Point. *Transactions of the Edinburgh Geological Society*, 12, 213–33.
- Day, T.C. (1930c) Chemical analyses of phono-lites from Traprain Law, the Bass Rock and North Berwick Law. *Transactions of the Edinburgh Geological Society*, 12, 234–5.
- Day, T.C. (1930d) Two large xenoliths within the phonolite of Traprain Law. *Transactions of the Edinburgh Geological Society*, 12, 252–5.
- Day, T.C. (1930e) An igneous dyke in the quartz-banakite of Bangly Quarry near Haddington. *Transactions of the Edinburgh Geological Society*, 12, 256–9.



- Day, T.C. (1930f) The intrusive rocks of Frances Craig, and the teschenite of Ravensheugh. *Transactions of the Edinburgh Geological Society*, 12, 260–1.
- Day, T.C. (1932a) The teschenite of Point Garry, North Berwick. *Transactions of the Edinburgh Geological Society*, 12, 334–7.
- Day, T.C. (1932b) Large sandstone xenolith within the phonolite of Traprain Law. *Transactions of the Edinburgh Geological Society*, 12, 338–41.
- Day, T.C. (1932c) Volcanic vents at Longskelly Rocks, and Yellow Craig Plantation, west of North Berwick. *Transactions of the Edinburgh Geological Society*, 12, 376–81.
- Day, T.C. (1933) *Arthur's Seat, a Ruined Volcano*, Oliver and Boyd, Edinburgh, 75 pp.
- Day, T.C. and Bailey, E.B. (1928) Bombs of nepheline-basanite in the Partan Craig Vent, North Berwick. *Transactions of the Edinburgh Geological Society*, 12, 87–9.
- Dearnley, R. (1960) Petrology of the Carboniferous igneous rocks of the Bristol area. *Institute of Geological Sciences, Petrology Unit Internal Report*, No. 137.
- Dentith, M.C. (1988) Geophysical constraints on upper crustal structure in the Midland Valley of Scotland. Unpublished PhD thesis, University of Glasgow.
- Dentith, M.G. and Hall, J. (1989) MAVIS — an upper crustal seismic refraction experiment in the Midland Valley of Scotland. *Geophysical Journal International*, 99, 627–43.
- De Souza, H.A.F. (1974) Potassium-argon ages of Carboniferous igneous rocks from East Lothian and the south of Scotland. Unpublished MSc thesis, University of Leeds.
- De Souza, H.A.F. (1979) The geochronology of Scottish Carboniferous volcanism. Unpublished PhD thesis, University of Edinburgh.
- De Souza, H.A.F. (1982) Age data from Scotland and the Carboniferous time scale. In *Numerical Dating in Stratigraphy* (ed. G.S. Odin), John Wiley and sons Ltd, Chichester, pp. 455–65.
- Dewey, J.F. (1982) Plate tectonics and the evolution of the British Isles. *Journal of the Geological Society of London*, 139, 371–412.
- Dickson, J.A.D., Ford, T.D. and Swift, A. (1987) The stratigraphy of the Carboniferous rocks around Castletown, Isle of Man. *Proceedings of the Yorkshire Geological Society*, 46, 203–29.
- Dineley, D.L. and Metcalf, S.J. (1999) *Fossil Fishes of Great Britain*, Geological Conservation Review Series, No. 16, Joint Nature Conservation Committee, Peterborough, 675 pp.
- Dinham, C.H. (1927) The Stirling district. *Proceedings of the Geologists' Association*, 38, 470–92.
- Dinham, C.H. and Haldane, D. (1932) *The Economic Geology of the Stirling and Clack-mannan Coalfield*, Memoir of the Geological Survey of Great Britain (Scotland), HMSO, Edinburgh, 242 pp.
- Dixon, C.G. (1938) The geology of the Fintry, Gargunnoch and Touch hills. *Geological Magazine*, 75, 425–32.
- Dixon, E.E.L. (1917) The geology of the Titterstone Clee Hill Coalfield. *Transactions of the Royal Society of Edinburgh*, 51, 1064–71.
- Dixon, J.E., Fitton, J.G. and Frost, R.T.C. (1981) The tectonic significance of post-Carboniferous igneous activity in the North Sea Basin. In *Petroleum Geology of the Continental Shelf of North-west Europe: Proceedings of the Second*

*Conference on Petroleum Geology*, London, 4–6 March, 1980 (eds L.V. Ming and G.D. Hobson), Heyden and Son on behalf of the Institute of Petroleum, London, pp. 121–37.

Donaldson, C.H. (1978) Petrology of the uppermost upper mantle deduced from spinel-lherzolite and harzburgite nodules at Calton Hill, Derbyshire. *Contributions to Mineralogy and Petrology*, 65, 363–77.

Donaldson, C.H. (1984) Kinematics of pyrope megacryst reactions in ascending basaltic magma - relevance to high-pressure magmatic crystallisation at Elie Ness, East Fife. *Geological Magazine*, 121, 615–20.

Downes, H., Upton, B.G.J., Handisyde, E. and Thirlwall, M.F. (2001) Geochemistry of mafic and ultramafic xenoliths from Fidra (Southern Uplands, Scotland): implications for lithospheric processes in Permo-Carboniferous times. *Lithos*, 58, 105–24.

Dreyer, H.I. and MacDonald, J.G. (1967) Some new data on "Kylitic" sills and associated picrites in Ayrshire, Scotland. *Proceedings of the Royal Society of Edinburgh*, B70, 31–48.

Dubey, V.S. and Holmes, A. (1929) Estimates of the ages of the Whin Sill and Cleveland Dyke by the helium method. *Nature*, 123, 794–5.

Du Bois, P.M. (1957) Comparison of palaeomagnetic results for selected rocks for Great Britain and North America. *Advances in Physics*, 6, 177–86.

Duckworth, S.P. (1977) Stratigraphy and petrography of the Carboniferous lava flows near Machrihanish, Kintyre. Unpublished BSc thesis, University of Lancaster.

Duff, P.McL.D. and Smith, A.J. (eds) (1992) *Geology of England and Wales*, The Geological Society, London, 671 pp.

Dunham, A.C. (1970) Whin sills and dykes. In *Geology of Durham County* (eds G.A.L. Johnson and G. Hickling), *Transactions of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne*, 41(1), Large and Sons Ltd, Newcastle-upon-Tyne, for the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne, pp. 92–100.

Dunham, A.C. and Kaye, M.T. (1965) The petrology of the Little Whin Sill, County Durham. *Proceedings of the Yorkshire Geological Society*, 35, 229–76.

Dunham, A.G. and Strasser-King, V.E.H. (1981) Petrology of the Great Whin Sill in the Throckley Borehole, Northumberland. *Report of the Institute of Geological Sciences*, 81/4.

Dunham, A.C. and Strasser-King, V.E.H. (1982) Late Carboniferous intrusions of northern Britain. In *Igneous Rocks of the British Isles* (ed. D.S. Sutherland), John Wiley and sons Ltd, Chichester, pp. 277–83.

Dunham, A.C. and Wilkinson, F. (1992) A note on the mineralogy of the chilled margin of the Little Whin Sill at Turn Wheel Linn, Weardale, Co. Durham. *Proceedings of the Yorkshire Geological Society*, 49, 67–70.

Dunham, A.C., Copley, P.A. and Strasser-King, V.E.H. (1972) Submicroscopic exsolution lamellae in pyroxenes in the Whin Sill, northern England. *Contributions to Mineralogy and Petrology*, 37, 211–20.

Dunham, K.C. (1932) Quartz-dolerite pebbles (Whin Sill) in the Upper Brockram. *Geological Magazine*, 69, 425–7.

Dunham, K.C. (1948) *Geology of the Northern Pennine Orefield, Volume 1: Tyne to Stainmore*, Memoir of the Geological Survey of Great Britain (England and Wales), HMSO, London, 357 pp.

Dunham, K.C. (1990) *Geology of the Northern Pennine Orefield, Volume 1: Tyne to Stainmore*, 2nd edn, Memoir of the British Geological Survey, sheets 19 and 25 and parts of 13, 24, 26, 31, 32 (England and Wales), HMSO, London, 299 pp.

- Dunham, K.C., Dunham, A.C., Hodge, B.L. and Johnson, G.A.L. (1965) Granite beneath Viséan sediments and mineralization at Rookhope, northern Pennines. *Quarterly Journal of the Geological Society of London*, 121, 383–417.
- Dunham, K.C., Fitch, F.J., Ineson, P.R., Miller, J.A. and Mitchell, J.G. (1968) The geochronological significance of Argon-40/Argon-39 age determinations on White Whin from the northern Pennine orefield. *Proceedings of the Royal Society of London*, A307, 251–66.
- Eastwood, T (1928) The Cockerthorpe Lavas, Cumberland — a Carboniferous volcanic episode. *Summary of Progress of the Geological Survey of Great Britain, for 1927, Part 2*, 15–22.
- Eastwood, T, Hollingworth, S.E., Rose, W.C.C. and Trotter, F.M. (1968) *Geology of the Country around Cockerthorpe and Caldbeck*, Memoir of the Geological Survey of Great Britain, Sheet 23 (England and Wales), HMSO, London, 298 pp.
- Eckford, R.J.A. and Ritchie, M. (1939) The igneous rocks of the Kelso District. *Transactions of the Edinburgh Geological Society*, 13, 464–72.
- Egglestone, W.M. (1910) The geology of the Little Whin Sill in Weardale. *Transactions of the Institution of Miners and Engineers*, 39, 18–51.
- El-Harathi, R.M. and Tarling, D.H. (1988) A magnetic study of the Holy Island dyke system, Northumberland. *Transactions of the Natural History Society of Northumbria*, 55, 12–19.
- Ellis, N.V. (ed.), Bowen, D.Q., Campbell, S., Knill, J.L., McKirdy, A.P., Prosser, C.D., Vincent, M.A. and Wilson, R.C.L. (1996) *An Introduction to the Geological Conservation Review*, Geological Conservation Review Series, No. 1, Joint Nature Conservation Committee, Peterborough, 131 pp.
- Elliott, R.B. (1960) The Carboniferous volcanic rocks of the Langholm district. *Proceedings of the Geologists' Association*, 71, 1–24.
- Emeleus, C.H. and Gyopari, M.C. (1992) *British Tertiary Volcanic Province*, Geological Conservation Review Series, No. 4, Chapman and Hall, London, 259 pp.
- Ernst, R. and Buchan, K.L. (1997) Giant radiating dyke swarms; their use in identifying pre-Mesozoic large igneous provinces and mantle plumes. In *Large Igneous Provinces; Continental, Oceanic and Planetary Flood Volcanism* (eds J.J. Mahoney and M.F. Coffin), *Geophysical Monograph Series*, No. 100, American Geophysical Union, Washington DC, pp. 297–333.
- Esang, C.B. and Piper, J.D.A. (1984) Palaeomagnetism of the Carboniferous E–W dyke swarm in Argyllshire. *Scottish Journal of Geology*, 20, 309–14.
- Eyles, V.A. and Blundell, C.R.K. (1957) On a volcanic vent and associated monchiquite intrusions in Monmouthshire. *Geological Magazine*, 94, 54–7.
- Eyles, V.A., Simpson, J.B. and MacGregor, A.G. (1929) The igneous geology of central Ayrshire. *Transactions of the Geological Society of Glasgow*, 18, 361–87.
- Eyles, V.A., Simpson, J.B. and MacGregor, A.G. (1949) *Geology of Central Ayrshire*, 2nd edn, Memoir of the Geological Survey of Great Britain, Sheet 14 (Scotland), HMSO, Edinburgh, 160 pp.
- Falconer, J.D. (1906) The igneous geology of the Bathgate and Linlithgow Hills. Part 2. Petrography. *Transactions of the Royal Society of Edinburgh*, 45, 133–50.
- Falconer, J.D. (1907) The geology of Ardrossan. *Transactions of the Royal Society of Edinburgh*, 45, 601–10.

- Faulkner, T.J. (1989a) Carbonate facies on a Lower Carboniferous storm-influenced ramp in South-West Britain. Unpublished PhD thesis, University of Bristol.
- Faulkner, T.J. (1989b) The early Carboniferous (Courseyan) Middle Hope volcanics of Weston-super-Mare: development and demise of an offshore volcanic high. *Proceedings of the Geologists' Association*, 100, 93–106.
- Fitch, F.J. and Miller, J.A. (1964) The age of the paroxysmal Variscan Orogeny in England. In *The Phanerozoic Time-Scale: a Symposium Dedicated to Professor Arthur Holmes* (eds W.B. Harland, A. Gilbert Smith and B. Wilcock), *Quarterly Journal of the Geological Society of London, Supplement*, 120S, The Geological Society of London, London, pp. 159–73.
- Fitch, F.J. and Miller, J.A. (1967) The age of the Whin Sill. *Liverpool and Manchester Geological Journal*, 5, 233–50.
- Fitch, F.J., Miller, J.A., Evans, A.L., Grasty, R.L. and Meneisy, M.Y. (1969) Isotopic age determinations on rocks from Wales and the Welsh Borders. In *The Precambrian and Lower Palaeozoic Rocks of Wales* (ed. A. Wood), University of Wales Press, Cardiff, pp. 23–45.
- Fitch, F.J., Miller, J.A. and Williams, S.C. (1970) Isotopic ages of British Carboniferous rocks. In *Compte Rendu: Sixième Congrès International de Stratigraphie et de Géologie du Carbonifère*, Sheffield, 11–16 September, 1967 (ed. C.J. Stubblefield), van Aelst, Maastricht, Volume 2, pp. 771–90.
- Flett, J.S. (1900) The trap dykes of the Orkneys. *Transactions of the Edinburgh Geological Society*, 39, 865–908.
- Flett, J.S. (1930) The teschenite of Easter Dalmeny. *Summary of Progress of the Geological Survey of Great Britain*, for 1929, Part 3, 59–74.
- Flett, J.S. (1931a) The Saline No. 1 teschenite. *Summary of Progress of the Geological Survey of Great Britain*, for 1930, Part 2, 44–50.
- Flett, J.S. (1931b) The Blackness teschenite. *Summary of Progress of the Geological Survey of Great Britain*, for 1930, Part 3, 39–45.
- Flett, J.S. (1932) The Stankards Sill. *Summary of Progress of the Geological Survey of Great Britain*, for 1931, Part 2, 141–55.
- Flett, J.S. (1934) A thomsonized inclusion from the Blackness Sill. *Summary of Progress of the Geological Survey of Great Britain*, for 1933, Part 2, 85–90.
- Floyd, J.D. (1994) The derivation and definition of the 'Southern Upland Fault': a review of the Midland Valley-Southern Uplands terrane boundary. *Scottish Journal of Geology*, 30, 51–62.
- Floyd, P.A., Exley, C.S. and Styles, M.T. (1993) *Igneous Rocks of South-west England*, Geological Conservation Review Series, No. 5, Chapman and Hall, London, 256 pp.
- Forster, S.C. and Warrington, G. (1985) Geochronology of the Carboniferous, Permian and Triassic. In *The Chronology of the Geological Record* (ed. N.J. Snelling), *Geological Society Memoir*, No. 10, Blackwell Scientific Publications, Oxford, for The Geological Society, pp. 99–113.
- Forsyth, I.H. and Chisholm, J.I. (1968) Geological Survey boreholes in the Carboniferous of East Fife. *Bulletin of the Geological Survey of Great Britain*, 28, 61–101.
- Forsyth, I.H. and Chisholm, J.I. (1977) *The Geology of East Fife*, Memoir of the Geological Survey of Great Britain, Sheet 41 and part of 49 (Scotland), HMSO, Edinburgh, 284 pp.

