# Quaternary of Northern England

### D. Huddart

Liverpool John Moores University, Liverpool, UK

and

**N.F. Glasser** University of Wales, Aberystwyth, UK

## With contributions from

Jim Innes David Evans John Boardman Silvia Gonzalez Richard Chiverrell Wishart Mitchell Andy Plater Sarah Morriss Cynthia Burek Stephan Harrison Richard Jones Graham Wilson

GCR Editor: G.S.P. Thomas



# 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.

- Aalbersberg, G. and Litt, T. (1998) Multiproxy climate reconstructions for the Eemian and Early Weichselian. *Journal of Quaternary Science*, 13, 367–90.
- Adam, P., Birks, H.J.B., Huntley, B. and Prentice, I.C. (1975) Phytosociological studies at Malham Tarn Moss and Fen, Yorkshire, England. Vegetatio, 30, 117–32.
- Adams, A.E. and Horbury, A.D. (1989) Tree root structures on a Dinantian palaeokarst, Urswick Limestone, south Cumbria. Proceedings of the Yorkshire Geological Society, 47, 345-8.
- Agar, R. (1954) Glacial and post-glacial geology of Middlesborough and the Tees estuary. *Proceedings of the Yorkshire Geological Society*, 29, 237–53.
- Aigurre, E. and Passini, G. (1985) The Plio-Pleistocene boundary. *Episodes*, 8, 116–20
- Aikin, J. (1795) Description of the County from Thirty to Forty Miles around Manchester, John Stockdale, London, 624 pp.
- Aitken, J.F. (1998) Sedimentology of Late Devensian glaciofluvial outwash in the Don Valley, Grampian Region. Scottish Journal of Geology, 34, 97–117.
- Aitkenhead, N., Chisholm, J.I. and Stevenson, I.P. (1985) Geology of the country around Buxton, Leek and Bakewell, Memoir (Sheet)

of the British Geological Survey (England and Wales) (111), HMSO, London, 168 pp.

- Akhurst, M.C., Chadwick, R.A., Holliday, D.W. et al. (1997) Geology of the west Cumbria district, Memoir (Sheet) of the British Geological Survey (England and Wales) (28+37+47), British Geological Survey, Keyworth, 138 pp.
- Alabaster, C. and Straw, A. (1976) The Pleistocene context of faunal remains and artefacts discovered at Welton-le-Wold, Lincolnshire. *Proceedings of the Yorksbire Geological Society*, 41,75–94.
- Aldhouse-Green, A.E., Allen, J.R.L, Caseldine, A.E. et al. (1992) Prehistoric human footprints from the Severn Estuary at Uskmouth and Magor Pill, Gwent, Wales. Archaeologia Cambrensis, 141, 14-55.
- Allen, P. (1983) Middle Pleistocene stratigraphy and landform development of south-east Suffolk. Unpublished PhD thesis, University of London.
- Allen, P. and Rose, J. (1986) A glacial meltwater drainage system between Whittonstall and Ebchester, Northumberland. In *Quaternary* river landforms and sediments in the northern Pennines: field guide (eds M.G. Macklin and J. Rose), *Quaternary Research Associ*ation Field Guide, Quaternary Research Association/British Geomorphological Re-

search Group, London, pp. 69-88.

- Allen, P., Keen, D. Lewis, S. (in press) Quaternary of East Anglia and the Midlands, Geological Conservation Review Series, Joint Nature Conservation Committee, Peterborough.
- Alley, R.B., Cuffey, K.M., Evenson, E.B. *et al.* (1997) How glaciers entrain and transport basal sediment: physical constraints. *Quaternary Science Reviews*, **16**, 1017–38.
- Ambers, J.C., Matthews, K.J. and Bowman, S.G.E. (1986) Radiocarbon dates from two peat samples. In *Lindow Man. The Body in the Bog* (eds I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 25–6.
- Andersen, B.G. (1981) Late Weichselian ice sheets in Eurasia and Greenland. In *The Last Great Ice Sheets* (eds G.H. Denton and T.J. Hughes), John Wiley and Sons Ltd, New York, pp. 1–65.
- Andersen, J.M., Byrd, BF., Elson, MD. et al. (1981) The deerhunters: Star Carr reconsidered. World Archaeology, 13, 31–46.
- Anderson, P. and Yalden, D. (1981) Present moorland vegetation. In *Peak District Moorland Erosion Study: Phase I Report* (eds J. Phillips, D. Yalden and J. Tallis), Peak Park Joint Planning Board, Bakewell, pp. 28–34.
- Anderson, W. (1939) Possible late glacial sea levels at 190' and 140' OD in the British Isles. *Geological Magazine*, **76**, 317–21.
- Anderson, W. (1940) Buried valleys and late glacial drainage systems in Northwest Durham.
  Proceedings of the Geologists' Association, 51, 274–81.
- Anderton, R., Bridges, P.H., Leeder, M.R. and Sellwood, B.W. (1979) A Dynamic Stratigraphy of the British Isles: a Study in Crustal Evolution, George Allen and Unwin, London, 301 pp.
- Anderton, R., Bridges, P.H., Leeder, M.R. and Sellwood, B.W. (1983) *A Dynamic Stratigraphy of the British Isles: a Study in Crustal Evolution*, 2nd edn, George Allen and Unwin, London.
- André, M.F. (1985) Lichénométre et vitesses d'évolution des versants arctiques pendant l'Holocene (Region de la Baie du Roi, Spitsberg, 79°N). Révue de Géomorphologie Dynamique, 1985 (2), 29–72.
- André, M.F. (1986) Dating slope deposits and estimating rate of rock wall retreat in northwest Spitsbergen by lichenometry. *Geograf*-

iska Annaler, 68A, 65-75.

- Andrew, R. and West, R.G. (1977) Pollen analysis from Four Ashes, Worcs. *Philosophical Transactions of the Royal Society of London*, B280, 242-6.
- Andrews, C.W. (1919) Description of the bones of *Elephas*. In: Trechmann, C.T. On a deposit of interglacial loess, and some transported preglacial freshwater clays on the Durham coast. *Quarterly Journal of the Geological Society of London*, **75**, p. 201.
- Andrews, I.J., Long, D., Richards, P.C. et al. (1990) The Geology of the Moray Firth, United Kingdom Offshore Regional Report, No. 3, HMSO, London, 96 pp.
- Andrews, J.T. (1961) The development of scree slopes in the English Lake District and central Quebec–Labrador. *Cahiers de Geographie du Quebec*, 10, 219–30.
- Andrews, J.T. (1972) Glacier power, mass balance, velocities and erosion potential. *Zeitschrift für Geomorphologie*, 13, 1–17.
- Andrews, J.T. and King, C.A.M. (1969) Comparative till fabrics and till fabric variability in a till sheet and a drumlin: a small-scale study. *Proceedings of the Yorkshire Geological Society*, **36**, 435–61.
- Andrews, J.T. and Shimizu, K. (1966) Threedimensional vector technique for analysing till fabrics: discussion and Fortran program. *Geographical Bulletin*, 8, 151–65.
- Andrews, J.T., Kirby, M.E., Aksu, A., Barber, D.C. and Meese, D. (1998) Late Quaternary detrital carbonate (DC) layers in Baffin Bay marine sediments (67°N-74°N): correlation with Heinrich Events in the North Atlantic? *Quaternary Science Reviews*, 17, 1125-37.
- Annis, R. (1994) A Neolithic fishweir (?) from Cleveland. PAST, 17, 6–7.
- Anon (1785–1786) A Survey with Maps of Lands within the Manor of Malham-Moors and East Malham in the Parish of Kirkby-malhamdale and County of York, now the property of Thos. Lister Esq.. In the possession of the National Trust, York.
- Anon. (1972) Borehole Records. In Annual Report of the Institute of Geological Sciences, 1971, 119, HMSO, London.
- Anson, W. W. and Sharp, J.I. (1960) Surface and rock bead relief features in the northern part of the Northumberland coalfield, Department of Geography University of Durbam Research Series, 2, Department of Geography, University of Durham, 23 pp.

- Armstrong, A.L. (1923) The Maglemose remains of Holderness and their Baltic counterparts. *Proceedings of the Prehistoric Society of East Anglia*, 6, 57–70.
- Arthurton, R.S. (1984) The Ribblesdale fold belt, NW England – a Dinantian–early Namurian dextral shear zone. In Variscan Tectonics of the North Atlantic Region (eds D.H.W. Hutton and D.J. Sanderson), Geological Society of London Special Publication, No. '14, Blackwell Scientific Publications, Oxford, pp. 131–8.
- Arthurton, R.S., Johnson, E.W. and Mundy, D.J.C. (1988) Geology of the Country around Settle, Memoir (Sheet) of the British Geological Survey (England and Wales) (60), HMSO, London, 147 pp.
- Ashmead, P. (1974) The caves and karst of the Morecambe Bay area. In *The Limestones and Caves of North-West England* (ed. A.C. Waltham), David and Charles, Newton Abbot, pp. 201–26.
- Ashton, W. (1909) The Battle of Land and Sea on the Lancashire, Cheshire and North Wales Coasts and the Origin of the Lancashire Sandhills, Ashton and Sons Ltd, Southport; Heywood Ltd, Manchester.
- Ashton, W. (1920) *The Evolution of a Coastline*, Stanford Ltd, London; Ashton and Sons Ltd, Southport.
- Ashworth, A.C. (1972) A Late-glacial insect fauna from Red Moss, Lancashire, England. *Entomologica Scandinavia*, **3**, 211–24.
- Atherden, M.A. (1972) A contribution to the vegetation and land use history of the easterncentral North York Moors. Unpublished PhD thesis, University of Durham.
- Atherden, M.A. (1976a) Late Quaternary vegetational history of the North York Moors. III. Fen Bogs. Journal of Biogeography, 3, 115–24.
- Atherden, M.A. (1976b) The impact of late prehistoric cultures on the vegetation of the North York Moors. *Transactions of the Institute of British Geographers, New Series*, 1, 284–300.
- Atherden, M.A. (1979) Late Quaternary vegetational history of the North York Moors. VII.
  Pollen diagrams from the eastern-central area. *Journal of Biogeography*, 6, 63–83.
- Atherden, M.A. (1989) Three pollen diagrams from the eastern North York Moors. *Naturalist*, **114**, 55-63.
- Atherden, M.A. (1999) The vegetation history of

Yorkshire: a bog-trotter's guide to God's own county. *The Naturalist*, **124**, 137–56.