- Forsyth, I.H. and Rundle, C.C. (1978) The age of the volcanic and hypabyssal rocks of East Fife. *Bulletin of the Geological Survey of Great Britain*, 60, 23–9.
- Forsyth, I.H., Hall, I.H.S. and McMillan, A.A. (1996) *Geology of the Airdrie District*, Memoir of the British Geological Survey, Sheet 31 (Scotland), The Stationery Office, London, for the British Geological Survey, 94 pp.
- Fowler, A. and MacGregor, A.G. (1938) Kelso district Sheet 25. *Summary of Progress of the Geological Survey of Great Britain*, for 1937, 55–9.
- Francis, E.H. (1956) *The Economic Geology of the Stirling and Clackmannan Coalfield, Scotland: Area North of the River Forth*, Coalfield Papers of the Geological Survey of Great Britain, No. 1, HMSO, Edinburgh, 36 pp.
- Francis, E.H. (1957) New evidence of volcanicity in West Fife. *Transactions of the Edinburgh Geological Society*, 17, 71–80.
- Francis, E.H. (1959) A volcanic vent in the Bogside mines, Fife. *Geological Magazine*, 96, 457–69.
- Francis, E.H. (1960) Intrusive tuffs related to the Firth of Forth volcanoes. *Transactions of the Edinburgh Geological Society*, 18, 32–50.
- Francis, E.H. (1961a) *The Economic Geology of the Fife Coalfields, Area 2: Cowdenbeath and Central Fife including Fordell, Lochgelly, Cadham and Kirkcaldy*, 2nd edn, Memoir of the Geological Survey, Scotland, HMSO, Edinburgh, 152 pp.
- Francis, E.H. (1961b) Volcanism in relation to sedimentation in the Carboniferous rocks of the Saline district, Fife. *Bulletin of the Geological Survey of Great Britain*, 17, 116–44.
- Francis, E.H. (1961c) Thin beds of graded tuffs and tuffaceous siltstone in the Carboniferous of Fife. *Bulletin of the Geological Survey of Great Britain*, 17, 191–215.
- Francis, E.H. (1965) Carboniferous–Permian igneous rocks. In *Geology of Scotland*, 1st edn (ed. G.Y. Craig), Oliver and Boyd, Edinburgh, pp. 359–82.
- Francis, E.H. (1967) Review of Carboniferous–Permian Volcanicity in Scotland. *Geologische Rundschau*, 57, 219–46.
- Francis, E.H. (1968a) Pyroclastic and related rocks of the Geological Survey boreholes in East Fife. *Bulletin of the Geological Survey of Great Britain*, 28, 121–35.
- Francis, E.H. (1968b) Effect of sedimentation on volcanic processes, including neck-sill relationships in the British Carboniferous. In *International Geological Congress, Prague, 1968: Report of the 23rd Session, Section 2: Volcanism and Tectogenesis* (ed. M. Kuthan), Academia, Prague, Volume 2, pp. 163–74.
- Francis, E.H. (1969) Les tonstein du Royaume-Uni. *Annales de la Société Géologique du Nord*, 89, 209–14.
- Francis, E.H. (1970a) Review of Carboniferous volcanism in England and Wales. *Journal of Earth Sciences, Leeds Geological Association*, 8, 41–56.
- Francis, E.H. (1970b) Bedding in Scottish (Fifeshire) tuff-pipes and its relevance to maars and calderas. *Bulletin Volcanologique*, 34, 697–712.
- Francis, E.H. (1978a) Igneous activity in a fractured craton: Carboniferous volcanism in northern Britain. In *Crustal Evolution in Northwestern Britain and Adjacent Regions: Proceedings of an International Conference held in Glasgow University, 5–8 April, 1977* (eds D.R. Bowes and B.E. Leake), *Geological Journal Special Issue*, No. 10, Seel House Press, Liverpool, pp. 279–96.

- Francis, E.H. (1978b) The Midland Valley as a rift, seen in connection with the late Palaeozoic European Rift system. In *Tectonics and Geophysics of Continental Rifts* (eds I.B. Ramberg and E.-R. Neumann), *NATO Advanced Study Institutes Series, Series C: Mathematics and Physical Sciences*, No. 37, Reidel, Dordrecht, pp. 133–47.
- Francis, E.H. (1982) Magma and sediment — 1. Emplacement mechanism of late Carboniferous tholeiite sills in northern Britain. *Journal of the Geological Society of London*, 139, 1–20.
- Francis, E.H. (1983) Carboniferous–Permian igneous rocks. In *Geology of Scotland*, 2nd edn (ed. G.Y. Craig), Scottish Academic Press, Edinburgh, pp. 297–324.
- Francis, E.H. (1985) Recent ash-fall: a guide to tonstein distribution. In *Compte Rendu: Dixième Congrès International de Stratigraphie et de Géologie du Carbonifère*, Madrid, 12–17 September, 1983 (eds J.L. Escobedo *et al.*), Ministerio de Industria y Energía, Madrid, pp. 189–95.
- Francis, E.H. (1988) Mid-Devonian to early Permian volcanism: Old World. In *The Caledonian–Appalachian Orogen* (eds A.L. Harris and D.J. Fettes), *Geological Society Special Publication*, No. 38, Blackwell Scientific Publications, Oxford, for The Geological Society, pp. 573–84.
- Francis, E.H. (1991) Carboniferous-Permian igneous rocks. In *Geology of Scotland*, 3rd edn (ed. G.Y. Craig), The Geological Society, London, pp. 393–420.
- Francis, E.H. (1992) Upper Palaeozoic volcanism of the craton. In *Geology of England and Wales* (eds P.McL.D. Duff and A.J. Smith), The Geological Society London, pp. 502–5.
- Francis, E.H. and Ewing, C.J.C. (1961) Coal Measures and volcanism off the Fife coast. *Geological Magazine*, 98, 501–10.
- Francis, E.H. and Hoggood, A.M. (1970) Volcanism and the Ardross Fault, Fife, Scotland. *Scottish Journal of Geology*, 6, 162–85.
- Francis, E.H. and Walker, B.H. (1987) Emplacement of alkali-dolerite sills relative to extrusive volcanism and sedimentary basins in the Carboniferous of Fife, Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 77, 309–23.
- Francis, E.H., Sabine, P.A. and Young, B.R. (1961) Thin beds of graded kaolinized tuff and tuffaceous siltstone in the Carboniferous of Fife. *Bulletin of the Geological Survey of Great Britain*, 17, 191–214.
- Francis, E.H., Forsyth, I.H., Read, W.A. and Armstrong, M. (1970) *The Geology of the Stirling District*, Memoir of the Geological Survey of Great Britain, Sheet 39 (Scotland), HMSO, Edinburgh, 357 pp.
- Fraser, A.J. and Gawthorpe, R.L. (1990) Tectonostratigraphic development and hydrocarbon habitat of the Carboniferous in northern England. In *Tectonic Events Responsible for Britain's Oil and Gas Reserves* (eds R.F.P. Hardman and J. Brooks), *Geological Society Special Publication*, No. 55, The Geological Society, London, pp. 49–86.
- Frost, D.V. and Holliday, D.W. (1980) *Geology of the Country around Bellingham*, Memoir of the Geological Survey of Great Britain, Sheet 13 (England and Wales), HMSO, London, 112 pp.
- Fumes, H. and Sturt, B.A. (1976) Beach/shallow marine hyaloclastite deposits and their geological significance - an example from Gran Canaria. *Journal of Geology*, 84, 439–53.
- Fyfe, J.A., Long, D. and Evans, D. (1993) *United Kingdom Offshore Regional Report: Geology of the Malin-Hebrides Sea Areas*, HMSO, London, for the British Geological Survey, 91 pp.
- Gallagher, M.J. (1963) Lamprophyre dykes from Argyll. *Mineralogical Magazine*, 33, 415–30.

- Galtier, J., Scott, A.C., Powell, J.H., Glover, B.W. and Waters, C.N. (1992) Anatomically preserved conifer-like stems from the Upper Carboniferous of England. *Proceedings of the Royal Society of London*, B247, 211–14.
- Garwood, E.J. (1931) The Tuedian Beds of northern Cumberland and Roxburghshire, east of the Liddel Water. *Quarterly Journal of the Geological Society of London*, 87, 97–159.
- Gawthorpe, R.L., Gutteridge, P. and Leeder, M.R. (1989) Late Devonian and Dinantian basin evolution in northern England and North Wales. In *The Role of Tectonics in Devonian and Carboniferous Sedimentation in the British Isles* (eds R.S. Arthurton, P Gutteridge and S.C. Nolan), *Yorkshire Geological Society Occasional Publication*, No. 6, Yorkshire Geological Society, Leeds, pp. 1–24.
- Geikie, A. (1866) Traces of a group of Permian volcanoes in the south-west of Scotland. *Geological Magazine*, 3, 243–8.
- Geikie, A. (1880) On the Carboniferous volcanic rocks of the basin of the Firth of Forth — their structure in the field and under the microscope. *Transactions of the Royal Society of Edinburgh*, 29, 437–518.
- Geikie, A. (1897) *The Ancient Volcanoes of Great Britain*, 2 volumes, McMillan, London.
- Geikie, A. (1900) *The Geology of Central and Western Fife and Kinross*, Memoir of the Geological Survey of Great Britain, Sheet 40 (Scotland), HMSO, Edinburgh, 284 pp.
- Geikie, A. (1902) *The Geology of Eastern Fife*, Memoir of the Geological Survey of Great Britain, Sheet 41 and parts of 40, 48 and 49 (Scotland), HMSO, Edinburgh, 421 pp.
- Geikie, A. and Strahan, A. (1899) Volcanic group in the Carboniferous Limestone of North Somerset. *Summary of Progress of the Geological Survey of the United Kingdom*, for 1898, 104–11.
- Geikie, A., Geikie, J. and Peach, B.N. (1869) *Ayrshire: Southern District*, Sheet Explanation of the Geological Survey of Great Britain, Sheet 14 (Scotland), HMSO, Edinburgh, 27 pp.
- Geikie, J. (1893) *Fragments of Earth Lore*, Bartholomew and Co., Edinburgh, 428 pp.
- George, T.N. (1960) The stratigraphic evolution of the Midland Valley. *Transactions of the Geological Society of Glasgow*, 24, 32–107.
- George, TN., Johnson, G.A.L., Prentice, J.E., Sevastopulo, G.D., Mitchell, M., Ramsbottom, W.H.C. and Wilson, R.B. (1976) *A Correlation of Dinantian Rocks in the British Isles*, *Geological Society of London Special Report*, No. 7, Scottish Academic Press, Edinburgh, for The Geological Society of London, 87 pp.
- Gibbs, A. (1987) Development of extension and mixed-mode sedimentary basins. In *Continental Extensional Tectonics* (eds M.P. Coward, J.F. Dewey and P.L. Hancock), *Geological Society Special Publication*, No. 28, Blackwell Scientific Publications, Oxford, for The Geological Society, pp. 19–33.
- Giddings, J.W., Randall, B.A.O. and Farmer, N. (1971) The palaeomagnetism of the Holy Island Dyke. *Transactions of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne*, 17, 177–82.
- Gillespie, M.R. and Styles, M.T. (1999) BGS rock classification scheme, Volume 1: Classification of igneous rocks, 2nd edn. *British Geological Survey Research Report*, RR/99/6.
- Glover, B.W, Powell, J.H. and Waters, C.N. (1993) Etruria Formation (Westphalian C) palaeoenvironments and volcanicity on the southern margins of the Pennine Basin, south Staffordshire, England. *Journal of the Geological Society, London*, 150, 737–50.
- Godchaux, M.M., Bonnischsen, W and Jenks, M.D. (1992) Types of phreatomagmatic volcanoes in the western Snake River Plain, Idaho, USA. *Journal of Volcanology and Geothermal Research*, 52, 1–25.