- Atkinson, D. and Houston, J. (eds) (1993) The Sand Dunes of the Sefton Coast: proceedings of the Sefton Coast Research Seminar, 31 May 1991, Liverpool, National Museums and Galleries on Merseyside with Sefton Metropolitan Borough Council, Liverpool, 194 pp.
- Atkinson, T.C., Lawson, T.J., Smart, P.L., Harmon, R.S. and Hess, J.W. (1986a) New data on speleothem deposition and palaeoclimate in Britain over the last forty thousand years. *Journal of Quaternary Science*, 1, 67–72.
- Atkinson, T.C., Briffa, K.R. and Coope, G.R. (1987) Seasonal temperature in Britain during the past 22 000 years, reconstructed using beetle remains. *Nature*, **325**, 587–92.
- Austin, W.E.N. and Evans, J.R. (1999) Filey Bay and the Speeton Shell Bed. In The Quaternary of North-East England: field guide (eds D.R. Bridgland, B.P. Horton and J.B. Innes), Quaternary Research Association Field Guide, Quaternary Research Association, London, pp. 167–8.
- Austin, W.E.N. and McCarroll, D. (1992) Foraminifera from Irish Sea glacigenic deposits of Aberdaron, western Lleyn, North Wales: palaeoenvironmental implications. Journal of Quaternary Science, 7, 311–17.
- Auton, C.A. (1997a) Peel Place Quarry. In The Quaternary Geology of West Cumbria Field Guide (eds M. Browne, R.J. Heath, D. Huddart and P. Nathanail), Environment Group of the Geological Society of London, London, pp. 79–81.
- Auton, C.A. (1997b) Newton Sand Pit. In The Quaternary Geology of West Cumbria Field Guide (eds M. Browne, R.J. Heath, D. Huddart and P. Nathanail), Environment Group of the Geological Society of London, London, pp. 82-4.
- Aveline, W.T. and Hughes, T.McK. (1888) The Geology of the Country around Kendal, Sedbergh, Bowness and Tebay: (Quarter-sheet 98 NE), Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) Old Series, 2nd edn revised and enlarged by A. Strahan, HMSO, London, 94 pp.
- Awujoola, A.I. (1987) The occurrence and nature of deep saprolites on Cheviot granites. Unpublished PhD thesis, University of Newcastle upon Tyne.

Backhouse, H. (1844) Notes on a botanical ram-

ble in Yorkshire etc. in the summer of 1844. *Phytologist*, **1**, 1065–9.

- Baden-Powell, D.F.W. (1956) The correlation of the Pliocene and Pleistocene marine beds of Britain and the Mediterranean. *Proceedings of the Geologists' Association*, 66, 271–92.
- Ball, D.F. (1966) Late-glacial scree in Wales. Biuletyn Peryglacjalny, 15, 151-63.
- Ball, D.F. and Goodier, R. (1968) Large sorted stone-stripes in the Rhinog Mountains, North Wales. *Geografiska Annaler*, **50A**, 54–9.
- Ballantyne, C. (1985) Nivation landforms and snowpatch erosion on two massifs in the Northern Highlands of Scotland. *Scottish Geographical Magazine*, **101**, 40–9.
- Ballantyne, C.K. (1978) The hydrologic significance of nivation features in permafrost areas. *Geografiska Annaler*, **60A**, 51–4.
- Ballantyne, C.K. (1984) The late Devensian periglaciation of upland Scotland. *Quaternary Science Reviews*, 3, 311–43.
- Ballantyne, C.K. (1987) The present-day periglaciation of upland Britain. In *Periglacial Processes and Landforms in Britain and Ireland* (ed. J. Boardman), Cambridge University Press, Cambridge, pp. 113–26.
- Ballantyne, C.K. (1990) The Late Quaternary glacial history of the Trotternish Escarpment, Isle of Skye, Scotland, and its implications for icesheet reconstruction. *Proceedings of the Geologists' Association*, **101**, 171–86.
- Ballantyne, C.K. (1991) Periglacial features on the mountains of Skye. In *The Quaternary of the Isle of Skye: field guide* (eds C.K. Ballantyne, D.I. Benn, J.J. Lowe and M.J.C. Walker), *Quaternary Research Association Field Guide*, Quaternary Research Association, Cambridge, pp. 68–81.
- Ballantyne, C.K. (1994) The tors of the Cairngorms. *Scottish Geographical Magazine*, **110**, 54–9.
- Ballantyne, C.K. (1997) Periglacial trimlines in the Scottish Highlands. *Quaternary International*, 38/39, 119–36.
- Ballantyne, C.K. (1999) Age and significance of mountain-top detritus. *Permafrost and Periglacial Processes*, 9, 327–45.
- Ballantyne, C.K. and Benn, D.I. (1994) Glaciological constraints on protalus rampart development. *Permafrost and Periglacial Processes*, 5, 145–53.
- Ballantyne, C.K. and Eckford, J.D. (1984) Characteristics and evolution of two relict talus slopes in Scotland. *Scottish*

Geographical Magazine, 100, 20-33.

- Ballantyne, C.K. and Harris, C. (1994) *The Periglaciation of Great Britain*, Cambridge University Press, Cambridge, 330 pp.
- Ballantyne, C.K. and Kirkbride, M.P. (1987a) Rockfall activity in upland Britain during the Loch Lomond Stadial. *Geographical Journal*, **152**, 86–92.
- Ballantyne, C.K. and Kirkbride, M.P. (1987b) The characteristics and significance of some Lateglacial protalus ramparts in upland Britain. *Earth Surface Processes and Landforms*, **11**, 659–71.
- Ballantyne, C.K., McCarroll, D., Nesje, A. and Dahl, S.O. (1997) Periglacial trimlines, former nunataks and the altitude of the last ice sheet in Wester Ross, northwest Scotland. *Journal* of *Quaternary Science*, **12**, 225–38.
- Ballantyne, C.K., McCarroll, D., Nesje, A., Dahl, S.O., Stone, J.O. and Fifield, L.K., (1998) High Resolution reconstruction of the last ice sheet in NW Scotland. *Terra Nova*, **10**, 63–7.
- Balson, P.S. and Jeffery, D.H. (1991) The glacial sequence of the southern North Sea. In *Glacial Deposits in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 245–54.
- Barber, K.E. (1981) Peat Stratigraphy and Climatic Change: a Palaeoecological Test of the Theory of Cyclic Peat Bog Regeneration, A.A. Balkema Publishers, Rotterdam, 219 pp.
- Barber, K.E. (1982) Peat-bog stratigraphy as a proxy climate record. In *Climatic Change in Later Prehistory* (ed. A.F. Harding), Edinburgh University Press, Edinburgh, pp. 103–13.
- Barber, K.E. (1986) Peat macrofossil analyses as indicators of the bog palaeoenvironment and climatic change. In *Lindow Man: The Body in the Bog* (eds I.M. Stead, J.B. Bourke, and D. Brothwell), British Museums Publications, London, pp. 86–90.
- Barber, K.E. (1993) Peatlands as scientific archives of biodiversity. *Biodiversity and Conservation*, 2, 474–89.
- Barber, K.E. (1994) Deriving Holocene palaeoclimates from peat stratigraphy: some misconceptions regarding the sensitivity and continuity of the record. *Quaternary Newsletter*, 72, 1–9.
- Barber, K.E. (1995) Peat stratigraphy and the body in the bog: a reconstruction of the evidence. In *Bog Bodies. New Discoveries and*

New Perspectives (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 50–1.

- Barber, K.E. and Twigger, S.N. (1987) Late Quaternary palaeoecology of the Severn Basin. In *Palaeobydrology in Practice: a river basin analysis* (eds K.J. Gregory, J. Lewin and J.B. Thornes), John Wiley and Sons Ltd, Chichester, pp. 217–50
- Barber, K.E., Dumayne, L. and Stoneman, R. (1993) Climatic change and human impact during the late Holocene in northern Britain. In *Climate Change and Human Impact on the Landscape: Studies in Palaeoecology and Environmental Archaeology* (ed. F.M. Chambers), 1st edn, Chapman and Hall, London, New York, pp. 225–36.
- Barber, K.E., Chambers, F.M., Dumayne, L., Haslam, C.J., Maddy, D. and Stoneman, R.E. (1994a) Climatic change and human impact in north Cumbria: peat stratigraphic and pollen evidence from Bolton Fell Moss and Walton Moss. In *Cumbria: field guide* (eds J. Boardman and J. Walden), *Quaternary Research Association Field Guide*, Quaternary Research Association, Oxford, pp. 20–49.
- Barber, K.E., Chambers, F.M., Maddy, D., Stoneman, R.E. and Brew, J.S. (1994b) A sensitive high-resolution record of late Holocene climatic change from a raised bog in northern England. *The Holocene*, 4, 198–205.
- Barber, K.E., Dumayne-Peaty, L., Hughes, PD.M., Mauquoy, D. and Scaife, R. (1998) Replicability and variability of the recent macrofossil and proxy-climate record from raised bogs: field stratigraphy and macrofossil data from Bolton Fell Moss and Walton Moss, Cumbria, England. Journal of Quaternary Science, 13, 515–28.
- Barber, K.E., Battarbee, R.W., Brooks, S.J. *et al.* (1999) Proxy records of climate change in the UK over the last two millennia: documented change and sedimentary records from lakes and bogs. *Journal of the Geological Society*, *London*, **156**, 369–80.
- Barker, H. and Mackey, J. (1961) British Museum Natural Radiocarbon Measurements III. *Radiocarbon*, **3**, 39–45.
- Barlow, D. (1998) A lake sediment study of particulate flux in the Humber catchment using magnetic techniques. Unpublished PhD thesis, University of Edinburgh.
- Barnes, F.A. (1963) Peat erosion in the southern Pennines: problems of interpretation. *East*

Midland Geographer, 3, 216-22.

- Barnes, G. (1962) The evidence of place-names for the Scandinavian settlements in Cheshire. *Transactions of the Lancashire and Cheshire Antiquarian Society*, 63, 131–55.
- Barrett, J.H. (1992) An extreme value analysis of the flow of Burbage Brook. *Stochastic Hydrology and Hydraulics*, 6, 151–65.
- Barrow, G. (1888) The Geology of North Cleveland: Explanation of maps 34 and 35, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series, HMSO, London, 101 pp.
- Bartley, D.D. (1962) The stratigraphy and pollen analysis of lake deposits near Tadcaster, Yorkshire. *New Phytologist*, **61**, 277–87.
- Bartley, D.D. (1966) Pollen analysis of some lake deposits near Bamborough in Northumberland. *New Phytologist*, 65, 141–56.
- Bartley, D.D. (1975) Pollen analytical evidence for prehistoric field clearance in the upland area west of Rishworth, West Yorkshire. *New Phytologist*, 74, 375–81.
- Bartley, D.D. and Chambers, C. (1992) A pollen diagram, radiocarbon ages and evidence of agriculture on Extwistle Moor, Lancashire. *New Phytologist*, **121**, 311–20.
- Bartley, D.D. and Morgan, A.V. (1990) The palynological record of the King's Pool, Staffordshire. *New Phytologist*, **116**, 177–94.
- Bartley, D.D., Chambers, C. and Hart-Jones, B. (1976) The vegetational history of parts of south and east Durham. *New Phytologist*, 77, 437–68.
- Bartley, D.D., Jones, I.P. and Smith, R.T. (1990) Studies in the Flandrian vegetational history of the Craven district of Yorkshire. *Journal of Ecology*, **78**, 611–32.
- Bateman, M.D. (1995) Thermoluminescence dating of the British coversands deposits. *Quaternary Science Reviews*, 14, 791–8.
- Bateman, M.D. (1998) The origin and age of coversand in north Lincolnshire, UK. *Permafrost and Periglacial Processes*, 9, 313–25.
- Bateman, M.D. and Catt, J.A. (1996) An absolute chronology for the raised beach and associated deposits at Sewerby, East Yorkshire, England. *Journal of Quaternary Science*, **11**, 389–95.
- Bates, M.R. (1993) Aminostratigraphy in northwestern France. *Quaternary Science Reviews*, 12, 793–810.

Battiau-Queney, Y. (1980) Contribution a l'etude

geomorphologique du massif Gallois. Unpublished PhD thesis, University of Western Britanny, 797 pp.

- Battiau-Queney, Y. (1984) The pre-glacial evolution of Wales. *Earth Surface Processes and Landforms*, 9, 229–52.
- Baumann, K.-H., Lackschewitz, K.S., Mangerud, J. et al. (1995) Reflection of Scandinavian ice sheet fluctuations in Norwegian sediments during the past 150,000 years. *Quaternary Research*, 43, 185–97.
- Baxter, J. (1983) Vegetation history of the Shirdley Hill Sands in south-west Lancashire. Unpublished PhD thesis, University of Wales, Aberystwyth.
- Beales, P.W. (1980) The Late Devensian and Flandrian vegetational history of Crose Mere, Shropshire. *New Phytologist*, **85**, 133–61.
- Beaumont, P. (1967) The glacial deposits of eastern Durham. Unpublished PhD thesis, University of Durham.
- Beaumont, P. (1968) A bistory of glacial research in Northern England from 1860 to the present day, Department of Geography University of Durham Occasional Papers Series, No. 9, Department of Geography, University of Durham, Durham, 21 pp.
- Beaumont, P. (1970) Geomorphology. In Durbam County and City with Teesside (ed. J.C. Dewdney), British Association Surveys, British Association for the Advancement of Science (Durham Local Executive Committee), Durham, pp. 26–45.
- Beaumont, P. (1971) Stone orientation and stone count data from the Lower Till sheet, eastern Durham. *Proceedings of the Yorkshire Geological Society*, 38, 343-60.
- Beaumont, P. (1972) Clay minerology of glacial tills in eastern Durham, England. In Research Methods in Pleistocene Geomorphology: proceedings of the 2nd Guelph Symposium on Geomorphology (eds E. Yatsu and A. Falconer), Department of Geography University of Guelph Geographical Publications, No. 2, Geo Abstracts Ltd, Norwich, pp. 83–108.
- Beaumont, P., Turner, J. and Ward, P.F. (1969) An Ipswichian peat raft in glacial till at Hutton Henry, Co. Durham. *New Phytologist*, 68, 779–81.
- Beckett, S.C. (1975) The Late Quaternary vegetational history of Holderness, Yorkshire. Unpublished PhD thesis, University of Hull.

Beckett, S.C. (1977a) Skipsea Withow. In

Yorkshire and Lincolnshire (ed. J. Catt), International Union for Quaternary Research Guidebook for Excursion, C7, International Union for Quaternary Research, Birmingham, pp. 36–7.

- Beckett, S.C. (1977b) The Bog, Roos. In Yorksbire and Lincolnshire (ed. J. Catt), International Union for Quaternary Research Guidebook for Excursion, C7, International Union for Quaternary Research, Birmingham, pp. 42–46.
- Beckett, S.C. (1981) Pollen diagrams from Holderness, North Humberside. Journal of Biogeography, 8, 177–98.
- Bedlington, D. (1995) Holocene sea-level changes and crustal movements in North Wales and Wirral. Unpublished PhD thesis, University of Durham.
- Behre, K.-E. (1981) The interpretation of anthropogenic indicators in pollen diagrams. *Pollen et Spores*, **23**, 225–45.
- Belbin, S. (1985) Long-term landform development in North-west England: the application of the planation concept. In *The Geomorphology of North-West England* (ed. R.H. Johnson), Manchester University Press, Manchester, pp. 37–58.
- Bell, A. (1917) The shells of the Holderness Basement Clays. *The Naturalist, Hull*, 95–8 and 135–8.
- Bell, A. (1919) Fossils of the Holderness Basement Clays. *The Naturalist*, *Hull*, 57–9.
- Bell, M. (1995) Field Survey and excavation at Goldcliff 1994. In Archaeology in the Severn Estuary: Annual Report of the Severn Estuary Levels Research Committee (ed. M. Bell), University of Wales, Lampeter, pp. 115–44.
- Bellamy, D.J., Bradshaw, M.E., Millington, G.R. and Simmons, I.G. (1966) Two Quaternary deposits in the lower Tees Basin. *New Phytologist*, **65**, 429–42.
- Bellamy, D.J., Bridgewater, P., Marshall, C. and Tickle, W.M. (1969a) Status of the Teesdale Rarities. *Nature*, **222**, 238–43.
- Bellamy, D.J., Bridgewater, P., Jones, A. and Marshall, C. (1969b) Teesdale rarities. *Nature*, 224, 619–20.
- Bemrose, H.H.A. and Newton, E.T. (1905) On a fossiliferous cavern of Pleistocene age at Hoe Grange Quarry, Longcliffe, near Brassington (Derbyshire). Quarterly Journal of the Geological Society of London, 61, 43–63.
- Benn, D. (1992) The genesis and significance of 'hummocky moraine': evidence from the Isle

of Skye, Scotland. Quaternary Science Reviews, 11, 781-99.

- Benn, D.I. (1994) Fabric shape and the interpretation of sedimentary fabric data. *Journal of Sedimentary Research*, 64, 910–15.
- Benn, D.I. (1995) Fabric signature of till deformation, Breidamerkurjökull, Iceland. Sedimentology, 42, 735–47.
- Benn, D.I. and Ballantyne, C.K. (1994) Reconstructing the transport history of glacigenic sediments: a new approach based on the co-variance of clast shape indices. *Sedimentary Geology*, **91**, 215–27.
- Benn, D.I. and Evans, D.J.A. (1996) The interpretation and classification of subglaciallydeformed materials. *Quaternary Science Reviews*, 15, 23–52.
- Benn, D.I. and Evans, D.J.A. (1998) *Glaciers and Glaciation*, Arnold, London, 734 pp.
- Bennett, K.D. and Preece, R.C. (1998) Palaeobotany. In *Late Quaternary Environmental Change in North-west Europe: Excavations at Holywell Coombe, South-east England* (eds R.C. Preece and D.R. Bridgland), Chapman and Hall, London, pp. 123–48.
- Bennett, M.R. (1994) Morphological evidence as a guide to deglaciation following the Loch Lomond Readvance: a review of research approaches and models. *Scottish Geographical Magazine*, **110**, 24–32.
- Bennett, M.R. and Doyle, P. (1994) Carruthers and the theory of glacial undermelt: lessons from a pamphleteer? *Geology Today*, **September–October**, 191–93.
- Bennett, M.R. and Glasser, N.F. (1996) Glacial Geology: Ice Sheets and Landforms, John Wiley and Sons Ltd, Chichester, 364 pp.
- Bennett, M.R, Hambrey, M.J. and Huddart, D. (1997) Modification of clast shape in high-arctic environments. *Journal of Sedimentary Research*, 67, 550–9.
- Bennett, M.R., Hambrey, M.J., Huddart, D., Glasser, N.F. and Crawford, K. (1998) The icedammed lakes of Ossian Sarsfjellet (Svalbard): their geomorphology and significance. *Boreas*, 27, 25–43.
- Bennett, M.R, Waller, R.I., Glasser, N.F., Hambrey, M.J. and Huddart, D. (1999) Glacigenic clast fabrics: genetic fingerprint or wishful thinking? *Journal of Quaternary Science*, 14, 125–35.
- Berggren, W.A., Burckle, L.H., Cita, M.B. et al. (1980) Towards a Quaternary time scale.

Quaternary Research, 13, 277-302.

- Berridge, N.G. and Pattison, J. (1994) Geology of the Country around Grimsby and Patrington, Memoir (Sheet) of the British Geological Survey (England and Wales) (81, 82, 90, 91), HMSO, London, 96 pp.
- Best, R.H. (1956) Westward proglacial drainage in Cleveland. *Proceedings of the Yorkshire Geological Society*, **30**, 301–19.
- Binford, L.R. (1978a) Dimensional analysis of behaviour and site structure: learning from an Eskimo hunting stand. *American Antiquity*, 43, 330–61.
- Binford, L.R. (1978b) Nunamuit Ethnoarchaeology, Academic Press, New York, 509 pp.
- Binford, L.R. (1983) In Pursuit of the Past: decoding the archaeological record, Thames and Hudson, London, 256 pp.
- Binney, E.W. (1848) Sketch of the drift deposits of Manchester and its neighbourhood. *Memoir of the Manchester Literary and Philosophical Society, Series 2*, 8, 195–234.
- Binney, E.W. and Talbot, J.H. (1843) On the petroleum found in the Downholland Moss, near Ormskirk. Paper read at *Fifth Annual General Meeting of the Manchester Geological Society*, 6 October 1843.
- Birks, H.J.B. (1964) Chat Moss, Lancashire. Memoirs and Proceedings of the Manchester Geological Society, 8, 41–8.
- Birks, H.J.B. (1965a) Late-Glacial deposits at Bagmere, Cheshire and Chat Moss, Lancashire. *New Phytologist*, 64, 270–5.
- Birks, H.J.B. (1965b) Pollen analytical investigations at Holcroft Moss, Lancashire and Lindow Moss, Cheshire. *Journal of Ecology*, 53, 299–314.
- Birks, H.J.B. (1973) Past and Present Vegetation on the Isle of Skye – a Palaeoecological Study, Cambridge University Press, Cambridge, 415 pp.
- Birks, H.J.B. (1982) Mid-Flandrian forest history of Roudsea Wood National Nature Reserve, Cumbria. *New Phytologist*, **90**, 339–54.
- Birks, H.J.B. (1988) Long term ecological change in the British uplands. In *Ecological Change* in the Uplands (eds M.B. Usher and D.B.A. Thompson), British Ecological Society Special Publication, No. 7, Blackwell Scientific Publications, Oxford, pp. 37–56.
- Bisat, W.S. (1932) On the subdivision of the Holderness boulder clays. *The Naturalist*, *Hull*, 215–19.