- Goodchild, J.G. (1904) The geological history of Lower Tweedside. *Proceedings of the Geologists' Association*, 18, 105–42.
- Gordon, W.T. (1909) On the nature of occurrence of the plant-bearing rocks at Pettycur, Fife. *Transactions of the Edinburgh Geological Society*, 9, 353–60.
- Gordon, W.T. (1935) The genus *Pitys*, Witham, emend. *Transactions of the Royal Society of Edinburgh*, 58, 279–311.
- Goswami, G. (1968) A magnetic and chemical study of the titanium-bearing ore minerals of Carboniferous igneous rocks of the Midland Valley of Scotland. Unpublished PhD thesis, University of Glasgow
- Gouly, N.R., Pierce, C., Flatman, TD., Home, M. and Richardson, J.H. (2000) Magnetic survey of the Holy Island Dyke on Holy Island, Northumberland. *Proceedings of the Yorkshire Geological Society*, 53, 111–18.
- Gradstein, F.M. and Ogg, J.G. (1996) A Phanerozoic time scale. *Episodes*, 19, 3–5.
- Graham, A.M. and Upton, B.G.J. (1978) Gneisses in diatremes, Scottish Midland Valley: petrology and tectonic implications. *Journal of the Geological Society of London*, 135, 219–28.
- Green, A.H., Le Neve Foster, C. and Dakyns, J.R. (1887) *The Geology of the Carboniferous Limestone, Yoredale Rocks and Millstone Grit of North Derbyshire*, 2nd edn, Memoir of the Geological Survey of Great Britain, parts of sheets 88SE, 81NE, 81SE, 72NE, 82NW, 82SW and 71NW (England and Wales), HMSO, London, 212 pp.
- Green, J.F.N. (1918) The Mell Fell Conglomerate. *Proceedings of the Geologists' Association*, 29, 117–25.
- Greig, D.C. (1971) *British Regional Geology: The South of Scotland*, 3rd edn, HMSO, Edinburgh, 125 pp.
- Groessens, E. (1976) Preliminary range chart of conodont biozonation in the Belgian Dinan-tian. In *International Symposium on Belgian Micropalaeontological Limits from Emsian to Visean*, Namur, 1–10 September, 1974 (eds J. Bouckaert and M. Streeel), Publication No. 17, Ministry of Economic Affairs, Brussels.
- Guion, P.D., Gutteridge, P. and Davies, S.J. (2000) Carboniferous sedimentation and volcanism on the Laurussian margin. In *Geological History of Britain and Ireland* (eds N.H. Woodcock and R.A. Strachan), Blackwell Scientific Publications, Oxford, pp. 227–70.
- Gunn, W. (1900) *The Geology of Belford, Holy Island and the Fame Islands Northumberland*, Memoir of the Geological Survey of Great Britain, Sheet 110SE (England and Wales), HMSO, London, 155 pp.
- Hains, B.A. and Horton, A. (1969) *British Regional Geology: Central England*, 3rd edn, HMSO, London, 142 pp.
- Haldane, D. (1927) The Ochil Fault and its dolerite intrusion. *Summary of Progress of the Geological Survey of Great Britain*, for 1926, 147–53.
- Hall, I.H.S., Gallagher, M.J., Skilton, B.R.H. and Johnson, C.E. (1982) Investigation of polymetallic mineralisation in Lower Devonian volcanics near Alva, central Scotland. *Institute of Geological Sciences, Mineral Reconnaissance Programme Report*, No. 53.
- Hall, I.H.S., Browne, M.A.E. and Forsyth, I.H. (1998) *Geology of the Glasgow District*, Memoir of the British Geological Survey, Sheet 30E (Scotland), The Stationery Office, London, for the British Geological Survey, 117 pp.
- Hall, J. (1805) Experiments on whinstone and lava. *Transactions of the Royal Society of Edinburgh*, 5, 43–75.
- Hall, J. (1971) A preliminary seismic survey adjacent to the Rashiehill borehole near Slamannan, Stirlingshire. *Scottish Journal of Geology*, 7, 170–4.



- Hall, J. (1974) A seismic reflection survey of the Clyde Plateau Lavas in North Ayrshire and Renfrewshire. *Scottish Journal of Geology*, 9, 253–79.
- Halliday, A.N., Aftalion, M., Upton, B.G.J., Aspen, P. and Jocelyn, J. (1984) U-Pb isotopic ages from a granulite-facies xenolith from Partan Craig in the Midland Valley of Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 75, 71–4.
- Halliday, A.N., Dickin, A.P., Hunter, R.N., Davies, G.R., Dempster, T.J., Hamilton, P.J. and Upton, B.G.J. (1993) Formation and composition of the lower continental crust: evidence from Scottish xenolith suites. *Journal of Geophysical Research*, 98, 581–607.
- Halliday, A.N., McAlpine, A. and Mitchell, J.G. (1977) The age of the Hoy Lavas, Orkney. *Scottish Journal of Geology*, 13, 43–52.
- Hamad, S. el D. (1963) The chemistry and mineralogy of the olivine nodules of Calton Hill, Derbyshire. *Mineralogical Magazine*, 33, 483–97.
- Harcombe-Smee, B.J., Piper, J.D.A., Rolph, T.C. and Thomas, D.N. (1996) A palaeomagnetic and palaeointensity study of the Mauchline lavas, south-west Scotland. *Physics of the Earth and Planetary Interiors*, 94, 63–74.
- Harker, A. (1895) *Petrology for Students: an Introduction to the Study of Rocks under the Microscope*, Cambridge University Press, Cambridge, 306 pp.
- Harrison, R.K. (1968) Petrology of the Little and Great Whin sills in the Woodland Borehole, County Durham. *Bulletin of the Geological Survey of Great Britain*, 28, 38–54.
- Harrison, R.K. (1977) Petrology of the intrusive rocks in the Duffield Borehole, Derbyshire. *Bulletin of the Geological Survey of Great Britain*, 59, 41–59.
- Hartley, J. and Leedal, G.P. (1951) A monchiquite vent, Stob a'Ghrianain, Inverness-shire. *Geological Magazine*, 88, 140–4.
- Haslett, S.K. (1992) Petrology of a monchiquite from the Welsh Borderlands. *Mercian Geologist*, 13, 43–6.
- Haszeldine, R.S. (1984) Carboniferous North Atlantic palaeogeography: stratigraphic evidence for rifting, not megashear or subduction. *Geological Magazine*, 121, 443–63.
- Haszeldine, R.S. (1988) Crustal lineaments in the British Isles: their relationship to Carboniferous basins. In *Sedimentation in a Synorogenic Basin Complex: the Upper Carboniferous of Northwest Europe* (eds B.M. Besly and G. Kelling), Mackie and Son, Glasgow, pp. 53–68.
- Hatch, F.H. (1891) *An Introduction to the Study of Petrology: the Igneous Rocks*, Swan Sonnenschein, London, 128 pp.
- Hatch, F.H. (1892) The Lower Carboniferous Volcanic Rocks of East Lothian (Garleton Hills). *Transactions of the Royal Society of Edinburgh*, 37, 115–26.
- Hatch, F.H., Wells, A.K. and Wells, M.K. (1961) *Petrology of the Igneous Rocks*, 12th edn, Thomas Murby and Co., London, 515 pp.
- Hawkes, L. and Smythe, J.A. (1931) Garnet-bearing sands of the Northumberland coast. *Geological Magazine*, 68, 345–61.
- Henderson, C.M.B. and Gibb, F.G.F. (1983) Felsic mineral crystallization trends in differentiating alkaline basic magmas. *Contributions to Mineralogy and Petrology*, 84, 355–64.

- Henderson, C.M.B. and Gibb, F.G.F. (1987) The petrology of the Lugar Sill, SW Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 77, 325–47.
- Henderson, C.M.B., Foland, K.A. and Gibb, F.G.F. (1987) The age of the Lugar Sill and a discussion of the Late-Carboniferous/ Early Permian sill complex of SW Scotland. *Geological Magazine*, 22, 43–52.
- Henderson, J. (1880) On the structure and arrangement of the rocks of Arthur's Seat. *Transactions of the Edinburgh Geological Society*, 3, 222–44.
- Heslop, M.K. (1908) On some elementary forms of crystallization in the igneous dykes of Northumberland and Durham. *Proceedings of the University of Durham Philosophical Society*, 3, 37–46.
- Heslop, M.K. (1912) A preliminary note on the uniaxial augites of the north of England igneous dykes. *Proceedings of the University of Durham Philosophical Society*, 4, 172–4.
- Higazy, R.A. (1952) The distribution and significance of the trace elements in the Braefoot Outer Sill, Fife. *Transactions of the Edinburgh Geological Society*, 15, 150–86.
- Hill, J.A. and Dunham, K.C. (1968) The barites deposits of Closehouse, Lunedale, Yorkshire. *Proceedings of the Yorkshire Geological Society*, 36, 351–72.
- Hinton, R.W. and Upton, B.G.J. (1991) The chemistry of zircon; variations within and between large crystals from syenite and alkali basalt xenoliths. *Geochimica et Cosmochimica Acta*, 55, 3287–302.
- Hjelmqvist, S. (1939) Some post-Silurian dykes in Scania and problems suggested by them. *Sveriges Geologiske Undersökning Arsbok*, 33(10), 1–32.
- Holmes, A. and Harwood, H.F. (1928) The age and composition of the Whin Sill and the related dykes of the north of England. *Mineralogical Magazine*, 21, 493–542.
- Holmes, A. and Mockler, G.S. (1931) Late Carboniferous and Tertiary intrusions. *Proceedings of the Geologists' Association*, 42, 261–71.
- Holmes, A. and Smith, S. (1921) The Wackerfield Dyke, County Durham. *Geological Magazine*, 58, 440–54.
- House, M.R., Richardson, J.B., Chaloner, W.G., Allen, J.R.L., Holland, C.H. and Westoll, T.W. (1977) *A Correlation of Devonian Rocks in the British Isles*, Geological Society of London Special Report, No. 8, Scottish Academic Press, Edinburgh, 110 pp.
- Howard, M. (1999) The geochemistry of Late-Palaeozoic quartz tholeiite intrusions in northern Britain. Unpublished MRes thesis, University of Edinburgh.
- Howell, H.H. and Geikie, A. (1861) *The Geology of the Neighbourhood of Edinburgh (with Appendix and List of Fossils by J.W. Slater)*, Memoir of the Geological Survey of Great Britain, Sheet 32 and part of 31 (Scotland), HMSO, Edinburgh, 151 pp.
- Howell, H.H., Geikie, A. and Young, J. (1866) *The Geology of East Lothian including parts of the counties of Edinburgh and Berwick*, Memoir of the Geological Survey of Great Britain, sheets 33, 34 and part of 41 (Scotland), HMSO, Edinburgh, 77 pp.
- Howells, M.F. (1969) Cryptovents and allied structures in Carboniferous strata between Port Seton and Aberlady, East Lothian. *Scottish Journal of Geology*, 5, 1–10.
- Huddart, D. and Glasser, N.F. (2002) *Quaternary of Northern England*, Geological Conservation Review Series, No. 25, Joint Nature Conservation Committee, Peterborough, 745 pp.

- Hunter, R.H. and Upton, B.G.J. (1987) The British Isles — a Palaeozoic mantle sample. In *Mantle Xenoliths* (ed. P.H. Nixon), John Wiley and sons Ltd, Chichester, pp. 107–18.
- Hunter, R.H., Upton, B.G.J. and Aspen, P (1984) Meta-igneous granulite and ultramafic xenoliths from basalts of the Midland Valley of Scotland: petrology and mineralogy of the lower crust and upper mantle. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 75, 75–84.
- Hutchings, W.M. (1895) An interesting contact rock, with notes on contact-metamorphism. *Geological Magazine*, 2, 122–31, 163–9.
- Hutchings, W.M. (1898) The contact rocks of the Great Whin Sill. *Geological Magazine*, 5, 69–82, 123–31.
- Hutton, J. (1788) Theory of the Earth: or an investigation of the laws observable in the composition, dissolution, and restoration of the land upon the globe. *Transactions of the Royal Society of Edinburgh*, 1, 209–304.
- Hutton, W (1838) On the stratiform basalt associated with the Carboniferous formation in the north of England. *Transactions of the Natural History Society of Northumbria*, 2, 187–214.
- Ineson, P.R. (1968) The petrology and geochemistry of altered quartz-dolerite in the Close House Mine area. *Proceedings of the Yorkshire Geological Society*, 36, 373–84.
- Ineson, P.R. (1969) Trace-element aureoles in limestone wallrocks adjacent to lead-zinc-barite-fluorite mineralization in the northern Pennine and Derbyshire ore fields. *Transactions of the Institute of Mining and Metallurgy, London*, B78, 29–40.
- Ineson, P.R. and Walters, S.G. (1983) Dinantian extrusive activity in the south Pennines. *Mercian Geologist*, 9, 88–98.
- Ineson, P.R., Walters, S.G. and Simon, R.M. (1983) The petrography and geochemistry of the Waterswallows Sill, Buxton, Derbyshire. *Proceedings of the Yorkshire Geological Society*, 44, 341–54.
- Institute of Geological Sciences (1978) IGS Boreholes 1977. *Report of the Institute of Geological Sciences*, 78/21.
- Irving, E. (1977) Drift of the major continental blocks since the Devonian. *Nature*, 270, 304–9.
- Irving, J. (1924) The Carboniferous igneous intrusions of North-eastern Fifeshire. Unpublished PhD thesis, University of St Andrews.
- Irving, J. (1930) Four 'Felstone' intrusions in central Berwickshire. *Geological Magazine*, 67, 529–41.
- Jackson, D.I., Jackson, A.A., Wingfield, R.T.R., Evans, D., Barnes, R.P. and Arthurs, M.P. (1995) *United Kingdom Offshore Regional Report: The Geology of the Irish Sea*, HMSO, London, for the British Geological Survey, 123 pp.
- Jackson, D.I., Johnson, H. and Smith, N.J.P. (1997) Stratigraphical relationships and a revised lithostratigraphical nomenclature for the Carboniferous, Permian and Triassic rocks of the offshore East Irish Sea Basin. In *Petroleum Geology of the Irish Sea and Adjacent Areas* (eds N.S. Meadows, S.P. Trueblood, M. Hardman and G. Gowan), *Geological Society Special Publication*, No. 124, The Geological Society, London, pp. 11–32.
- Jameson, J. (1987) Carbonate sedimentation on a mid-basin high: the Petershill Formation, Midland Valley of Scotland. In *European Dinantian Environments* (eds J. Miller, A.E. Adams and V.P. Wright), *Geological Journal Special Issue*, No. 12, John Wiley and sons Ltd, Chichester, pp. 309–27.
- Jeffreys, D.H. (1979) Sedimentology of the Dinantian volcanoclastic and carbonate rocks of Middle Hope and Spring Cove, Weston-super-Mare. Unpublished MSc thesis, University of Reading.