601

- Bisat, W.S. (1939) The relationship of the 'Basement Clays' of Dimlington, Bridlington and Filey Bays. *Naturalist*, **133–135**, 161–8.
- Bisat, W.S. (1940) Older and newer drift in east Yorkshire. *Proceedings of the Yorkshire Geological Society*, 24, 137–51.
- Bisat, W.S. (1946) Fluvio-glacial gravels at Stanley Ferry, near Wakefield. *Transactions of the Leeds Geological Association*, 6, 31–6.
- Bisat, W.S. (1948) Interglacial moss at Dimlington, Yorkshire. *The Naturalist, Hull*, 1.
- Bisat, W.S. and Dell, J.A. (1941) The occurrence of a bed containing moss in the boulder clays of Dimlington. *Proceedings of the Yorkshire Geological Society*, 24, 219–22.
- Björk, S., Walker, M.J.C., Cwynar, L.C. *et al.* (1998) An event stratigraphy for the Last Termination in the North Atlantic region based on the Greenland ice-core record: a proposal by the INTIMATE group. *Journal of Quaternary Science*, **13**, 283–92.
- Blackburn, K.B. (1931) The Late-Glacial and Post-Glacial periods in the North Pennines. II. Possible survivals in our flora. *Transactions of the Northumberland Naturalists Union*, 1, 30–36.
- Blackburn, K.B. (1952) The dating of a deposit containing an elk skeleton found at Neasham near Darlington, County Durham. New Phytologist, 51, 364–77.
- Blackburn, K.B. (1939) Biological Report. Bulletin of the Geological Survey of Great Britain, 2, 18-25.
- Blackford, J.J. and Chambers, F.M. (1991) Proxy records of climate from blanket mires: evidence for a dark-age (1400 BP) climatic deterioration in the British Isles. *The Holocene*, **1**, 63–7.
- Blackford, J.J. and Chambers, F.M. (1999) Harold's Bog, East Bilsdale Moor. In *The Quaternary of North-East England: field guide* (eds D.R. Bridgland, B.P. Horton and J.B. Innes), Quaternary Research Association, London, pp. 113–130.
- Blackham, A. and Flenley, J.R. (1984) A pollen analytical study of the Flandrian vegetational history at Skipsea Withow. In *Late Quaternary Environments and Man in Holderness* (ed. D.D. Gilbertson), *British Archaeological Reports British Series*, 134, British Archaeological Reports, Oxford, pp. 159–64.
- Blackham, A., Davies, C. and Flenley, J.R. (1981) Evidence for Late Devensian landslipping and Late Flandrian forest regeneration at Gormire

Lake, North Yorkshire. In *The Quaternary in Britain* (eds J. Neale and J. Flenley), Pergamon Press, Oxford, pp. 184–93.

- Blake W.H., Plater, A.J. and Boyle, J.F. (1998) Seasonal trends in the uranium-series isotopic signatures of lake waters and sediments: Hawes Water, northwest England. *Journal of Paleolimnology*, **20**, 1–14.
- Blatt, H., Middleton, G. and Murray, R. (1972) Origins of Sedimentary Rocks, Prentice-Hall, Englewood Cliffs, 634 pp.
- Bluck, B.J. (1974) Structure and directional properties of some valley sandur deposits in Southern Iceland. *Sedimentology*, **21**, 533-54.
- Bluck, B.J. (1979) Structure of coarse-grained braided stream alluvium. *Transactions of the Royal Society of Edinburgh*, **70**, 181–221.
- Boardman, J. (1977) Stratified screes in the northern Lake District. Proceedings of the Cumberland Geological Society, 3(4), 233-7.
- Boardman, J. (1978) Grèze litées near Keswick, Cumbria. Biuletyn Peryglacjalny, 27, 23–34.
- Boardman, J. (1979) Pre-Devensian weathered tills near Threlkeld Common, Keswick, Cumbria. *Proceedings of the Cumberland Geological Society*, 4(1), 33–44.
- Boardman, J. (1980) Evidence for pre-Devensian glaciation in the northeastern Lake District. *Nature*, **286**, 599–600.
- Boardman, J. (1981) Quaternary geomorphology of the northeastern Lake District. Unpublished PhD thesis, University of London, 410 pp.
- Boardman, J. (1982) Glacial geomorphology of the Keswick area, northern Cumbria. *Proceedings of the Cumberland Geological Society*, 4(2), 115–34.
- Boardman, J. (1983) The role of micromorphological analysis in an investigation of the Troutbeck Paleosol, Cumbria, England. In *Soil Micromorphology* (eds P. Bullock and C.P. Murphy), A.B. Academic Publishers, Berkhamsted, pp. 281–8.
- Boardman, J. (ed.) (1985a) Field Guide to the Periglacial Landforms of Northern England, Quaternary Research Association, Cambridge, 82 pp.
- Boardman, J. (1985b) The northeastern Lake District: periglacial slope deposits. In *Field Guide to the Periglacial Landforms of Northern England* (ed. J. Boardman), Quaternary Research Association, Cambridge, pp 23–37.

#### References

- Boardman, J. (1985c) The Troutbeck paleosol, Cumbria, England. In *Soils and Quaternary Landscape Evolution* (ed. J. Boardman), John Wiley and Sons Ltd, Chichester, pp. 231–60.
- Boardman, J. (1991) Glacial deposits of the English Lake District. In *Glacial Deposits in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 175–83.
- Boardman, J. (1992) Quaternary landscape evolution in the English Lake District: a discussion. *Proceedings of the Cumberland Geological Society*, 5(3), 285–315.
- Boardman, J. (1996) *Classic Landforms of the Lake District, Classic Landform Guides*, new edn, Geographical Association in conjunction with the British Geomorphological Research Group, Sheffield, 52 pp.
- Bolton, J. (1862) On a deposit with insects, leaves, etc. near Ulverston. *Quarterly Journal* of the Geological Society of London, 18, 274-7.
- Bond, G. and Lotti, R. (1995) Iceberg discharges into the North Atlantic on millennial timescales during the last glaciation. *Science*, 267, 1005–10.
- Bonney, A.P., Mathers, S.J. and Haworth, E.Y. (1986) Interstadial deposits with Chelford affinities from Burland, Cheshire. *Mercian Geologist*, **10**, 151–60.
- Bonny, A.P. (1972) A method for determining absolute pollen frequencies in lake sediments. *New Phytologist*, **71**, 391–403.
- Bonsall, C. (1981) The coastal factor in the Mesolithic settlement in North West England.
  In The Mesolithic in Europe, Second International Symposium, Potsdam, 3–8 April 1978 (ed. B. Gramsch), Veröffentlichungen des Museums für Urund Frühgeschichte Potsdam, Bd 14–15, Deutscher Verlag der Wissenschaften, Berlin, pp. 451–72.
- Bonsall, C. (1984) Low Hauxley, Northumberland. Summary excavation report. *Proceedings of the Prehistoric Society*, 50, 398.
- Bonsall, C., Sutherland, D.G. and Payton, R.W. (1994) The Eskmeals coastal foreland: archaeology and shoreline development. In *Cumbria: field guide* (eds J. Boardman and J. Walden), *Quaternary Research Association Field Guide*, Quaternary Research Association, Oxford, pp. 90–102.
- Boothroyd, J.C. and Ashley, G.M. (1975) Processes, bar morphology and sedimentary

structures on braided outwash fans, northeastern Gulf of Alaska. In *Glaciofluvial and Glaciolacustrine Sedimentation* (eds A.V. Jopling and B.C. McDonald), *Society of Economic Paleontologists and Mineralogists Special Publication*, No. 23, Society of Economic Paleontologists and Mineralogists, Tulsa, pp. 193–222.

- Bott, M.H.P. (1967) Geophysical investigations of the northern Pennine basement rocks. *Proceedings of the Yorkshire Geological* Society, 36, 139-68.
- Boult, J. (1865) On the alleged submarine forests on the shores of Liverpool Bay and the River Mersey. *Journal of the Polytechnic Society* 1865, 29–48.
- Boulter, M.C. (1971a) A palynological study of two of the Neogene Plant Beds in Derbyshire.
  Bulletin of the British Museum (Natural History): Geology, 19, 360-411.
- Boulter, M.C. (1971b) A survey of the Neogene flora from the Derbyshire pocket deposits. *Mercian Geologist*, 4, 45–62.
- Boulter, M.C., Ford, T.D., Ijtaba, M. and Walsh, P.T. (1971) Brassington Formation: a newly recognised Tertiary formation in the southern Pennines. *Nature*, **231**, 134–6.
- Boulton, G.S. (1967) The development of a complex supraglacial moraine at the margin of Sørbreen, Ny Friesland, Vestspitsbergen. *Journal of Glaciology*, 6, 717–36.
- Boulton, G.S. (1968) Flow tills and related deposits on some Vestspitsbergen glaciers. *Journal of Glaciology*, 7, 391–412.
- Boulton, G.S. (1970) On the origin and transport of englacial debris in Svalbard glaciers. *Journal of Glaciology*, 9, 213–28.
- Boulton, G.S. (1971) Till genesis and fabric in Svalbard, Spitsbergen. In *Till: a Symposium* (ed. R.P. Goldthwait), Ohio State University Press, Columbus, pp. 41–72.
- Boulton, G.S. (1972) Modern Arctic glaciers as depositional models for former ice sheets. *Journal of the Geological Society, London*, 128, 361–93.
- Boulton, G.S. (1976) A genetic classification of tills and criteria for distinguishing tills of different origin. In *Till: its Genesis and Diagenesis* (ed. W. Stankowski), Uniwersytet im Adama Mickiewicza W Paznaniu, Seria Geografia, 12, 65–80.
- Boulton, G.S. (1977) A multiple till sequence formed by a Late-Devensian Welsh ice cap: Glanllynau, Gwynedd. *Cambria*, 4, 10–31.

- Boulton G.S. (1978) Boulder shapes and grainsize distributions of debris as indicators of transport paths through a glacier and till genesis. *Sedimentology*, **25**, 773–99.
- Boulton, G.S. (1979) Processes of glacier erosion on different substrata. *Journal of Glaciology*, 23, 15–38.
- Boulton, G.S. (1987) A theory of drumlin formation by subglacial deformation. In Drumlin Symposium: proceedings of the Drumlin Symposium, first International Conference on Geomorphology, Manchester, 16–18 September 1985 (eds J. Menzies and J Rose), A.A. Balkema Publishers, Rotterdam, pp. 25–80.
- Boulton, G.S. (1996) Theory of glacial erosion, transport and deposition as a consequence of subglacial sediment deformation. *Journal of Glaciology*, **42**, 43–62.
- Boulton, G.S. and Dobbie, K.E. (1993) Consolidation of sediments by glaciers: relations between sediment geotechnics, soft-bed glacier dynamics and subglacial groundwater flow. *Journal of Glaciology*, **39**, 26–44.
- Boulton, G.S. and Eyles, N. (1979) Sedimentation by valley glaciers: a model and genetic classification. In Moraines and Varves: origin, genesis, classification: proceedings of an INQUA Symposium on Genesis and Lithology of Quaternary Deposits, Zurich, 10–20 September 1978, (ed. C. Schlüchter), A.A. Balkema Publishers, Rotterdam, pp. 11–24.
- Boulton, G.S. and Hindmarsh, R.C.A. (1987) Sediment deformation beneath glaciers: rheology and geological consequences. *Journal* of *Geophysical Research*, **92**, 9059–82.
- Boulton, G.S. and Paul, M.A. (1976) The influence of genetic processes on some geotechnical properties of glacial tills. *Quarterly Journal of Engineering Geology*, 9, 159–94.
- Boulton, G.S. and Worsley, P. (1965) Late Weichselian glaciation of the Cheshire-Shropshire Basin. *Nature*, **207**, 704–6.
- Boulton, G.S., Jones, A.S., Clayton, K.M. and Kenning, M.J. (1977) A British ice sheet model and patterns of glacial erosion and deposition in Britain. In *British Quaternary Studies: Recent Advances* (ed. F.W. Shotton), Clarendon Press, Oxford, pp. 231–46.
- Boulton, G.S., Smith, G.S., Jones, A.J. and Newsome, J. (1985) Glacial geology and glaciology of the last mid-latitude ice sheets. *Journal of the Geological Society, London*, 142, 447-74.