- Johnson, G.A.L. (1959) The Carboniferous stratigraphy of the Roman Wall district in western Northumberland. *Proceedings of the Yorkshire Geological Society*, 32, 83–130.
- Johnson, G.A.L. (ed.) (1973) *The Durham Area*, 2nd edn, Geologists' Association Guide, No. 15, Benham and Co., Colchester, 32 pp.
- Johnson, G.A.L. (1997) *Geology of Hadrian's Wall*, Geologists' Association Guide, No 59, Geologists' Association, London, 89 pp.
- Johnson, G.A.L. and Dunham, K.C. (2001) Emplacement of the Great Whin Dolerite Complex and the Little Whin Sill in relation to the structure of northern England. *Proceedings of the Yorkshire Geological Society*, 53, 177–86.
- Johnson, G.A.L., Robinson, D. and Hornung, M. (1971) Unique bedrock and soils associated with the Teesdale flora. *Nature*, 232, 453.
- Johnstone, G.S. (1965) The volcanic rocks of the Misty Law–Knockside Hills district, Renfrewshire. *Bulletin of the Geological Survey of Great Britain*, 22, 53–64.
- Jones, J.G. and Nelson, P.H.H. (1970) The flow of basalt lava from air into water - its structural expression and stratigraphic significance. *Geological Magazine*, 107, 13–21.
- Jones, J.M. and Cooper, B.S. (1970) Coal. In *Geology of Durham County* (eds G.A.L. Johnson and G. Hickling), *Transactions of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne*, 41(1), Large and Sons Ltd, Newcastle-upon-Tyne, for the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne, pp. 43–65.
- Jones, J.M. and Creany, S. (1977) Optical character of thermally metamorphosed coals of northern England. *Journal of Microscopy*, 109, 105–18.
- Jones, J.M., Magraw, D., Robson, D.A. and Smith, F.W. (1980) Movements at the end of the Carboniferous Period. In *The Geology of North East England* (ed. D.A. Robson), *Natural History Society of Northumbria Special Publication*, No. 3, Natural History Society of Northumbria, Newcastle-upon-Tyne, pp. 79–85.
- Judd, J.W. (1875) On the structure and age of Arthur's Seat, Edinburgh. *Quarterly Journal of the Geological Society of London*, 31, 131–48.
- Jukes, J.B. (1859) *The South Staffordshire Coalfield*, 2nd edn, Memoir of the Geological Survey of Great Britain, sheets 54NW, 62, 72SW and 72SE (England and Wales), HMSO, London, 241 pp.
- Kelling, G. (1988) Silesian sedimentation and tectonics in the South Wales Basin: a brief review. In *Sedimentation in a Synorogenic Basin Complex: the Upper Carboniferous of Northwest Europe* (eds B.M. Besly and G. Kelling), Blackie and Son, Glasgow, pp. 38–42.
- Kennedy, W.Q. (1931) On composite lava flows. *Geological Magazine*, 68, 166–81.
- Kennedy, W.Q. (1933) Composite auto-intrusion in a Carboniferous lava flow. *Summary of Progress of the Geological Survey of Great Britain*, for 1932, 83–93.
- Kimbell, G.S., Chadwick, R.A., Holliday, D.W. and Werngren, O.C. (1989) The structure and evolution of the Northumberland Trough from new seismic reflection data and its bearing on modes of continental extension. *Journal of the Geological Society, London*, 146, 775–87.
- Kirton, S.R. (1981) Petrogenesis and tectonic relationships of Carboniferous lavas of the English Midlands. Unpublished PhD thesis, University of Lancaster.

- Kirton, S.R. (1984) Carboniferous volcanicity in England with special reference to the Westphalian and the east and west Midlands. *Journal of the Geological Society of London*, 141, 161–70.
- Klingspor, I. (1976) Radiometric age-determination of basalts, dolerites and related syenite in Slane, Southern Sweden. *Geologiska Foreningens i Stockholm Forhandlingar*, 98, 195–215.
- Knox, J. (1954) *The Economic Geology of the Fife Coalfields, Area 3: Markinch, Dysart and Leven*, Memoir of the Geological Survey, Scotland, HMSO, Edinburgh, 134 pp.
- Kokelaar, B.P. (1983) The mechanism of Surtseyan volcanism. *Journal of the Geological Society of London*, 140, 939–44.
- Kokelaar, B.P. (1986) Magma-water interactions in subaqueous and emergent basaltic volcanism. *Bulletin of Volcanology*, 48, 275–89.
- Land, D.H. and Cheeney, R.F. (2000) *Discovering Edinburgh's Volcano: a Geological Guide to Holyrood Park*, Edinburgh Geological Society, Edinburgh.
- Lapworth, C., Watts, W.W. and Harrison, W.J. (1898) Sketch of the geology of the Birmingham district. *Proceedings of the Geologists' Association*, 15, 313–89.
- Lawrence, D.J.D., Sanderson, R.W. and Waters, R.A. (1981) A Lower Carboniferous dyke from Castleton, Gwent, South Wales. *Proceedings of the Geologists' Association*, 92, 125–7.
- Lawson, J.D. and Weedon, D.S. (eds) (1992) *Geological Excursions around Glasgow and Girvan*, Geological Society of Glasgow, Glasgow, 495 pp.
- Le Maitre, R.W. (ed.) (2002) *Igneous Rocks: a Classification and Glossary of Terms; Recommendations of the International Union of Geological Sciences Subcommission on the Systematics of Igneous Rocks*, Cambridge University Press, Cambridge.
- Leake, R.C., Cameron, D.G., Bland, D.J., Styles, M.T. and Fortey, N.J. (1997) The potential for gold mineralisation in the British Permian and Triassic red beds and their contacts with underlying rocks. *Mineral Reconnaissance Programme Report, British Geological Survey*, No. 144.
- Lebour, G.A.L. (1886) *Outlines of the Geology of Northumberland and Durham*, 2nd edn, Lambert and Co., Newcastle-upon-Tyne, 219 pp.
- Lebour, G.A.L. and Fryer, M. (1877) On the Harkess Rocks near Bamburgh. *Transactions of the North of England Institute of Mining and Mechanical Engineers*, 26, 121–9.
- Lee, D.-C., Halliday, A.N., Hunter, R.H., Holden, P. and Upton, B.G.J. (1993) Rb-Sr and Sm-Nd isotopic variations in dissected crustal xenoliths. *Geochimica et Cosmochimica Acta*, 57, 219–30.
- Leedal, G.P. (1951) Faulted Permian dykes in the Highlands. *Geological Magazine*, 88, 60–4.
- Leeder, M.R. (1971) Initiation of the Northumberland Basin. *Geological Magazine*, 108, 511–16.
- Leeder, M.R. (1974) The origin of the Northumberland Basin. *Scottish Journal of Geology*, 10, 283–96.
- Leeder, M.R. (1982) Upper Palaeozoic basins of the British Isles — Caledonian inheritance versus Hercynian plate marginal processes. *Journal of the Geological Society of London*, 139, 479–91.
- Leeder, M.R. and McMahon, A.H. (1988) Upper Carboniferous (Silesian) basin subsidence in northern Britain. In *Sedimentation in a Synorogenic Basin Complex: the Upper Carboniferous of Northwest Europe* (eds B.M. Besly and G.

Kelling), Blackie and Son, Glasgow, pp. 43–52.

Leeder, M.R., Fairhead, D., Lee, A., Stuart, G., Clemmey, H., Al-Haddeh, B. and Green, C. (1989) Sedimentary and tectonic evolution of the Northumberland Basin. In *The Role of Tectonics in Devonian and Carboniferous Sedimentation in the British Isles* (eds R.S. Arthurton, P. Gutteridge and S.C. Nolan), *Yorkshire Geological Society Occasional Publication*, No. 6, Yorkshire Geological Society, Leeds, pp. 207–23.

Leitch, D. (1942) The Upper Carboniferous rocks of Arran. *Transactions of the Geological Society of Glasgow*, 20, 141–54.

Lewis, C.L.E. (2001) Arthur Holmes' vision of a geological timescale. In *The Age of the Earth: from 4004BC to AD2002* (eds C.L.E. Lewis and S.J. Knell), *Geological Society, London, Special Publication*, No. 190, The Geological Society, London, pp. 121–38.

Liss, D., Hutton, D.H.W. and Owen, W.H. (2001) Macroscopic and magnetic magma flow indicators from the Whin Sill, England (abstract). *Tectonic Studies Group Annual Meeting, University of Leeds, 3–6 January, 2001*.

Livingstone, A. and McKissock, G.M. (1974) The geochemistry of the igneous rocks in the Lower Carboniferous (Dinantian) sequence at Spilmersford, East Lothian, Scotland. *Bulletin of the Geological Survey of Great Britain*, 45, 47–61.

Long, A.M., Menzies, M.A., Thirlwall, M.F., Upton, B.G.J. and Aspen, P (1994) Carbonatite mantle interaction: a possible origin for megacryst/xenolithic suites in Scotland. In *Proceedings of the Fifth International Kimberlite Conference, Araxa, Brazil, 1991* (eds H.O.A. Meyer and O.H. Leonardis), Companhia de Pesquisa de Recursos Minerais, Rio de Janeiro, Volume 1, pp. 467–77.

Lorenz, V. (1973) On the formation of maars. *Bulletin Volcanologique*, 37, 183–204.

Lorenz, V. (1986) On the growth of maars and diatremes and its relevance to the formation of tuff rings. *Bulletin of Volcanology*, 48, 265–74.

Loveland, P.J. and Bendelow, V.C. (1984) Celadonite-aluminous-glaucophane: an example from the Lake District, UK. *Mineralogical Magazine*, 48, 113–17.

Lumsden, G.I. (1967) Intrusive coal at Douglas in Scotland. *Scottish Journal of Geology*, 3, 235–41.

Lumsden, G.I. and Wilson, R.B. (1961) The stratigraphy of the Archerbeck Borehole, Canonbie, Dumfriesshire. *Bulletin of the Geological Survey of Great Britain*, 18, 1–89.

Lumsden, G.I., Tulloch, W, Howells, M.F. and Davies, A. (1967) *The Geology of the Neighbourhood of Langholm*, Memoir of the Geological Survey of Great Britain, Sheet 11 (Scotland), HMSO, Edinburgh, 255 pp.

Lunn, J.W. (1928) The intrusion of Binny Craig, West Lothian. *Transactions of the Edinburgh Geological Society*, 12, 74–9.

McAdam, A.D. (1974) The petrography of the igneous rocks in the Lower Carboniferous (Dinantian) at Spilmersford, East Lothian, Scotland. *Bulletin of the Geological Survey of Great Britain*, 45, 39–46.

McAdam, A.D. and Clarkson, E.N.K. (eds) (1986) *Lothian Geology — an Excursion Guide*, 3rd edn, Scottish Academic Press, Edinburgh, 221 pp.

McAdam, A.D. and Tulloch, W. (1985) *Geology of the Haddington District*, Memoir of the British Geological Survey, Sheet 33W and part of 41 (Scotland), HMSO, London, 99 pp.

- McCallien, W.J. (1927) Preliminary account of the post-Dalradian geology of Kintyre. *Pans-actions of the Geological Society of Glasgow*, 18, 40–126.
- McCallien, W.J. and Anderson, R.B. (1930) The Carboniferous sediments of Kintyre. *Transactions of the Royal Society of Edinburgh*, 56, 599–619.
- MacCulloch, J. (1819) *A Description of the Western Isles of Scotland, including the Isle of Man: Comprising an Account of their Geological Structure; with Remarks on their Agriculture, Scenery and Antiquities*, Hurst, Robinson and Co., London.
- MacCulloch, J. (1840) *Geological Map of Scotland, 1:253 440*, G.F. Cruchley, London.
- MacDonald, J.G. (1965) The petrology of the Clyde Plateau Lavas of the Campsie and Kilpatrick hills. Unpublished PhD thesis, University of Glasgow.
- MacDonald, J.G. (1967) Variations within a Scottish Lower Carboniferous lava flow. *Scottish Journal of Geology*, 3, 34–45.
- MacDonald, J.G. (1973) Carbon-dioxide metasomatism in the Campsie lavas. *Mineralogical Magazine*, 39, 119–20.
- MacDonald, J.G. and Whyte, F. (1981) Petrochemical evidence for the genesis of a Lower Carboniferous transitional basaltic suite in the Midland Valley of Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 72, 75–88.
- Macdonald, R. (1975) Petrochemistry of the early Carboniferous (Dinantian) lavas of Scotland. *Scottish Journal of Geology*, 11, 269–314.
- Macdonald, R. (1980) Trace element evidence for mantle heterogeneity beneath the Scottish Midland Valley in the Carboniferous and Permian. *Philosophical Transactions of the Royal Society of London*, 280, 111–23.
- Macdonald, R. and Walker, B.H. (1985) Geochemistry and tectonic significance of the Lower Carboniferous Cockermouth lavas, Cumbria. *Proceedings of the Yorkshire Geological Society*, 45, 141–6.
- Macdonald, R., Thomas, J.E. and Rizzello, S.A. (1977) Variations in basalt chemistry with time in the Midland Valley province during the Carboniferous and Permian. *Scottish Journal of Geology*, 13, 11–22.
- Macdonald, R., Gottfried, D., Farrington, M.J., Brown, F.W. and Skinner, N.G. (1981) The geochemistry of a continental tholeiitic suite: late Palaeozoic quartz-dolerite dykes of Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 72, 57–74.
- Macdonald, R., Gass, K.N., Thorpe, R.S. and Gass, I.G. (1984) Geochemistry and petrogenesis of the Derbyshire Carboniferous basalts. *Journal of the Geological Society of London*, 141, 147–59.
- McGill, R.A.R., Hall, A.J., Braithwaite, C.J.R., Fallick, A.E. and Rolfe, W.D.I. (1990) Petrography and geochemistry of a Lower Carboniferous lacustrine hot-spring deposit, East Kirkton, Bathgate, Scotland. In *Proceedings of the 12th New Zealand Geothermal Workshop* (eds C.C. Harvey, P.R.L. Browne, D.H. Freestone and G.L. Scott), Auckland University Press, Auckland, pp. 203–8.
- McGill, R.A.R., Hall, A.J., Fallick, A.E. and Boyce, A.J. (1994) The palaeoenvironment of East Kirkton, West Lothian, Scotland: stable isotope evidence from silicates and sulphides. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 84, 223–37.
- MacGregor, A.G. (1928) The classification of Scottish Carboniferous olivine-basalts and mugearites. *Transactions of the Geological Society of Glasgow*, 18, 324–60.