- Boulton, G.S., Peacock, J.D. and Sutherland, D.G. (1991) Quaternary. In *Geology of Scotland* (ed. G.Y. Craig), 3rd edn, Geological Society of London, London, pp. 503–43.
- Bourke, R. (1993) A palynological study of the Late-glacial in Gransmoor Quarry, East Yorkshire. Unpublished MSc thesis, Royal Holloway, University of London.
- Bowen, D.Q. (1973) The Pleistocene history of Wales and the borderland. *Geological Journal*, 8, 207–24.
- Bowen, D.Q. (1978) Quaternary Geology: a Stratigraphic Framework for Multidisciplinary work, Pergamon Press, Oxford, 221 pp
- Bowen, D.Q. (1989) The last interglacial-glacial cycle in the British Isles. *Quaternary International*, 3/4, 41-7.
- Bowen, D.Q. (1991) Time and space in the glacial sediment systems of the British Isles. In *Glacial Deposits in Great Britain and Ireland* (ed. J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 3–11.
- Bowen, D.Q. (1999) A Revised Correlation of Quaternary Deposits in the British Isles, Geological Society of London Special Report, No. 23, Geological Society of London, Bath, pp. 174.
- Bowen, D.Q. and Sykes, G.A. (1988) Correlation of marine events and glaciations on the North East Atlantic Margin. *Philosophical Transactions of the Royal Society*, **B318**, 619–35.
- Bowen, D.Q. and Sykes, G.A. (1991) Discussion of 'The correlation of the Speeton Shell Bed, Filey Bay to an oxygen isotope stage'. *Proceedings of the Yorkshire Geological Society*, 48, 463-5.
- Bowen, D.Q., Rose, J., McCabe, A.M. and Sutherland, D.G. (1986) Correlation of Quaternary glaciations in England, Ireland, Scotland and Wales. *Quaternary Science Reviews*, 5, 299–340.
- Bowen, D.Q., Hughes, S., Sykes, G.A. and Miller, G.H. (1989) Land-sea correlations in the Pleistocene based on isoleucine epimerization in non-marine molluscs. *Nature*, **340**, 49–51.
- Bowen, D.Q., Smith, D.B. and Sykes, G.A. (1991) The age of the Easington Raised Beach, County Durham. *Proceedings of the Yorkshire Geological Society*, **48**, 415–20.
- Bower, M.M. (1960a) Peat erosion in the Pennines. Advancement of Science, 16,

323-31.

- Bower, M.M. (1960b) The erosion of blanket peat in the southern Pennines. *East Midland Geographer*, **13**, 22–33.
- Bower, M.M. (1961) The distribution of erosion in blanket peat bogs in the Pennines. *Transactions of the Institute of British Geographers*, 29, 17–30.
- Bower, M.M. (1962) The cause of erosion in blanket peat bogs. Scottish Geographical Magazine, 78, 33-43.
- Boyce, J.I. and Eyles, N. (1991) Drumlins carved by deforming till streams below the Laurentide ice sheet. *Geology*, **19**, 787–90.
- Boyce, J.I. and Eyles, N. (2000) Architectural element analysis applied to glacial deposits: internal geometry of a late Pleistocene till sheet, Ontario, Canada. *Bulletin of the Geological Society of America*, **112**, 98–118.
- Boylan, P.J. (1966a) New records of Holocene Mollusca from East Yorkshire. *The Naturalist*, 899, 113–18.
- Boylan, P.J. (1966b) The Pleistocene deposits of Kirmington, Lincolnshire. *Mercian Geologist*, 1, 339–50.
- Boylan, P.J. (1967) Pleistocene Mammalia of the Sewerby-Hessle buried cliff. *Proceedings of the Yorkshire Geological Society*, **36**, 115–25.
- Boylan, P.J. (1972) The scientific significance of the Kirkdale Cave hyaenas. Yorksbire Philosophical Society Annual Report for 1971, 38-47.
- Boylan, P.J. (1977a) Kirkdale Cave. In Yorkshire and Lincolnshire (ed. J. Catt), International Union for Quaternary Research Guidebook for Excursion, C7, International Union for Quaternary Research, Birmingham, pp. 26–7.
- Boylan, P.J. (1977b) Victoria Cave. In Yorkshire and Lincolnshire (ed. J. Catt), International Union for Quaternary Research Guidebook for Excursion, C7, International Union for Quaternary Research, Birmingham, pp. 52–3.
- Bradshaw, M.E. (1970) The Teesdale Flora. In Durham County and City with Teesside (ed. J.C. Dewdney), British Association for the Advancement of Science (Durham Local Executive Committee), Durham, pp. 141–152.
- Bradshaw, M.E. and Clark, W.A. (1965) Flora and vegetation. Chapter 3. In *The Natural History* of Upper Teesdale (ed. D.H. Valentine), Northumberland and Durham Naturalist's Trust, Newcastle upon Tyne.
- Bradshaw, M.E. and Clark, W.A. (1976) Flora and vegetation. In *The Natural History of Upper*

*Teesdale* (ed. M.E. Bradshaw), rev. edn, Durham Conservation Trust Ltd, Darlington, pp. 23–41.

Bradshaw, M.E., Clark, W.A. and Turner, J. (1976)
Origin and history of the Teesdale Flora. In *The Natural History of Upper Teesdale* (ed. M.E. Bradshaw), rev. edn, Durham Conservation Trust Ltd, Darlington, pp. 42–9.

- Bramwell, D. (1964) The excavations at Elder Bush Cave, Wetton, Staffordshire. North Staffordshire Journal of Field Studies, 4, 46-59.
- Bramwell, D. and Shotton, F.W. (1982) Rodent remains from the caddis-bearing tufa of Elder Bush Cave. *Quaternary Newsletter*, **38**, 7–13.
- Branch, N.P. and Scaife, R.G. (1995) The stratigraphy and pollen analysis of peat sequences associated with the Lindow III bog body. In *Bog Bodies. New Discoveries and New Perspectives* (eds. R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 19–30.
- Brayshay, B. (1999) Some palaeoenvironmental evidence for marginality in the upper Mersey Basin. In Living on the Edge of Empire: Models, Methodology and Marginality. Late Prehistoric and Romano-British Rural Settlement in Northwest England (ed. M. Nevell), Council for British Archaeology North West, Field Archaeology Centre at the University of Manchester and Chester Archaeology, Manchester, pp 82–9
- Breeze, D.J. and Dobson, B. (1978) *Hadrian's Wall*, rev. edn, Penguin, Harmondsworth, 324 pp.
- Brenchley, P. (1968) An investigation into the glacial deposits at Thurstaston, Wirral. *Amateur Geologist*, **3**, 27–40.
- Brennand, T.A. (1994) Macroforms, large bedforms and rhythmic sedimentary sequences in subglacial eskers, south-central Ontario, implications for esker genesis and meltwater regime. *Sedimentary Geology*, **51**, 9–55.
- Brew, D.S., Funnell, B.M. and Kreiser, A. (1992) Sedimentary environments and Holocene evolution of the lower Blyth estuary, Suffolk (England), and a comparison with other East Anglian coastal sequences. *Proceedings of the Geologists' Association*, **103**, 57–74.
- Bridger, J.F.D. (1975) The Pleistocene succession in the southern part of Charnwood Forest. *Mercian Geologist*, **5**, 189–203.
- Bridger, J.F.D. (1977) Barmston. In Yorkshire and Lincolnshire (ed. J. Catt), International

Union for Quaternary Research Guidebook for Excursion, C7, International Union for Quaternary Research, Birmingham, pp. 32–6.

- Bridger, J.F.D. (1981) The glaciation of Charnwood Forest, Leicestershire and its geomorphological significance. In *The Quaternary in Britain* (eds J. Neale and J. Flenley), Pergamon Press, Oxford, pp. 68–81.
- Bridgland, D.R. (1994) *Quaternary of the Thames*, Geological Conservation Review Series, No. 7, Chapman and Hall, London, 441 pp.
- Bridgland, D.R. (1999) The Pleistocene of northeast England. In *The Quaternary of North-East England: field guide* (eds D.R.
  Bridgland, B.P. Horton and J.B. Innes), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 1–9.
- Bridgland, D.R. and Austin, W.E.N. (1999) Shippersea Bay to Hawthorn Hive. In *The Quaternary of North-East England: field guide* (eds D.R. Bridgland, B.P. Horton and J.B. Innes), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 51–6.
- Bridgland, D.R. and Thomas, G.N. (1999)
  Kirmington. In *The Quaternary of North-East England: field guide* (eds D.R. Bridgland, B.P. Horton and J.B. Innes), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 180–4.
- Briggs, C.S. (1995) Did they fall or were they pushed? Some unresolved questions about bog bodies. In *Bog Bodies. New Discoveries* and New Perspectives (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 168–82.
- Briggs, C.S. and Turner, R.C. (1986) The bog burials of Britain and Ireland. In *Lindow Man. Body in the Bog* (eds. I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 144–62.
- Briggs, D.J. and Burek, C.V. (1985) Quaternary deposits in the Peak District. In *Peak District* and Northern Dukeries: field guide (eds D.J. Briggs, D.D.Gilbertson and R.D.S. Jenkinson), *Quaternary Research Association Field* Guide, Quaternary Research Association, Cambridge, pp. 17–32.
- Bristow, C.R. and Cox, F.C. (1973) The Gipping Till: a reappraisal of East Anglian glacial stratigraphy. *Journal of the Geological Society, London*, **129**, 1–37.

- British Geological Survey (1991) Sheet 81 Patrington (and including parts of Sheets 82 and 90) Solid and Drift Geology, British Geological Survey 1:50 000 Series: England and Wales, Ordnance Survey, Southampton.
- Brodrick, H. (1903) Martin Mere. Report of the British Association for the Advancement of Science, Transactions Section C, p. 656.
- Brodzikowski, K., Gotowala, R., Haluszczak, A., Krzyskowski, D. and Van Loon, A.J. (1987) Soft-sediment deformations from the glaciodeltaic, glaciolacustrine and fluviolacustrine sediments from the Kleszczow graben (Poland). In *Deformation of Sediments and Sedimentary Rocks* (eds M.E. Jones and R.M.F. Preston), *Geological Society of London Special Publication*, No. 29, Blackwell Scientific Publications, Oxford, pp. 255–67.
- Broecker, W.S. (1994) Massive iceberg discharges as triggers for global climate change. *Nature*, **372**, 421–4.
- Bronger, A. and Catt, J.A. (1989) Paleosols: problems of definition, recognition and interpretation. *Catena*, *Supplement*, 16, 1–7.
- Brook, A., Brook, D., Davies, G.M. and Long, M.H. (1982) Northern Caves, Vol. 2: Penyghent and Malham, 2nd edn, Dalesman, Clapham, 128 pp.
- Brooks, S.J. and Birks, H.J.B. (2000) Chironomid-inferred Late-glacial air temperatures at Whitrig Bog, Southeast Scotland. *Journal of Quaternary Science*, **15**, 759–64.
- Brothwell, D. (1986) *The Bog Man and the Archaeology of People*, British Muscum Publications, London, 128 pp.
- Brothwell, D. (1995) Recent research on the Lindow bodies in the context of five years of world studies. In *Bog Bodies. New Discoveries and New Perspectives* (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 100–3.
- Brothwell, D. and Bourke, J.B. (1995) The human remains from Lindow Moss 1987–8. In *Bog Bodies. New Discoveries and New Perspectives* (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 52–58.
- Brown, A.G. (1988) The palaeoecology of *Alnus* (alder) and the postglacial history of floodplain vegetation: pollen percentage and influx data from the West Midlands, UK. *New Phytologist*, **110**, 425–36.
- Brown, A.G. (1990) Holocene floodplain diachronism and inherited downstream variations in fluvial processes: a study of the River

Perry, Shropshire, England. Journal of Quaternary Science, 5, 39–51.

- Browne, M., Heath, R.J., Huddart, D. and Nathanail, P. (eds) (1997) *The Quaternary Geology of West Cumbria Field Guide*, Environment Group of the Geological Society of London, London, 100 pp.
- Brumhead, D. (1979) Geology Explained in the Yorkshire Dales and on the Yorkshire Coast, David and Charles, Newton Abbot, 192 pp.
- Bryan, K. (1923) Pedestal rocks in the arid South-west. U.S. Geological Survey Bulletin, B 0760-A, 1-11.
- Bryan, K. (1926) Pedestal rocks formed by differential erosion and channel erosion of the Rio Salado, Socorro County, New Mexico, U.S Geological Survey Bulletin, B 0790–A, 1–19.
- Bryant, R.H. and Carpenter, C.P. (1987) Ramparted ground ice depressions in Britain and Ireland. In *Periglacial Processes and Landforms in Britain and Ireland* (ed. J. Boardman), Cambridge University Press, Cambridge, pp. 183–90.
- Bryant, R.H., Carpenter, C.P. and Ridge, T.S. (1985) Pingo scars and related features in the Whicham Valley, Cumbria. In *Field Guide to the Periglacial Landforms of Northern England* (ed. J. Boardman), Quaternary Research Association, Cambridge, pp. 47–53.
- Buckland, P.C. (1979) Thorne Moors: a Palaeoecological Study of a Bronze Age Site, Department of Geography University of Birmingham Occasional Publication, No. 8, Department of Geography, University of Birmingham, Birmingham, 173 pp.
- Buckland, P.C. (1982) The coversands of north Lincolnshire and the Vale of York. In *Papers in Earth Studies: Lovatt Lectures – Worcester* (eds B.H. Adlam, C.R. Fenn and L. Morris), Geo Books, Norwich, pp. 143–78.
- Buckland, P.C. (1995) Peat stratigraphy and the age of the Lindow Bodies. In *Bog Bodies. New Discoveries and New Perspectives* (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 47–9.
- Buckland, P.C. and Edwards, K.J. (1984) The longevity of pastoral episodes of clearance activity in pollen diagrams: the role of postoccupation grazing. *Journal of Biogeography*, **11**, 243–9.
- Buckland P.C. and Sadler J. (1985) The nature of late Flandrian alluviation in the Humberhead levels. *East Midland Geographer*, **8**, 239–51.

Buckland, P.C., Pyatt, F.B. and Housley, R. (1994)

Paints, dates, bog stratigraphy and murder: some comments on Lindow Man. In *Whither Environmental Archaeology?* (eds R. Luff and P. Bowley-Conwy). *Oxbow Monograph*, No. **38**, Oxbow Books, Oxford, pp. 7–12.

- Buckland, W. (1822) An account of an assemblage of fossil teeth and bones discovered in a cave at Kirkdale. *Philosophical Transactions* of the Royal Society of London, 122, 171–236.
- Büdel, J. (1982). Climatic Geomorphology, Princeton University Press, Princeton, 443 pp.
- Budworth, G., McCord, M., Priston, A.V. and Stead, I.M. (1986) The artefacts. In *Lindow Man. Body in the Bog* (eds. I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 38–40.
- Bullerwell, R.G.A. (1910) A section of the cliffs near Newbiggin-by-the Sea, in which is exposed a gravel bed containing Chalk flints. *Transactions of the Natural History of Northumberland*, 4, 61–8.
- Bullock, P., Carroll, D.M. and Jarvis, R.A. (1973) Palaeosol features in Northern England. *Nature*, 242, 53–4.
- Bunting, B.T. (1961) The role of seepage moisture in soil formation, slope development and stream initiation. *American Journal of Science*, **259**, 503–18.
- Burek, C. (1977) In *Limestones and Caves of the Peak District* (ed. T.D. Ford), Geo Abstracts, Norwich, 469 pp.
- Burek, C.V. (1978) Quaternary deposits on the Carboniferous Limestone of Derbyshire, Unpublished PhD thesis, University of Leicester, 509 pp.
- Burek, C.V. (1991) Quaternary history and glacial deposits of the Peak District. In *Glacial Deposits in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 193–202.
- Burgess, I.C. and Mitchell, M. (1994) Origin of limestone pavements. Proceedings of the Cumberland Geological Society, 5(4), [for 1992-3], 405-12.
- Burgess, I.C. and Wadge, A.J. (1974) The Geology of the Cross Fell Area: Explanation of 1:25 000 geological Special Sheet comprising parts of Sheets NY53, 62, 63, 64, 71, 72, 73, Classic Areas of Geology Description of 1:25 000 Sheets, HMSO, London, 91 pp.
- Burleigh, R., Ambers, J. and Matthews, K. (1983) British Museum natural radiocarbon measurements XVI. *Radiocarbon*, 25, 40.
- Bush, M.B. (1986) The Late Quaternary Palaeo-

ecological History of the Great Wold Valley. Unpublished PhD thesis, University of Hull.

- Bush, M.B. (1988a) Early Mesolithic disturbance: a force on the landscape. *Journal of Archaeological Science*, **15**, 453–62.
- Bush, M.B. (1988b) The use of multivariate analysis and modern analogue sites as an aid to the interpretation of data from fossil mollusc assemblages. *Journal of Biogeography*, **15**, 849–61.
- Bush, M.B. (1989) On the antiquity of British chalk grasslands: a response to Thomas. *Journal of Archaeological Science*, 16, 555–60.

Bush, M.B. (1993) An 11 400 year palaeoecological history of a British chalk grassland. *Journal of Vegetation Science*, 4, 47–66.

- Bush, M.B. and Ellis, S. (1987) The sedimentological and vegetational history of Willow Garth. In *East Yorkshire: field guide* (ed. S. Ellis), *Quaternary Research Association Field Guide*, Quaternary Research Association, Cambridge, pp. 42–52.
- Bush, M.B. and Flenley, J.R. (1987) The age of the British chalk grasslands. *Nature*, 395, 484–85.

Bush, M.B. and Hall, A.R. (1987) Flandrian Alnus: expansion or immigration? Journal of Biogeography, 14, 479–81.

- Bushell, T.P. (1986) Reservoir geology of the Morecambe Field. In *Habitat of Palaeozoic* Gas in NW Europe: proceedings of a conference beld at the Royal Society, London, on 11th and 12th February 1995 (eds J. Brooks, J. Goff and B. Van Hoorn), Geological Society of London Special Publication, No. 23, Scottish Academic Press, Edinburgh, pp. 189–208.
- Butterworth, A. and Lewis, G.D. (1968) *Prebistoric and Roman Times in the Sheffield Area*, Sheffield City Museums, Sheffield, 16 pp.
- Butzer, K. (1965) Environment and Archaeology: an introduction to Pleistocene geography, Methuen, London, 524 pp.
- Caine, N. (1967) The tors of Ben Lomond, Tasmania. Zeitschrift für Geomorphologie, 11, 418–29.
- Caine, N. (1992) Sediment transfer on the floor of the Martinelli snowpatch, Colorado Front Range, USA. Geografiska Annaler, 74A, 133–44.
- Caine, T.N. (1963a) The origin of sorted stripes in the Lake District, northern England.

Geografiska Annaler, 45A, 172-9.

- Caine, T.N. (1963b) Movement of low angle scree slopes in the Lake District, northern England. *Revue de Géomorphologie Dynamique*, 14, 171-7.
- Caine, T.N. (1972) The distribution of sorted patterned ground in the English Lake District. *Revue de Géomorphologie Dynamique*, 21(2), 49–56.
- Cameron A.G. (1878) Notes on some peat deposits at Kildale and West Hartlepool. *Geological Magazine*, 5, 351-2.
- Cameron, K. (1959) The Place-names of Derbyshire, English Place Name Society, Cambridge University Press, London.
- Cameron, T.D.J., Crosby, A., Balson, P.S. et al. (1992) The Geology of the Southern North Sea, United Kingdom Offshore Regional Report, No. 7, HMSO, London, 152 pp.
- Cameron, T.D.J., Stoker, M.S. and Long, D. (1987) The history of Quaternary sedimentation in the UK sector of the North Sea Basin. *Journal of the Geological Society, London*, 144, 43–58.
- Campbell, J.B. (1969) Excavations at Creswell Crags. *Derbyshire Archaeological Journal*, 89, 47–58.
- Campbell, J.B. (1977) The Upper Palaeolithic of Britain: a Study of Man and Nature in the Late Ice Age, Clarendon Press, Oxford.
- Campbell, S. and Bowen, D.Q. (1989) *Quaternary of Wales*, Geological Conservation Review Series, No. 2, Nature Conservancy Council, Peterborough 237 pp.
- Campbell, S., Hunt, C.O., Scourse, J.D., Keen, D.H. and Stephens, N. (1998) *Quaternary of South-west England*, Geological Conservation Review Series, No. 14, Chapman and Hall, London, 439 pp.
- Carling, P. (1997) Sedimentology of the 1749 flood deposit. In *Geomorphology of the Lake District: a Field Guide* (ed J. Boardman), Environmental Change Unit for the British Geomorphological Research Group, Oxford, pp. 23–9.
- Carroll, D.M. and Bendelow, V.C. (1981) Soils of the North York Moors, Soil Survey Special Survey, No. 13, Soil Survey of England and Wales, Harpenden, 132 pp.
- Carruthers, R.G. (1939) On Northern glacial drifts: some peculiarities and their significance. *Quarterly Journal of the Geological Society of London*, **95**, 299–310.
- Carruthers, R.G. (1947) The secret of the glacial

drifts. *Proceedings of the Yorkshire Geological Society*, **27**, 43–57.