- MacGregor, A.G. (1936) The composite sill of St Leonard's Craig and Heriot Mount, Edinburgh. *Transactions of the Edinburgh Geological Society*, 13, 317–31.
- MacGregor, A.G. (1937) The Carboniferous and Permian volcanoes of Scotland. *Bulletin Volcanologique, Serie 2*, 1, 41–58.
- MacGregor, A.G. (1948) Problems of Carboniferous-Permian volcanicity in Scotland. *Quarterly Journal of the Geological Society of London*, 108, 133–53.
- MacGregor, A.G. and Ennos, F.R. (1922) The Traprain Law phonolite. *Geological Magazine*, 59, 514–23.
- MacGregor, A.R. (1973) *Fife and Angus Geology: an Excursion Guide*, Scottish Academic Press, Edinburgh, 281 pp.
- MacGregor, A.R. (1996) *Fife and Angus Geology: an Excursion Guide*, 3rd edn, The Pentland Press, Edinburgh, 291 pp.
- Macgregor, M. and Haldane, D. (1933) *The Economic Geology of the Central Coalfield, Area 3: Bo'ness and Linlithgow*, Memoir of the Geological Survey, Scotland, HMSO, Edinburgh, 128 pp.
- Macgregor, M. and MacGregor, A.G. (1948) *British Regional Geology: The Midland Valley of Scotland*, 2nd edn, HMSO, Edinburgh, 95 pp.
- Macgregor, M., Lee, G.W. and Wilson, G.V. (1920) *The Iron Ores of Scotland*, Special Report on the Mineral Resources of Great Britain, Memoir of the Geological Survey of Great Britain, Vol. 11, HMSO, London, 236 pp.
- Macintyre, R.M., Cliff, R.A. and Chapman, N.A. (1981) Geochronological evidence for phased volcanic activity in Fife and Caithness necks, Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 72, 1–7.
- McKenzie, D.P. (1978) Some remarks on the development of sedimentary basins. *Earth and Planetary Science Letters*, 40, 25–32.
- McKerrow, W.S., MacNiocaill, C., Ahlberg, R.E., Clayton, G., Cleal, C.J. and Eagar, R.M.C. (2000) The late Palaeozoic relations between Gondwana and Laurussia. In *Orogenic Processes: Quantification and Modelling in the Variscan Belt* (eds W. Franke, V. Haak, O. Oncken and D. Tanner), *Geological Society, London, Special Publication*, No. 179, The Geological Society, London, pp. 9–20.
- Maclaren, C. (1834) On Arthur's Seat, the environs of Edinburgh and Calton Hill. *The Scotsman*, Five articles.
- Maclaren, C. (1839) *A Sketch of the Geology of Fife and the Lothians: including Detailed Descriptions of Arthur's Seat and Pentland Hills*, A. and C. Black, Edinburgh.
- Maclaren, C. (1866) *A Sketch of the Geology of Fife and the Lothians: including Detailed Descriptions of Arthur's Seat and Pentland Hills*, 2nd edn, A. and C. Black, Edinburgh.
- McLean, A.C. (1966) A gravity survey in Ayrshire and its geological interpretation. *Transactions of the Royal Society of Edinburgh*, 66, 239–65.
- McLean, A.G. (1978) Evolution of fault-controlled ensialic basins in northwestern Britain. In *Crustal Evolution in Northwestern Britain and Adjacent Regions: Proceedings of an International Conference held in Glasgow University*, 5–8 April, 1977 (eds D.R. Bowes and B.E. Leake), *Geological Journal Special Issue*, No. 10, Seel House Press, Liverpool, pp. 325–46.
- McLean, A.C. and Qureshi, I.R. (1966) Regional gravity anomalies in the western Midland Valley of Scotland. *Transactions of the Royal Society of Edinburgh*, 66, 267–83.



- McMillan, A.A. (2002) *Geology of the New Galloway and Thornhill District*, Memoir of the British Geological Survey, sheets 9W and 9E (Scotland), The Stationery Office, London, for the British Geological Survey, 126 pp.
- McMillan, A.A. and Brand, P.J. (1995) Depositional setting of Permian and Upper Carboniferous strata of the Thornhill Basin, Dumfriesshire. *Scottish Journal of Geology*, 31, 43–52.
- MacPherson, K.A.T. and Phillips, E.R. (1998) A welded pyroclastic deposit within the Dinantian Clyde Plateau Volcanic Formation, near Eaglesham, in the east Renfrewshire Hills of the Midland Valley. *Scottish Journal of Geology*, 34, 165–72.
- MacPherson, K.A.T., Smith, R.A. and Akhurst, M.C. (2001) *Geology of the Kilmarnock District — a brief explanation of the Geological Map*, Sheet Explanation of the British Geological Survey, 1:50 000 Series Sheet 22E (Scotland), British Geological Survey, Keyworth, 30 pp.
- McPhie, J., Doyle, M. and Allen, R. (1993) *Volcanic textures: a Guide to the Interpretation of Textures in Volcanic Rocks*, Centre for Ore Deposit and Exploration Studies, University of Tasmania, Tasmania, 198 pp.
- McRobert, R.W. (1914) Acid and intermediate intrusions and associated ash-necks in the neighbourhood of Melrose (Roxburghshire). *Quarterly Journal of the Geological Society of London*, 70, 303–14.
- McRobert, R.W. (1920) Igneous rocks of Teviot and Liddesdale. *Transactions of the Edinburgh Geological Society*, 11, 86–103.
- Marshall, C.E. (1942) Field relations of certain of the basic igneous rocks associated with the Carboniferous strata of the Midland counties. *Quarterly Journal of the Geological Society of London*, 98, 1–25.
- Marshall, C.E. (1946) The Barrow Hill intrusion, South Staffordshire. *Quarterly Journal of the Geological Society of London*, 101, 177–205.
- Martin, N.R. (1955) Lower Carboniferous volcanism near North Berwick. *Bulletin of the Geological Survey of Great Britain*, 7, 90–100.
- Matthews, S.C., Butler, M. and Sadler, P.M. (1973) Lower Carboniferous successions in north Somerset: report by directors of field meeting. *Proceedings of the Geologists' Association*, 84, 175–9.
- Max, M.D. (1976) The pre-Palaeozoic basement in southeastern Scotland and the Southern Uplands Fault. *Nature*, 264, 485–6.
- Maynard, J.R., Hofman, W., Dunay, R.E., Bentham, R.N., Dean, K.P. and Watson, I. (1997) The Carboniferous of western Europe: the development of a petroleum system. *Petroleum Geoscience*, 3, 97–115.
- Menning, M., Weyer, D., Drozdowski, G., van Amerom, H.W.J. and Wendt, I. (2000) A Carboniferous timescale 2000: discussion and use of geological parameters as time indicators from central and western Europe. *Geologisches Jahrbuch*, A156, 3–44.
- Menzies, M.A. and Halliday, A.N. (1988) Lithospheric mantle domains beneath the Archaean and Proterozoic crust of Scotland. In *Oceanic and Continental Lithosphere: Similarities and Differences* (eds M.A. Menzies and K.G. Cox), *Journal of Petrology Special Lithosphere Issue*, Oxford University Press, Oxford, pp. 275–302.
- Miller, G.D. (1986) The unveiling of a sill: Waterswallows 1900–1985. *The Amateur Geologist*, 12, 13–24.
- Miller, G.D. (1988) The Calton Hill S.S.S.I. - an update. *The Amateur Geologist*, 12, 31–9.
- Miller, H. (1887) *The Geology of the Country around Otterburn and Elsdon*, Memoir of the Geological Survey of Great Britain, Sheet 8 (England and Wales), HMSO, London, 147 pp.

- Miller, J.A. and Mussett, A.E. (1963) Dating basic rocks by the potassium-argon method: the Whin Sill. *Geophysical Journal of the Royal Astronomical Society*, 7, 547–53.
- Mills, D.A.C. and Hull, J.H. (1968) The Geological Survey borehole at Woodland, Co. Durham (1962). *Bulletin of the Geological Survey of Great Britain*, 28, 1–37.
- Millward, D., Carruthers, R.M., Marriner, G.F., Molyneux, S.G. and Beddoe-Stephens, B. (1999) The Eycott Volcanic Group. *British Geological Survey, Onshore Geology Series, Technical Report, WA/99/68*.
- Milne, D. (1837) A geological survey of Berwickshire. *Prize Essays and Transactions of the Highland and Agricultural Society of Scotland*, 11, 171–253.
- Mitchell, G.H. and Mykura, W (1962) *The Geology of the Neighbourhood of Edinburgh*, 3rd edn, Memoir of the Geological Survey of Great Britain, Sheet 32 (Scotland), HMSO, Edinburgh, 159 pp.
- Mitchell, M., Taylor, B.J. and Ramsbottom, W.H.C. (1978) Carboniferous. In *The Geology of the Lake District* (ed. F. Moseley), *Yorkshire Geological Society Occasional Publication*, No. 3, Yorkshire Geological Society, Leeds, pp. 168–77.
- Monckton, H.W. (1892) The geology of the country around Stirling. *Proceedings of the Geologists' Association*, 12, 242–53.
- Monckton, H.W. (1895) The Stirling dolerite. *Quarterly Journal of the Geological Society of London*, 51, 480–92.
- Monro, S.K. (1982) Sedimentation, stratigraphy and tectonics in the Dalry Basin, Ayrshire. Unpublished PhD thesis, University of Edinburgh.
- Monro, S.K. (1999) *Geology of the Irvine District*, Memoir of the British Geological Survey, Sheet 22 and part of 21 (Scotland), The Stationery Office, London, for the British Geological Survey, 140 pp.
- Monro, S.K., Loughnan, F.C. and Walker, M.C. (1983) The Ayrshire Bauxitic Clay — an allochthonous deposit? In *Residual Deposits: Surface Related Weathering Processes and Materials* (ed. R.C.L. Wilson), *Geological Society Special Publication*, No. 11, Blackwell Scientific Publications, Oxford, pp. 47–58.
- Moore, J.G., Phillips, R.L., Grigg, R.W., Peterson, D.W. and Swanson, D.A. (1973) Flow of lava into the sea, 1969–71, Kilauea Volcano, Hawaii. *Bulletin of the Geological Society of America*, 84, 537–46.
- Morgan, C.L. and Reynolds, S.H. (1904) The igneous rocks associated with the Carboniferous Limestone of the Bristol district. *Quarterly Journal of the Geological Society of London*, 60, 137–57.
- Morrison, M.A., Hendry, G.L. and Leat, P.T. (1987) Regional and tectonic implications of parallel Caledonian and Permo-Carboniferous lamprophyre dyke swarms from Lismore, Ardgour. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 77, 279–88.
- Moseley, F. (1966) The volcanic vents and pocket deposits of Derbyshire. *Mercian Geologist*, 1, 283–5.
- Murchison, D.G. and Raymond, A.C. (1989) Igneous activity and organic maturation in the Midland Valley of Scotland. *International Journal of Coal Geology*, 14, 47–82.
- Mykura, W (1965) White trap in some Ayrshire coals. *Scottish Journal of Geology*, 1, 176–84.
- Mykura, W (1967) The Upper Carboniferous rocks of south-west Ayrshire. *Bulletin of the Geological Survey of Great Britain*, 26, 23–98.
- Mykura, W (1976) *British Regional Geology: Orkney and Shetland*, HMSO, Edinburgh, 149 pp.