- Carruthers, R.G. (1948) The secret of the glacial drifts. Part II. Applications to Yorkshire. *Proceedings of the Yorkshire Geological Society*, 27, 129-72.
- Carruthers, R.G. (1953) *Glacial Drifts and the Undermelt Theory*, Harold Hill, Newcastle, 42 pp.
- Carruthers, R.G., Dinham, C.H., Burnett, G.A. and Maden, J. (1927) *The Geology of Belford*, *Holy Island and the Farne Islands: Explanation of Sheet 4*, 2nd edn, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series, HMSO, London, 195 pp.
- Carruthers, R.G., Burnett, G.A. and Anderson, W. (1930) *The Geology of the Alnwick district: Explanation of Sheet 6*, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series, HMSO, London, 138 pp.
- Carruthers, R.G., Burnett, G.A. and Anderson, W. (1932) *The Geology of the Cheviot Hills: Explanation of Sheets 3 and 5*, Memoir of the Geological Survey of Great Britain (England and Wales) – New Series, HMSO, London, 174 pp.
- Carson, M.A. and Petley, D.J. (1970) The existence of threshold hillslopes in the denudation of the landscape. *Transactions of the Institute of British Geographers*, **49**, 71–95.
- Carter, B.A., Johnson, A.L. and Turner, J. (1978) An interglacial deposit at Scandal Beck, N.W. England. *New Phytologist*, **81**, 785–90.
- Carter, R.J. (1977) Age estimation of the roe deer (*Capreolus capreolus*) mandibles from the Mesolithic site of Star Carr, Yorkshire, based on radiographs of mandibular tooth development. *Journal of the Zoological Society of London*, 241, 495–502.
- Carter, W.L. (1905) The glaciation of the Don and Dearne valleys. *Proceedings of the Yorkshire Geological Society*, **15**, 411–36.
- Catt, J.A. (1963) Stratigraphical Investigations in the Pleistocene Deposits of Holderness, East Yorkshire. Unpublished PhD thesis, University of Hull.
- Catt, J.A. (1977a) General introduction. In Yorksbire and Lincolnsbire (ed. J. Catt), International Union for Quaternary Research Guidebook for Excursion, C7, International Union for Quaternary Research, Birmingham, pp. 6–9.

- Catt, J.A. (1977b) Kirmington. In Yorksbire and Lincolnshire (ed. J. Catt), International Union for Quaternary Research Guidebook for Excursion, C7, International Union for Quaternary Research, Birmingham, pp. 14–16.
- Catt, J.A. (ed.) (1977c) Yorkshire and Lincolnshire, International Union for Quaternary Research Guidebook for Excursion, C7, International Union for Quaternary Research, Birmingham, 56 pp.
- Catt, J.A. (1977d) York and Escrick moraines. In Yorksbire and Lincolnshire (ed. J. Catt), International Union for Quaternary Research Guidebook for Excursion, C7, International Union for Quaternary Research, Birmingham, pp. 16–17.
- Catt, J.A. (1980) Till facies associated with the Devensian glacial maximum in eastern England. *Quaternary Newsletter*, **30**, 4–10.
- Catt, J.A. (1981) British pre-Devensian glaciations. In *The Quaternary in Britain* (eds J. Neale and J. Flenley), Pergamon Press, Oxford, pp. 9–19.
- Catt, J.A. (1982) The Quaternary deposits of the Yorkshire Wolds. *Proceedings of the North of England Soils Discussion Group*, **18**, 61–7.
- Catt, J.A. (1986) Soils and Quaternary Geology: a handbook for field scientists, Monographs on soil and resource surveys, No. 11, Clarendon Press, Oxford, 267 pp.
- Catt, J.A. (1987a) The Quaternary of East Yorkshire and adjacent areas. In *East* Yorkshire: field guide (ed. S. Ellis), *Quaternary Research Association Field* Guide, Quaternary Research Association, Cambridge, pp. 1–14.
- Catt, J.A. (1987b) Dimlington. In *East Yorksbire: field guide* (ed. S. Ellis), *Quaternary Research Association Field Guide*, Quaternary Research Association, Cambridge, pp. 82–98.
- Catt, J.A. (1987c) Sewerby. In *East Yorksbire: field guide* (ed. S. Ellis), *Quaternary Research Association Field Guide*, Quaternary Research Association, Cambridge, pp. 53–7.
- Catt, J.A. (1990a) Palaeopedology manual. Quaternary International, 6, 1–95.
- Catt, J.A. (1990b) Geology and relief. In *Humber Perspectives. A Region Through the Ages* (eds S. Ellis and D.R. Crowther), Hull University Press, Hull, pp. 13–28.
- Catt, J.A. (1991a) Late Devensian glacial deposits and glaciations in eastern England and the adjoining offshore region. In *Glacial Deposits*

*in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 61–8.

- Catt, J.A. (1991b) The Quaternary history and glacial deposits of East Yorkshire. In *Glacial Deposits in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 185–92.
- Catt, J.A. (1996) Recent work on Quaternary palaeosols in Britain. *Quaternary International*, 34–36, 183–90.
- Catt, J.A. and Digby, P.G.N. (1988) Boreholes at Easington, Holderness, July 1985. Proceedings of the Yorkshire Geological Society, 47, 21-7.
- Catt, J.A. and Hodgson, J.M. (1976) Soils and geomorphology of the chalk of south east England. *Earth Surface Processes and Landforms*, 1, 181–93.
- Catt, J.A. and Madgett, P.A. (1981) The work of W.S. Bisat FRS on the Yorkshire Coast. In *The Quaternary in Britain* (eds J. Neale and J. Flenley), Pergamon Press, Oxford, pp. 119–36.
- Catt, J.A. and Penny, L.F. (1966) The Pleistocene deposits of Holderness, East Yorkshire. *Proceedings of the Yorkshire Geological Society*, **35**, 375–420.
- Catt, J.A., Weir, A.H. and Madgett, P.A. (1974) The loess of eastern Yorkshire and Lincolnshire. *Proceedings of the Yorkshire Geological Society*, 40, 23–39.
- Caulfield, S. (1978) Star Carr an alternative view. *Irish Archaeological Research Forum*, **5**, 15–22.
- Chambers, C. (1974) Vegetational history of Teesdale. Unpublished PhD thesis, University of Durham.
- Chambers, C. (1978) A radiocarbon dated pollen diagram from Valley Bog, on the Moor House Nature Reserve. *New Phytologist*, **80**, 273–80.
- Chambers, F.M., Barber, K.E., Maddy, D. and Brew, J. (1997) A 5500-year proxy-climate and vegetation record from blanket mire at Talla Moss, Borders, Scotland. *The Holocene*, 7, 391–9.
- Charlesworth, J.K. (1926) The glacial geology of the Southern Uplands, west of Annandale and upper Clydesdale. *Transactions of the Royal Society of Edinburgb*, **55**, 1–23.
- Charlesworth, J.K. (1955) The late-glacial history of the Highlands and Islands of Scotland. *Transactions of the Royal Society of Edinburgb*, **62**, 769–928.

- Chiverrell, R.C. (1998) Moorland vegetation history and climate change on the North York Moors during the last 2000 years. Unpublished PhD thesis, University of Leeds.
- Chiverrell, R.C. and Atherden, M.A. (1999)
  Climate change and human impact evidence
  from the peat stratigraphy at sites in the eastern North York Moors. In *The Quaternary of*North-East England: field guide (eds D.R.
  Bridgland, B.P. Horton and J.B. Innes),
  Quaternary Research Association Field
  Guide, Quaternary Research Association,
  London, pp. 113–30.
- Chiverrell, R.C. and Atherden, M.A. (2000) Post Iron Age vegetation history and climate change on the North York Moors: a preliminary report. In *People as an Agent of Environmental Change* (eds R.A. Nicholson and T.P. O'Connor), *Symposia of the Association for Environmental Archaeology*, No. 16, Oxbow Books, Oxford. pp. 45–59.
- Christiansen, H.H. (1996) Effects of nivation on periglacial landscape evolution in western Jutland, Denmark. *Permafrost and Periglacial Processes*, 7, 111–38.
- Christiansen, H.H. (1998a) Nivation forms and processes in unconsolidated sediments, NE Greenland. *Earth Surface Processes and Landforms*, 23, 751-60.
- Christiansen, H.H. (1998b) 'Little Ice Age' nivation activity in northeast Greenland. *The Holocene*, **8**, 719–28.
- Church, M. and Gilbert, R. (1975) Proglacial fluvial and lacustrine environments. In Glaciofluvial and Glaciolacustrine Sedimentation (eds A.V. Jopling and B.C. McDonald), Society of Economic Paleontologists and Mineralogists Special Publication, No. 23, Society of Economic Paleontologists and Mineralogists, Tulsa, pp. 22–100.
- Clapham, A.J. (1999) The characterisation of two mid-Holocene submerged forests. Unpublished PhD thesis, Liverpool John Moores University.
- Clapham, A.J., Clare, T. and Wilkinson, D. (1997) A plant macrofossil investigation of a submerged forest. In Archaeological Science 1995: proceedings of a conference on the application of scientific techniques to the study of archaeology, Liverpool, July 1995, (eds A. Sinclair, E. Slater and J. Gowlett), Oxbow Monograph, No. 64, Oxbow Books, Oxford, pp. 265-70.