- Nairn, A.E.M. (1956) The Lower Carboniferous rocks between the Rivers Esk and Annan, Dumfriesshire. *Transactions of the Geological Society of Glasgow*, 22, 80–93.
- Nairn, A.E.M. (1958) Petrology of the Whita Sandstone, southern Scotland. *Journal of Sedimentary Petrology*, 28, 57–64.
- Neves, R. and Downie, C. (eds) (1967) *Geological Excursions in the Sheffield Region and the Peak District National Park*, University of Sheffield, Sheffield, 163 pp.
- Neves, R., Gueinn, K.J., Clayton, G., Ioannides, N.S., Neville, R.S.W. and Kruszewska, K. (1973) Palynological correlations within the Lower Carboniferous of Scotland and northern England. *Transactions of the Royal Society of Edinburgh*, 69, 23–70.
- Nicol, J. (1847) On the geology of Roxburghshire. *Transactions of the Highland and Agricultural Society of Scotland*, 10, 35–83. Nicol, J. (1852) On the geology of the southern portion of the peninsula of Cantyre, Argyllshire. *Quarterly Journal of the Geological Society of London*, 8, 406–25.
- Oertel, G. (1952) A structural investigation of the porphyritic basalts of Arthur's Seat, Edinburgh. *Transactions of the Edinburgh Geological Society*, 14, 360–78.
- Pallister, J.W. (1952) The Birrenswark Lavas, Dumfriesshire. *Transactions of the Edinburgh Geological Society*, 14, 336–48.
- Parnell, J. (1984) Hydrocarbon minerals in the Midland Valley of Scotland with particular reference to the Oil-shale Group. *Proceedings of the Geologists' Association*, 95, 275–85.
- Parrish, J.T. (1993) Climate of the supercontinent Pangaea. *Journal of Geology*, 101, 215–33.
- Paterson, I.B. and Hall, I.H.S. (1986) Lithostratigraphy of the late Devonian and Early Carboniferous rocks in the Midland Valley of Scotland. *Report of the British Geological Survey*, 18/3.
- Paterson, I.B., Hall, I.H.S. and Stephenson, D. (1990) *Geology of the Greenock District*, Memoir of the British Geological Survey, Sheet 30 and part of 29E (Scotland), HMSO, London, 69 pp.
- Paterson, I.B., McAdam, A.D. and MacPherson, K.A.T. (1998) *Geology of the Hamilton District*, Memoir of the British Geological Survey, Sheet 23W (Scotland), The Stationery Office, London, for the British Geological Survey, 94 pp.
- Patterson, E.M. (1945) The distribution of trace-elements in a Scottish Permo-Carboniferous teschenite and its lugaritic differentiate. *Geological Magazine*, 82, 230–4.
- Patterson, E.M. (1946) The teschenite-picrite sill of Saltcoats, Ayrshire. *Transactions of the Geological Society of Glasgow*, 21, 1–28.
- Peach, B.N. (1911) *Description of Arthur's Seat Volcano*, Memoir of the Geological Survey, Scotland, HMSO, Edinburgh, 26 pp.
- Peach, B.N. and Horne, J. (1903) The Canonbie Coalfield: its geological structure and relations to the Carboniferous rocks of the North of England and Central Scotland. *Transactions of the Royal Society of Edinburgh*, 40, 835–77.
- Peach, B.N., Clough, C.T., Hinxman, L.W., Wilson, J.S.G., Crampton, C.B., Maufe, H.B., Bailey, E.B. *et al.* (1910) *The Geology of the Neighbourhood of Edinburgh*, Memoir of the Geological Survey of Great Britain, Sheet 32 with part of 31 (Scotland), HMSO, Edinburgh, 445 pp.
- Pederson, T. and van der Beek, P. (1994) Extension and magmatism in the Oslo rift, southeast Norway: no sign of a mantle plume. *Earth and Planetary Science Letters*, 123, 342–3.

- Penn, I.E., Holliday, D.W., Kirby, G.A., Kubala, M., Sobey, R.A. *et al.* (1983) The Lame No. 2 borehole: discovery of a new Permian volcanic centre. *Scottish Journal of Geology*, 19, 333–46.
- Phillips, J. (1836) *Illustrations of the Geology of Yorkshire Part 2: The Mountain Limestone District*, John Murray, London.
- Phillips, W.J. (1968) The crystallisation of the teschenite from the Lugar Sill, Ayrshire. *Geological Magazine*, 105, 23–34.
- Pocock, R.W. (1931) The age of the Midland basalts. *Quarterly Journal of the Geological Society of London*, 87, 1–12.
- Praegel, N.-O. (1981) Origin of ultramafic inclusions and megacrysts in a monchiquite dyke at Streap, Inverness-shire, Scotland. *Lithos*, 14, 305–22.
- Price, N.R. and Duff, P.McL.D. (1969) Mineralogy and chemistry of tonsteins from Carboniferous sequences in Great Britain. *Sedimentology*, 13, 45–69.
- Pringle, J. and Bailey, E.B. (1944) The Carboniferous rocks of Glas Eilean, Sound of Islay, Argyllshire. *Transactions of the Geological Society of Glasgow*, 20, 249–59.
- Ramsay, J.G. (1955) A camptonitic dyke suite at Monar, Ross-shire and Inverness-shire. *Geological Magazine*, 92, 297–308.
- Ramsbottom, W.H.C. and Mitchell, M. (1980) The recognition and division of the Tournaisian Series in Britain. *Journal of the Geological Society of London*, 137, 61–3.
- Randall, B.A.O. (1959) Intrusive phenomena of the Whin Sill, east of the R. North 'Fyne. *Geological Magazine*, 96, 385–92.
- Randall, B.A.O. (1995a) Lower Carboniferous igneous rocks. In *Robson's Geology of North East England*, 2nd edn (ed. G.A.L. Johnson), *Transactions of the Natural History Society of Northumbria*, 56(5), Natural History Society of Northumbria, Newcastle-upon-Tyne, pp. 317–18.
- Randall, B.A.O. (1995b) The Great Whin Sill and its associated dyke suite. In *Robson's Geology of North East England*, 2nd edn (ed. G.A.L. Johnson), *Transactions of the Natural History Society of Northumbria*, 56(5), Natural History Society of Northumbria, Newcastle-upon-Tyne, pp. 319–27.
- Randall, B.A.O. and Farmer, N. (1970) The Holy Island Dyke. *Transactions of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne*, 17, 79–91.
- Raymond, A.C. and Murchison, D.G. (1988) Development of organic maturation in the thermal aureoles of sills and its relation to sediment compaction. *Fuel*, 67, 1599–608.
- Read, W.A. (1956) Channelling on the dip-slope of the Stirling Sill. *Transactions of the Edinburgh Geological Society*, 16, 299–306.
- Read, W.A. (1988) Controls on Silesian sedimentation in the Midland Valley of Scotland. In *Sedimentation in a Synorogenic Basin Complex: the Upper Carboniferous of Northwest Europe* (eds B.M. Besly and G. Kelling), Mackie and Son, Glasgow, pp. 222–41.
- Read, W.A. and Johnson, S.R.H. (1967) The sedimentology of sandstone formations within the Upper Old Red Sandstone and lowest Calciferous Sandstone Measures west of Stirling, Scotland. *Scottish Journal of Geology*, 3, 242–67.
- Read, W.A. and Wilson, R.B. (1959) *The Economic Geology of the Stirling and Clack-mannan Coalfield, Scotland: Area South of the River Forth*, Coalfield Papers of the Geological Survey of Great Britain, No. 2, HMSO, Edinburgh, 73 pp.

- Rex, G.M. and Scott, A.C. (1987) The sedimentology, palaeoecology and preservation of the Lower Carboniferous plant deposits at Pettycur, Fife, Scotland. *Geological Magazine*, 124, 43–66.
- Reynolds, S.H. (1908) The basic intrusion of Bartestree. *Quarterly Journal of the Geological Society of London*, 64, 501–11.
- Reynolds, S.H. (1917) Further work on the igneous rocks associated with the Carboniferous Limestone of the Bristol district. *Quarterly Journal of the Geological Society of London*, 72, 23–42.
- Rhind, W (1836) *Excursions Illustrative of the Geology and Natural History of the Environs of Edinburgh*, 2nd edn, J. Anderson, Edinburgh, 146 pp.
- Richey, J.E. (1939) The dykes of Scotland. *Transactions of the Edinburgh Geological Society*, 13, 395–435.
- Richey, J.E., Anderson, E.M. and MacGregor, A.G. (1930) *The Geology of North Ayrshire*, Memoir of the Geological Survey of Great Britain, Sheet 22 (Scotland), HMSO, Edinburgh, 417 pp.
- Ridd, M.F., Walker, D.B. and Jones, J.M. (1970) A deep borehole at Harton on the margin of the Northumbrian trough. *Proceedings of the Yorkshire Geological Society*, 38, 75–103.
- Rippon, J., Read, W.A. and Park, R.G. (1996) The Ochil Fault and the Kincardine basin: key structures in the tectonic evolution of the Midland Valley of Scotland. *Journal of the Geological Society, London*, 153, 573–87.
- Robertson, T. and Haldane, D. (1937) *The Economic Geology of the Central Coalfield, Area I: Kilsyth and Kirkintilloch*, Memoir of the Geological Survey, Scotland, HMSO, Edinburgh, 169 pp.
- Robinson, D. (1970) Metamorphic rocks. In *Geology of Durham County* (eds G.A.L. Johnson and G. Hickling), *Transactions of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne*, 41(1), Large and Sons Ltd, Newcastle-upon-Tyne, for the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne, pp. 119–123.
- Robinson, D. (1971) Whin Sill metamorphism in Teesdale. Unpublished PhD thesis, University of Durham.
- Robson, D.A. (1954) A preliminary account of the geological structure of north Northumberland and the Borders. *Proceedings of the University of Durham Philosophical Society*, 12, 1–9.
- Robson, D.A. (1977) The structural history of the Cheviot and adjacent regions. *Scottish Journal of Geology*, 13, 255–62.
- Rock, N.M.S. (1982) Petrography and age of agglomeratic vents near Toscaig, Applecross. *Proceedings of the Geologists' Association*, 93, 305–8.
- Rock, N.M.S. (1983) The Permo-Carboniferous camptonite-monchiquite dyke-suite of the Scottish Highlands and Islands: distribution, field and petrological aspects. *Report of the Institute of Geological Sciences*, 82/14.
- Rolfe, W.D.I., Durant, G.P., Baird, W.J., Chaplin, C., Paton, R.L. and Reekie, R.J. (1994) The East Kirkton Limestone, Viséan, of West Lothian, Scotland: introduction and stratigraphy. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 84, 177–88.
- Russell, D.G. (1984) Experimental and petrological studies of phenocryst assemblages in Scottish Permo-Carboniferous basaltic rocks. Unpublished PhD thesis, University of Edinburgh.
- Russell, M.J. (1976) A possible Lower Permian age for the onset of ocean floor spreading in the northern North Atlantic. *Scottish Journal of Geology*, 12, 315–23.

- Russell, M.J. and Smythe, D.K. (1978) Evidence for an Early Permian oceanic rift in the northern North Atlantic. In *Petrology and Geochemistry of Continental Rifts* (eds E.-R. Neumann and I.B. Ramberg), *NATO Advanced Study Institutes Series, Series C: Mathematical and Physical Sciences*, No. 36, Reidel, Dordrecht, pp. 173–9.
- Russell, M.J. and Smythe, D.K. (1983) Origin of the Oslo Graben in relation to the Hercynian-Alleghenian Orogeny and lithosphere rifting in the North Atlantic. In *Processes of Continental Rifting: Selected Papers from the Lunar and Planetary Institute Topical Conference on the Processes of Planetary Rifting held in St Helena, California, USA, 3–5 December, 1981* (eds P. Morgan and B.H. Barker), *Developments in Geotectonics*, No. 19, Elsevier, Oxford, Amsterdam, pp. 457–72.
- Rutledge, H. (1952) A petrological note on a composite sill, The Dasses, Arthur's Seat. *Transactions of the Edinburgh Geological Society*, 14, 379–88.
- Sabine, P.A. and Sutherland, D.S. (1982) Petrography of British igneous rocks. In *Igneous Rocks of the British Isles* (ed. D.S. Sutherland), John Wiley and sons Ltd, Chichester, pp. 479–544.
- Sargent, H.C. (1917) On a spilitic facies of Lower Carboniferous lava-flows in Derbyshire. *Quarterly Journal of the Geological Society of London*, 73, 11–25.
- Sarjeant, W.A.S. (1967) Fibrous chlorites in the volcanic rocks of Derbyshire. *Mercian Geologist*, 2, 85–95.
- Savage, R.J.G. (ed.) (1977) *Geological Excursions in the Bristol District*, University of Bristol, Bristol, 196 pp.
- Scott, A. (1915) The Crawfordjohn Essexite and associated rocks. *Geological Magazine, New Series*, 2, 455–61, 513–19.
- Scott, A.C. (1990) Preservation, evolution, and extinction of plants in Lower Carboniferous volcanic sequences in Scotland. In *Volcanism and Fossil Biotas* (eds M.G. Lockley and A. Rice), *Geological Society of America Special Paper*, No. 244, Geological Society of America, Boulder, pp. 25–38.
- Scott, A.C., Galtier, J. and Clayton, G. (1984) Distribution of anatomically preserved floras in the Lower Carboniferous in Western Europe. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 75, 311–40.
- Scott, A.C., Meyer-Berthaud, B., Galtier, J., Rex, G.M., Brindley, S.A. and Clayton, G. (1986) Studies on a new Lower Carboniferous flora from Kingswood, near Pettycur, Scotland. 1. Preliminary Report. *Review of Palaeobotany and Palynology*, 48, 161–80.
- Scrutton, C.T. (ed.) (1995) *Northumbrian Rocks and Landscape: a Field Guide*, Ellenbank Press, Maryport, for the Yorkshire Geological Society, 216 pp.
- Sedgewick, A. (1827) On the association of trap rocks with the Mountain Limestone formation in High Teesdale. *Transactions of the Cambridge Philosophical Society*, 2, 139–96.
- Shand, S.J. (1908) Note upon crystals of grossularite from Corsiehill Quarry. *Transactions and Proceedings of the Perthshire Society of Natural Science*, 4, 210–12.
- Shiells, K.A.G. (1961) The geology of part of the limestone group of North Northumberland. Unpublished PhD thesis, University of Newcastle-upon-Tyne.
- Shiells, K.A.G. (1964) The geological structure of north-east Northumberland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 65, 449–81.
- Sibley, T.F. (1905) The Carboniferous limestones of the Weston-super-Mare district (Somerset). *Quarterly Journal of the Geological Society of London*, 61, 548–63.

- Simpson, J.B. and Richey, J.E. (1936) *The Geology of the Sanquhar Coalfield and Adjacent Basin of Thornhill*, Memoir of the Geological Survey, Scotland, HMSO, Edinburgh, 47 pp.
- Skipsey, E. (1992) Upper Teesdale. *Proceedings of the Cumberland Geological Society*, 5, 473–75.
- Smedley, P.L. (1986a) Petrochemistry of Dinantian volcanism in northern Britain. Unpublished PhD thesis, University of Edinburgh.
- Smedley, P.L. (1986b) The relationship between calc-alkaline volcanism and within-plate continental rift volcanism: evidence from Scottish Palaeozoic lavas. *Earth and Planetary Science Letters*, 77, 113–28.
- Smedley, P.L. (1988a) Trace element and isotope variations in Scottish and Irish Dinantian volcanism: evidence for an OIB-like mantle source. *Journal of Petrology*, 29, 413–43.
- Smedley, P.L. (1988b) The geochemistry of Dinantian volcanism in south Kintyre and the evidence for provincialism in the southern Scottish mantle. *Contributions to Mineralogy and Petrology*, 99, 374–84.
- Smellie, W.R. (1916) The igneous rocks of Bute. *Transactions of the Geological Society of Glasgow*, 15, 334–73.
- Smith, F.W. (1974) Factors governing the development of fluor spar orebodies in the north Pennine orefield. Unpublished PhD thesis, University of Durham.
- Smith, F.W. (1995) The mineralization of the Alston Block. In *Robson's Geology of North East England*, 2nd edn (ed. G.A.L. Johnson), *Transactions of the Natural History Society of Northumbria*, 56(5), Natural History Society of Northumbria, Newcastle-upon-Tyne, pp. 344–52.
- Smith, K. (1992) Carboniferous magmatism in the Iapetus convergence zone: evidence from deep seismic reflection profiles. *Journal of the Geological Society, London*, 149, 907–14.
- Smith, R.A., Stephenson, D. and Monro, S. (1994) The geological setting of the southern Bathgate Hills, West Lothian, Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 84, 189–96.
- Smythe, D.K. (1987) Deep seismic reflection profiling of the Lewisian foreland. In *Evolution of the Lewisian and Comparable Precambrian High-grade Terrain* (eds R.G. Park and J. Tarney), *Geological Society Special Publication*, No. 27, Blackwell Scientific Publications, Oxford, for The Geological Society, pp. 193–203.
- Smythe, D.K. (1994) Geophysical evidence for ultrawide dykes of the late Carboniferous quartz-dolerite swarm of northern Britain. *Geophysical Journal International*, 119, 20–30.
- Smythe, D.K., Russell, M.J. and Skuce, A.G. (1995) Intracontinental rifting inferred from the major late Carboniferous quartz-dolerite dyke swarm of NW Europe. *Scottish Journal of Geology*, 31, 151–62.
- Smythe, J.A. (1930a) A chemical study of the Whin Sill. *Transactions of the Natural History Society of Northumbria*, 7, 16–150.
- Smythe, J.A. (1930b) The Harkess Rocks. *Vasculum*, 16, 9–15.
- Smythe, J.A. (1931) Intrusion phenomena of the Whin Sill. *Proceedings of the Geologists' Association*, 42, 272–3.
- Soper, N.J., England, R.W., Snyder, D.B. and Ryan, P.D. (1992) The Iapetus suture zone in England, Scotland and eastern Ireland: a reconciliation of geological and deep seismic data. *Journal of the Geological Society, London*, 149, 697–700.
- Sowerbutts, A.A. (1999) Geology of the Dunure, Carrick Hills and Heads of Ayr area. *British Geological Survey, Onshore Geology Series, Technical Report*, WA/99/102.

- Spears, D.A. (1970) A kaolinitic mudstone (tonstein) in the British Coal Measures. *Journal of Sedimentary Petrology*, 40, 386–94.
- Spears, D.A. and Kanaris-Sotiriou, R. (1979) A geochemical and mineralogical investigation of some British and other European tonsteins. *Sedimentology*, 26, 407–25.
- Speight, J.M. and Mitchell, J.G. (1979) The Permo-Carboniferous dyke-swarm of northern Argyll and its bearing on dextral displacement on the Great Glen Fault. *Journal of the Geological Society of London*, 136, 3–12.
- Stecher, E. (1888) Contacterscheinungen an Schottischen Olivindiabasen. *Tschermaks Mineralogische and Petrographische Mitteilungen*, 9, 145–205.
- Steiger, R.H. and Jager, E. (1977) Subcommittee on geochronology: convention on the use of decay constants in geo- and cosmochronology. *Earth and Planetary Science Letters*, 36, 359–62.
- Stephenson, D. (1983) Polymetallic mineralisation in Carboniferous rocks at Hilderston, near Bathgate, central Scotland. *Institute of Geological Sciences, Mineral Reconnaissance Programme Report*, No. 68.
- Stephenson, D. and Coats, J.S. (1983) Baryte and copper mineralisation in the Renfrew-shire Hills, central Scotland. *Institute of Geological Sciences, Mineral Reconnaissance Programme Report*, No. 67.
- Stephenson, M.H. (2000) Report on palynology of samples from the Ballagan Formation, Doonfoot, Ayrshire. *British Geological Survey Technical Report*, WH/00/14R.
- Stevenson, I.P. and Gaunt, G.D. (1971) *Geology of the Country around Chapel en le Frith*, Memoir of the Geological Survey of Great Britain, Sheet 99 (England and Wales), HMSO, London, 444 pp.
- Stevenson, I.P., Harrison, R.K. and Snelling, N.J. (1970) Potassium-argon age determination of the Waterswallows Sill, Buxton, Derbyshire. *Proceedings of the Yorkshire Geological Society*, 37, 445–7.
- Stone, P. (ed.) (1996) *Geology in South-West Scotland: an Excursion Guide*, British Geological Survey, Keyworth, 214 pp.
- Storetvedt, K.M. and Gidskehaug, A. (1969) The magnetisation of the Great Whin Sill, northern England. *Physics of the Earth and Planetary Interiors*, 2, 105–14.
- Strahan, A. and Cantrill, T.C. (1912) *The Geology of the South Wales Coalfield: Part 3 The Country around Cardiff*, 2nd edn, Memoir of the Geological Survey of Great Britain, Sheet 263 (England and Wales), HMSO, London, 157 pp.
- Strasser-King, V. (1973) The petrology of the Whin Sill. Unpublished PhD thesis, University of Manchester.
- Summers, T.P., Los, A.P. and Westbrook, G.K. (1982) Geophysical investigations of the Whin Sill in the Roman Wall district of Northumberland. *Proceedings of the Yorkshire Geological Society*, 44, 109–18.
- Sundvoll, B. and Larsen, B.T. (1993) Rb-Sr and Sm-Nd relationships in dyke and sill intrusions in the Oslo Rift and related areas. *Norges Geologiske Undersøkelse Bulletin*, 425, 25–42.
- Sutherland, D.S. (ed.) (1982) *Igneous Rocks of the British Isles*, John Wiley and sons Ltd, Chichester, 645 pp.
- Tate, G. (1867) The geology of the district traversed by the Roman Wall. In *The Roman Wall: a Description of the Mural Barrier of the North of England*, 3rd edn (ed. J.C. Bruce), Longmans and Co., London, pp. 359–70.
- Tate, G. (1868) Geology. In *A New Flora of Northumberland and Durham* (eds J.G. Baker and G.R. Tate), *Natural History Transactions of Northumberland and Durham*, No. 2, Williams and Norgate, London, pp. 1–35.



- Tate, G. (1871) On the basaltic rocks of Northumberland. *Proceedings of the Berwickshire Natural History Club*, 6, 197–217.
- Taylor, B.J., Burgess, I.C., Land, D.H., Mills, D.A.C., Smith, D.B. and Warren, P.T. (1971) *British Regional Geology: Northern England*, 4th edn, HMSO, London, 121 pp.
- Teall, J.J.H. (1884a) Petrological notes on some north of England dykes. *Quarterly Journal of the Geological Society of London*, 40, 209–47.
- Teall, J.J.H. (1884b) On the chemical and microscopical characters of the Whin Sill. *Quarterly Journal of the Geological Society of London*, 40, 640–57.
- Teall, J.J.H. (1888) *British Petrography; with Special Reference to the Igneous Rocks*, Dulau, London, 469 pp.
- Thirlwall, M.F. (1982) Systematic variation in chemistry and Nd-Sr isotopes across a Caledonian calc-alkaline volcanic arc: implications for source materials. *Earth and Planetary Science Letters*, 58, 27–50.
- Thirlwall, M.F. (1986) Lead isotope evidence for the nature of the mantle beneath Caledonian Scotland. *Earth and Planetary Science Letters*, 80, 55–70.
- Thomas, D.N., Rolph, T.C. and Shaw, W. (1995) Palaeointensity results from the P-C (Kiaman) reversed superchron: the Great Whin and Midland Valley sills of the northern United Kingdom. *Geophysical Journal International*, 123, 798–816.
- Thompson, R.N. (1982) Magmatism of the British Tertiary Volcanic Province. *Scottish Journal of Geology*, 18, 49–107.
- Thomson, J. (1865) On the geology of the Campbeltown district. *Transactions of the Geological Society of Glasgow*, 2, 76–89.
- Thorarinsson, S. and Sigvaldason, G.E. (1972) The Hekla eruption of 1970. *Bulletin Volcanologique*, 36, 269–88.
- Thorpe, R.S. and Macdonald, R. (1985) Geochemical evidence for the emplacement of the Whin Sill complex of northern England. *Geological Magazine*, 122, 389–96.
- Toghill, P. (1990) *Geology in Shropshire*, Swan Hill Press, Shrewsbury, 188 pp.
- Tomkeieff, S.I. (1928) The volcanic complex of Calton Hill, Derbyshire. *Quarterly Journal of the Geological Society of London*, 84, 703–16.
- Tomkeieff, S.I. (1929) A contribution to the petrology of the Whin Sill. *Mineralogical Magazine*, 22, 100–20.
- Tomkeieff, S.I. (1931) Lower Carboniferous igneous rocks. *Proceedings of the Geologists' Association*, 42, 259–61.
- Tomkeieff, S.I. (1937) Petrochemistry of the Scottish Carboniferous-Permian igneous rocks. *Bulletin Volcanologique, Serie 2*, 1, 59–87.
- Tomkeieff, S.I. (1945) Petrology of the Carboniferous igneous rocks of the Tweed Basin. *Transactions of the Edinburgh Geological Society*, 14, 53–75.
- Tomkeieff, S.I. (1952) Analcite-trachybasalt in the phonolite of Traprain Law. *Transactions of the Edinburgh Geological Society*, 15, 360–73.
- Tomkeieff, S.I. (1953) The Carboniferous igneous rocks of the Kelso district. *Proceedings of the University of Durham Philosophical Society*, 11, 95–101.
- Topley, W and Lebour, G.A. (1877) On the intrusive character of the Whin Sill in Northumberland. *Quarterly Journal of the Geological Society of London*, 33, 406–21.

- Torsvik, T.H., Lyse, O., Atterås, G. and Bluck, B.J. (1989) Palaeozoic palaeomagnetic results from Scotland and their bearing on the British apparent polar wander path. *Physics of the Earth and Planetary Interiors*, 55, 93–105.
- Townson, R. (1799) *Tracts and Observations in Natural History and Physiology*, J. White, London, 232 pp.
- Trevelyan, W.C. (1823) Sketch of the geognosy of part of the coast of Northumberland. *Memoir of the Wernerian Natural History Society*, 4, 253–61.
- Trevelyan, W.C. (1831) Notice of a bed of whin at Stanhope in Weardale. *Transactions of the Natural History Society of Northumberland*, 1, 58–9.
- Trewin, N.H. (1968) Potassium bentonites in the Namurian of Staffordshire and Derbyshire. *Proceedings of the Yorkshire Geological Society*, 37, 73–91.
- Trewin, N.H. (in press) *The Geology of Scotland*, 4th edn, The Geological Society, London.
- Turner, B.R., Robson, D.A., Dearman, W.R., Jones, J.M., Magraw, D. and Smith, F.W. (1995) Structure. In *Robson's Geology of North East England*, 2nd edn (ed. G.A.L. Johnson), *Transactions of the Natural History Society of Northumbria*, 56(5), Natural History Society of Northumbria, Newcastle-upon-Tyne, pp. 331–41.
- Turner, N. (1994) Palynology of Devonian and Carboniferous rocks of the Cumnock and Doon Valley District, Strathclyde. *British Geological Survey, Biostratigraphy and Sedimentology Group Report*, WH/94/294 R.
- Turner, N. and Spinner, E. (1990) Palynological evidence for the age of the Coal Measures of the Titterstone Cleve Coalfield, Shropshire, England. *Proceedings of the Yorkshire Geological Society*, 48, 81–98.
- Tyrrell, G.W. (1909a) The classification of the post-Carboniferous intrusive igneous rocks of the west of Scotland. *Transactions of the Geological Society of Glasgow*, 13, 298–317.
- Tyrrell, G.W. (1909b) The geology and petrology of the intrusions of the Kilsyth-Croy district. *Geological Magazine*, 46, 299–309.
- Tyrrell, G.W. (1912) The late-Palaeozoic alkaline igneous rocks of the west of Scotland. *Geological Magazine*, 9, 125–7.
- Tyrrell, G.W. (1915) The bekinkinite of Barshaw. *Geological Magazine*, 2, 304–11, 361–6.
- Tyrrell, G.W. (1917a) The igneous geology of the Cumbrae Islands, Firth of Clyde. *Transactions of the Geological Society of Glasgow*, 16, 244–74.
- Tyrrell, G.W. (1917b) The picrite-teschenite sill of Lugar (Ayrshire). *Quarterly Journal of the Geological Society of London*, 74, 84–131.
- Tyrrell, G.W. (1920) The igneous geology of the Ayrshire coast from Doonfoot to the Heads of Ayr. *Transactions of the Geological Society of Glasgow*, 16, 339–63.
- Tyrrell, G.W. (1923) Classification and age of the analcite-bearing igneous rocks of Scotland. *Geological Magazine*, 60, 249–60.
- Tyrrell, G.W. (1928a) A further contribution to the petrography of the late-Palaeozoic igneous suite of the west of Scotland. *Transactions of the Geological Society of Glasgow*, 18, 259–94.
- Tyrrell, G.W. (1928h) On some dolerite sills containing analcite-syenite in central Ayrshire. *Quarterly Journal of the Geological Society of London*, 84, 540–69.
- Tyrrell, G.W. (1937) Flood basalts and fissure eruptions. *Bulletin Volcanologique, Serie 2*, 1, 89–111.

- Tyrrell, G.W. (1948) A boring through the Lugar Sill. *Transactions of the Geological Society of Glasgow*, 21, 157–202.
- Tyrrell, G.W. (1952) A second boring through the Lugar Sill. *Transactions of the Edinburgh Geological Society*, 15, 374–392.
- Upton, B.G.J. (1969) *Field Excursion Guide to the Carboniferous Volcanic Rocks of the Midland Valley of Scotland*, Edinburgh Geological Society Edinburgh, 46 pp.
- Upton, B.G.J. (1982) Carboniferous to Permian volcanism in the stable foreland. In *Igneous Rocks of the British Isles* (ed. D.S. Sutherland), John Wiley and sons Ltd, Chichester, pp. 255–75.
- Upton, B.G.J. (1994) Regional setting of Carboniferous volcanism in the Midland Valley of Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 84, 209–12.
- Upton, B.G.J., Aspen, P, Graham, A.M. and Chapman, N.A. (1976) Pre-Palaeozoic basement of the Scottish Midland Valley. *Nature*, 260, 517–18.
- Upton, B.G.J., Aspen, P and Chapman, N.A. (1983) The upper mantle and deep crust beneath the British Isles: evidence from inclusions in volcanic rocks. *Journal of the Geological Society of London*, 140, 105–21.
- Upton, B.G.J., Aspen, P and Hunter, R.H. (1984) Xenoliths and their implications for the deep geology of the Midland Valley of Scotland and adjacent regions. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 75, 65–70.
- Upton, B.G.J., Fitton, J.G. and Macintyre, R.M. (1987) The Glas Eilean lavas: evidence of a Lower Permian volcano-tectonic basin between Islay and Jura, Inner Hebrides. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 77, 289–93.
- Upton, B.G.J., Mitchell, R.H., Long, A. and Aspen, P (1992) Primitive olivine melanephelinite dykes from the Orkney Islands, Scotland. *Geological Magazine*, 129, 319–24.
- Upton, B.G.J., Aspen, P, Rex, D.C., Melcher, F. and Kinny, P. (1998) Lower crustal and possible shallow mantle samples from beneath the Hebrides: evidence from a xenolithic dyke at Gribun, western Mull. *Journal of the Geological Society, London*, 155, 813–28.
- Upton, B.G.J., Hinton, R.W., Aspen, P, Finch, A. and Valley, J.W. (1999) Megacrysts and associated xenoliths: evidence for migration of geochemically enriched melts in the upper mantle beneath Scotland. *Journal of Petrology*, 40, 935–56.
- Upton, B.G.J., Aspen, P. and Hinton, R.W. (2001) Pyroxenite and granulite xenoliths from beneath the Scottish Northern Highlands Terrane: evidence of lower-crust/upper-mantle relationships. *Contributions to Mineralogy and Petrology*, 142, 178–97.
- Urry, W.D. and Holmes, A. (1941) Age determinations of Carboniferous basic rocks from Shropshire and Colonsay. *Geological Magazine*, 78, 45–61.
- Van Breemen, O. and Hawkesworth, C.J. (1980) Sm-Nd isotopic study of garnets and their metamorphic host rocks. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 71, 97–102.
- Wadge, A.J. (1978) Devonian. In *The Geology of the Lake District* (ed. F. Moseley), *Yorkshire Geological Society Occasional Publication*, No. 3, Yorkshire Geological Society, Leeds, pp. 164–7.
- Wadge, A.J., Harrison, R.K and Snelling, N.J. (1972) Olivine-dolerite intrusions near Melmerby, Cumberland, and their age-determination by the potassium-argon method. *Proceedings of the Yorkshire Geological Society*, 39, 59–70.
- Wager, L.R. (1928) A metamorphosed nodular shale previously described as a 'spotted' metamorphic rock. *Geological Magazine*, 65, 88–91.

- Wager, L.R. (1929a) Metasomatism in the Whin Sill of the north of England. Part I: Metasomatism by lead vein solutions. *Geological Magazine*, 66, 97–110.
- Wager, L.R. (1929b) Metasomatism in the Whin Sill of the north of England. Part II: Hydrothermal alteration by juvenile solutions. *Geological Magazine*, 66, 221–38.
- Wagner, R.H. (1983) A Lower Rotliegend flora from Ayrshire. *Scottish Journal of Geology*, 19, 135–55.
- Walkden, G.M. (1972) The mineralogy and origin of interbedded clay wayboards in the Lower Carboniferous of the Derbyshire Dome. *Geological Journal*, 8, 143–60.
- Walkden, G.M. (1977) Volcanic and erosive events on an Upper Visean carbonate platform, north Derbyshire. *Proceedings of the Yorkshire Geological Society*, 41, 347–67.
- Walker, B.H. (1986) Emplacement mechanism of high-level dolerite sills and related eruptions in sedimentary basins, Fife, Scotland. Unpublished PhD thesis, University of Leeds.
- Walker, B.H. and Francis, E.H. (1987) High-level emplacement of an olivine-dolerite sill into Namurian sediments near Cardenden, Fife. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 77, 295–307.
- Walker, F. (1923) The igneous geology of the Dalmeny district. *Transactions of the Royal Society of Edinburgh*, 53, 361–75.
- Walker, F. (1925) A monchiquite dyke in Lauderdale. *Transactions of the Edinburgh Geological Society*, 11, 390–1.
- Walker, F. (1930) A tholeiitic phase of the quartz-dolerite magma of central Scotland. *Mineralogical Magazine*, 22, 368–76.
- Walker, F. (1934) A preliminary account of the quartz-dolerite dykes of Perthshire. *Transactions and Proceedings of the Perthshire Society of Natural Science*, 9, 109–17.
- Walker, F. (1935) The late Palaeozoic quartz dolerites and tholeiites of Scotland. *Mineralogical Magazine*, 24, 131–59.
- Walker, F. (1936) Geology of the Isle of May. *Transactions of the Edinburgh Geological Society*, 13, 275–85.
- Walker, F. (1952) Differentiation in a quartz-dolerite sill at Northfield Quarry, Stirlingshire. *Transactions of the Edinburgh Geological Society*, 15, 393–405.
- Walker, F. (1958) Dolerite–sandstone contact phenomena on the East Lomond, Fife. *Transactions of the Edinburgh Geological Society*, 17, 113–16.
- Walker, F. (1965) The part played by tholeiitic magma in the Carbo-Permian volcanicity of central Scotland. *Mineralogical Magazine*, 34, 498–516.
- Walker, F. and Irving, J. (1928) The igneous intrusions between St Andrews and Loch Leven. *Transactions of the Royal Society of Edinburgh*, 56, 1–17.
- Walker, G.P.L. and Croasdale, R. (1972) Characteristics of some basaltic pyroclastics. *Bulletin Volcanologique*, 35, 303–17.
- Walker, G.P.L. and Ross, J.V. (1954) A xenolithic monchiquite dyke near Glenfinnan, Inverness-shire. *Geological Magazine*, 91, 463–72.
- Wallace, I.F. (1916) Notes on the petrology of agglomerates and hypabyssal intrusions between Largo and St. Monance. *Transactions of the Edinburgh Geological Society*, 10, 348–62.

- Wallis, J. (1769) *The Natural History and Antiquities of Northumberland; and so much of the County of Durham as lies between the Rivers Tyne and Tweed; Commonly Called North Bishoprick*, 2 volumes, S. Bladon, London.
- Wallis, S.M. (1989) Petrology and geochemistry of Upper Carboniferous-Lower Permian volcanic rocks in Scotland. Unpublished PhD thesis, University of Edinburgh.
- Walters, S.G. and Ineson, P.R. (1981) A review of the distribution and correlation of igneous rocks in Derbyshire, England. *Mercian Geologist*, 8, 81–132.
- Walters, S.G. and Ineson, P.R. (1983) Clay minerals in the basalts of the south Pennines. *Mineralogical Magazine*, 47, 21–6.
- Warn, C.R. (1975) *Rocks and Scenery from Tyne to Tweed*, Frank Graham, Newcastle-upon-Tyne.
- Waters, C.N., Glover, B.W. and Powell, J.H. (1994) Structural synthesis of S. Staffordshire, UK: implications for the Variscan evolution of the Pennine Basin. *Journal of the Geological Society, London*, 151, 697–713.
- Watts, W.W. (1904) The long excursion to the Ludlow district. *Proceedings of the Geologists' Association*, 18, 487–91.
- Weigand, P.W. (1975) *Geochemistry of the Oslo Basaltic Rocks, Skrifter det Norske Videnskaps-Akademi i Oslo, I. Matematisk-Naturvidenskapelig Klasse, Ny Serie*, No. 34, Universitetsforlaget, Oslo, 38 pp.
- Welch, F.B.A. and Trotter, F.M. (1961) *Geology of the Country around Monmouth and Chepstow*, Memoir of the Geological Survey of Great Britain, sheets 233 and 250 (England and Wales), HMSO, London, 164 pp.
- Weston, 'ES., Robson, D.A. and Green, R. (1955) A guide to the geology of the district around Alwick, Northumberland. *Proceedings of the Yorkshire Geological Society*, 30, 61–100.
- White, J.D.L. and Houghton, B. (2000) Surtseyan and related phreatomagmatic eruptions. In *Encyclopedia of Volcanoes* (eds H. Sigurdsson *et al.*), Academic Press, San Diego, pp. 495–511.
- Whitehead, T.H. and Eastwood, T (1927) *The Geology of the Southern Part of the South Staffordshire Coalfield (South of the Bentley Faults)*, Memoir of the Geological Survey of Great Britain (England and Wales), HMSO, London, 218 pp.
- Whittaker, A. and Green, G.W. (1983) *Geology of the Country around Weston-super-Mare*, Memoir of the Geological Survey of Great Britain, Sheet 279 and parts of sheets 263 and 295 (England and Wales), HMSO, London, 147 pp.
- Whyte, F. (1963a) Volcanic vents of the Kilpatrick and Campsie hills. Unpublished PhD thesis, University of Glasgow.
- Whyte, F. (1963b) The Heads of Ayr Vent. *Transactions of the Geological Society of Glasgow*, 25, 72–97.
- Whyte, F. (1966) Dumbarton Rock. *Scottish Journal of Geology*, 2, 108–21.
- Whyte, F. (1968) Lower Carboniferous volcanic vents in the west of Scotland. *Bulletin Volcanique*, 32, 253–68.
- Whyte, F. (1980) Trace element variation at the contact of the Dumbarton Rock basalt. *Scottish Journal of Geology*, 16, 263–6.
- Whyte, F. and MacDonald, J.G. (1974) Lower Carboniferous volcanicity in the northern part of the Clyde plateau. *Scottish Journal of Geology*, 10, 187–98.
- Wilson, G. (1970) Wrench movements in the Aristarchus region of the Moon. *Proceedings of the Geologists' Association*, 81, 595–608.
- Wilson, G.V. (1922) *The Ayrshire Bauxitic Clay*, Memoir of the Geological Survey, Scotland, HMSO, Edinburgh, 28 pp.

- Wilson, G.V., Edwards, W, Knox, J., Jones, J.C.B. and Stephens, J.V. (1935) *The Geology of the Orkneys*, Memoir of the Geological Survey of Great Britain, sheets 117–122 (Scotland), HMSO, Edinburgh, 205 pp.
- Wilson, H.E. and Robbie, J.A. (1966) *The Geology of the Country around Ballycastle*, Memoir of the Geological Survey of Northern Ireland, Sheet 8, HMSO, Belfast, 370 pp.
- Wilson, M., Timmerman, M. and Partners, P.N. (2000) Permo-Carboniferous magmatism in western and central Europe: plume impact versus plume incubation models, Unpublished conference abstract, Geoscience 2000, Manchester.
- Winch, N.J. (1817) Observations on the geology of Northumberland and Durham. *Transactions of the Geological Society of London*, 4, 1–101.
- Winch, N.J. (1822) Remarks on the geology of Lindisfarne, or Holy Island. *Annals of Philosophy, New Series*, 20, 426–34.
- Woodhall, D.G. (1998) The volcanic and intrusive igneous rocks of the Burntisland and Kinghorn areas, Fife. *British Geological Survey, Onshore Geology Series, Technical Report, WA/98/34*.
- Wyllie, P.J. (1999) Hot little crucibles are pressured to reveal and calibrate igneous processes. In *James Hutton — Present and Future* (eds G.Y. Craig and J.H. Hull), *Geological Society, London, Special Publication*, No. 150, The Geological Society, London, pp. 37–57.
- Young, B., Dyer, A., Hubbard, N. and Starkey, R.E. (1991) Apophyllite and other zeolite-type minerals from the Whin Sill in the northern Pennines. *Mineralogical Magazine*, 55, 203–7.
- Young, B., Styles, M.T. and Berridge, N.G. (1985) Niccolite-magnetite mineralization from Upper Teesdale, North Pennines. *Mineralogical Magazine*, 49, 555–9.
- Young, B.R. (1903) An analcite diabase and other rocks from Gullane. *Transactions of the Edinburgh Geological Society*, 8, 326–35.
- Young, J. (1860) The geology of the Campsie district. *Transactions of the Geological Society of Glasgow*, 1, 1–45.
- Yuill, M. (1963) Fossil tree stumps at Saltcoats. *Transactions of the Geological Society of Glasgow*, 25, 1–3.
- Zirkel, F. (1870) *Untersuchungen über die Mikroskopische Zusammensetzung and Struktur der Basaltsteine*, Adolph Marcus, Bonn.

## [References](#)