- Clapham, A.R. (1978) Introduction. In Upper Teesdale: the Area and its Natural History (ed. A.R. Clapham), Collins, London, pp. 15–25.
- Clapperton, C.M. (1966) The influence of topography on the superimposition of glacial meltwater streams. In Deglaciation: Geomorphological Symposium, the Institute of British Geographers, Saint Andrews, January 1966 (ed. R.J. Price), British Geomorphological Research Group, Occasional Paper, No. 3, British Geomorphological Research Group, Swansea, pp. 13-18.
- Clapperton, C.M. (1967) The Deglaciation of the East Cheviot area, Northumberland. Unpublished PhD thesis, University of Edinburgh.
- Clapperton, C.M. (1968) Channels formed by the superimposition of glacial meltwater streams with special reference to the east Cheviot Hills, northeast England. *Geografiska Annaler*, **50A**, 207–20.
- Clapperton, C.M. (1970) The evidence for a Cheviot ice cap. *Transactions of the Institute* of British Geographers, **50**, 115–27.
- Clapperton, C.M. (1971a) The pattern of deglaciation in part of north Northumberland. *Transactions of the Institute of British Geographers*, 53, 67–78.
- Clapperton, C.M. (1971b) The location and origin of glacial meltwater phenomena in the eastern Cheviot hills. *Proceedings of the Yorkshire Geological Society*, **38**, 361–80.
- Clapperton, C.M. and Sugden, D.E. (1977) The Late Devensian glaciation of north-east Scotland. In *Studies in the Scottish Lateglacial Environment* (eds J.M. Gray and J.J. Lowe), 1st edn, Pergamon Press, Oxford, pp. 1–13.
- Clark, C.D. (1997) Reconstructing the evolutionary dynamics of former ice sheets using multitemporal evidence, remote sensing and GIS. *Quaternary Science Reviews*, 16, 1067–92.
- Clark, J.G.D. (1954) Excavations at Star Carr: an early Mesolithic site at Seamer near Scarborough, Cambridge University Press, Cambridge, 200 pp.
- Clark, J.G.D. (1972) Star Carr: a Case Study in Bioarchaeology, Addison-Wesley Module in Anthropology, 10, Addison-Wesley, Reading, MA.
- Clark, J.G.D. and Godwin, H. (1956) A Maglemosian site at Brandesburton,

Holderness, Yorkshire. *Proceedings of the Prehistoric Society*, **22**, 6–22.

- Clark, P.U. (1991) Striated clast pavements, products of deforming subglacial sediment? *Geology*, **19**, 530–3.
- Clark, P.U., MacAyeal, D.R., Andrews, J.T. and Bartlein, P.J. (1995) Ice sheets play important role in climate change. *EOS (Transactions, American Geophysical Union)*, 27, 265-6.
- Clark, R. (1967) A contribution to glacial studies of the Malham Tarn area. *Field Studies*, 2, 479–91.
- Clark, R. (1970) Aspects of glaciation in Northumberland. *Proceedings of the Cumberland Geological Society*, 2, 133-56.
- Clark, R. (1971) Periglacial landforms and landscapes in Northumberland. *Proceedings of the Cumberland Geological Society*, **3**, 5–20.
- Clark, R. (1994a) Tors, rock platforms and debris slopes at Stiperstones, Shropshire, England. *Field Studies*, **8**, 451–72.
- Clark, R. (1994b) The Skiddaw Massif Problem. Proceedings of the Cumberland Geological Society, 5(4) [for 1992-3], 437-48.
- Clark, R. and Smith, R.A. (1998) The recent investigations into the Quaternary geology of West Cumbria. *Proceedings of the Cumberland Geological Society*, 6(2) [for 1996–7], 203–25.
- Clark, R. and Wilson, P. (1994) Valley moraines in Borrowdale. In *Cumbria: field guide* (eds J. Boardman and J. Walden), *Quaternary Research Association Field Guide*, Quaternary Research Association, Oxford, pp. 153–6.
- Clayton, K.M. (1953) The denudation chronology of part of the Middle Trent basin. *Transactions of the Institute of British Geographers*, 19, 25-36.
- Clayton, K.M. (1966) The Origin of the Landforms of the Malham Area. *Field Studies*, 2, 359–84.
- Clayton, K.M. (1974) Zones of glacial erosion. In Progress in Geomorphology: papers in honour of David L. Linton (eds E.H. Brown and R.S. Waters), Institute of British Geographers Special Publication, No. 7, Institute of British Geographers, London, pp. 163–76.
- Clayton, K.M. (1977) The rate of denudation of some British lowland landscapes. *Earth Surface Processes and Landforms*, 22, 721-31.
- Clayton, K.M. (1979) The Midlands and southern Pennines. In *Eastern and Central England* (eds A. Straw and K.M. Clayton),

Geomorphology of the British Isles, Methuen, London, pp. 141–240.

- Clayton, K.M. (1981) Explanatory description of the landforms of the Malham area. *Field Studies*, **5**, 389–423.
- Clayton, K.M. (1996) Quantification of the impact of glacial erosion on the British Isles. *Transactions of the Institute of British Geographers, New Series*, **21**, 124–40.
- Clayton, K.M. (1997) Neotectonics of the British Isles: the geomorphological evidence for tectonic activity in the last five million years. *Nirex Report*, NSS/R236.
- Clayton, K.M. and Shamoon, N. (1997) A new approach to the relief of Great Britain, III. Derivation of the contribution of neotectonic movements and exceptional regional denudation to the present relief. *Geomorphology*, **27**, 173–89.
- Clayton, L. and Cherry, J.A. (1967) Pleistocene supraglacial and ice-walled lakes of west-central North America. In *Glacial geology of the Missouri Coteau and adjacent areas* (eds. L. Clayton and T.F. Freers), North Dakota Geological Survey Miscellaneous Series, No. 30, North Dakota Geological Survey, Grand Forks, pp. 47–52.
- Clough, C.T. (1888) The Geology of the Cheviot Hills (English side) (Quarter-sheet 108 NE), Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – Old Series, HMSO, London, 60 pp.
- Clough, R.McK. (1977) Some aspects of corrie initiation and evolution in the English Lake District. *Proceedings of the Cumberland Geological Society*, **3**, 209–32.
- Cloutman, E.W. (1988a) Palaeoenvironments in the Vale of Pickering, part 1: stratigraphy and palaeogeography of Seamer Carr, Star Carr and Flixton Carr. *Proceedings of the Prebistoric Society*, 54, 37–58.
- Cloutman, E.W. (1988b) Palaeoenvironments in the Vale of Pickering. Part 2: Environmental history at Seamer Carr. *Proceedings of the Prehistoric Society*, 54, 21–36.
- Cloutman, E.W. and Smith, A.G. (1988) Palaeoenvironments in the Vale of Pickering. Part 3: Environmental history at Star Carr. *Proceedings of the Prehistoric Society*, **54**, 37–58.
- Clutton-Brock, J. and Noe-Nygaard, N. (1990) New osteological and C-isotope evidence on Mesolithic dogs: companions to hunters and fishers at Star Carr, Seamer Carr and

Kongemøse. Journal of Archaeological Science, 17, 643–53.

- Cocks, L.R.M. (1989) The geology of south Shropshire. *Proceedings of the Geologists' Association*, 4, 505–19.
- Cole, E.M. (1879) On the origin and formation of the Wold dales. *Proceedings of the Yorksbire Geological Society*, 7, 128–40.
- Cole, E.M. (1887) Note on dry valleys in the Chalk. Proceedings of the Yorkshire Geological Society, 9, 343-6.
- Coles, B.J. (1990) Anthropomorphic wooden figurines from Britain and Ireland. *Proceedings* of the Prehistoric Society, **56**, 315–33.
- Coles, B.J. (1993) Roos Carr and company. In A Spirit of Enquiry: Essays for Ted Wright (eds J. Coles, V. Fenwick and G. Hutchinson), Wetland Archaeology Research Project Occasional Paper, No. 7, Wetland Archaeology Research Project, Nautical Archaeology Society and National Maritime Museum, Exeter, pp. 17–22.
- Coles, G. (1985) The Quaternary palaeo-ecology of north Derbyshire: a brief review. In *Peak District and Northern Dukeries: field guide* (eds D.J. Briggs, D.D. Gilbertson and R.D.S. Jenkinson), *Quaternary Research Association Field Guide*, Quaternary Research Association, Cambridge, pp. 7–16.
- Coles, G. (1987) Aspects of the Application of Palynology to Cave Deposits in the Magnesian Limestone Region of North Nottinghamshire. Unpublished PhD thesis, University of Sheffield.
- Coles, G., Hunt, C.O. and Jenkinson, R.D.S. (1985) Robin Hood's Cave: palynology. In *Peak District and Northern Dukeries: field* guide (eds D.J. Briggs, D.D. Gilbertson and R.D.S. Jenkinson), *Quaternary Research* Association Field Guide, Quaternary Research Association, Cambridge, pp. 178–82.
- Colhoun, E.A., Common, R. and Cruickshank, M.M. (1965) Recent bog flows and debris slides in the north of Ireland. Scientific Proceedings of the Royal Society of Dublin, Series A, 2,163-74.
- Common, R. (1953) The geomorphology of the east Cheviot area. Unpublished PhD thesis, University of Edinburgh.
- Common, R. (1954) The geomorphology of the east Cheviot area. Scottish Geographical Magazine, 70, 124–38.
- Common, R. (1957) Variations in the Cheviot meltwater channels. *Geographical Studies*, 4,

90-103.

Connolly, R.C. (1985) Lindow Man: Britain's prehistoric body. Anthropology Today, 15, 15–17.

- Conway, V.M. (1954) Stratigraphy and pollen analysis of southern Pennine blanket peats. *Journal of Ecology*, 42, 117–47.
- Coope, G.R. (1959) A Late Pleistocene insect fauna from Chelford, Cheshire. *Proceedings* of the Royal Society of London, **B151**, 70–86.
- Coope, G.R. (1977) Fossil coleopteran assemblages as sensitive indicators of climatic changes during the Devensian (last) cold stage. *Philosophical Transactions of the Royal Society of London*, **B280**, 313–40.
- Coope, G.R. (1994) The Lateglacial coleoptera from St. Bees, Cumbria. In *Cumbria: field* guide (eds J. Boardman and J. Walden), Quaternary Research Association Field Guide, Quaternary Research Association, Oxford, pp. 86–9.
- Coope, G.R. and Brophy, J.A. (1972) Late-glacial environmental changes indicated by a Coleopteran succession from North Wales. *Boreas*, 1, 97–142.
- Coope, G.R. and Joachim, M.J. (1980) Lateglacial environmental changes interpreted from fossil coleoptera from St. Bees, Cumbria, NW England. In Studies in the Lateglacial of North-West Europe: including papers presented at a symposium of the Quaternary Research Association held at University College London, January 1979 (eds J.J. Lowe, J.M. Gray and J.E. Robinson), Pergamon Press, London, pp. 55–68.
- Coope, G.R. and Lister, A.M. (1987) Late-glacial mammoth skeletons from Condover, Shropshire, England. *Nature*, **330**, 472–4.
- Coope, G.R. and Pennington, W. (1977) The Windermere Interstadial of the Late Devensian. *Philosophical Transactions of the Royal Society of London*, **B280**, 337–9.
- Coope, G.R., Shotton, F.W. and Strachan, I. (1961) A Late Pleistocene fauna and flora from Upton Warren, Worcestershire. *Philosophical Transactions of the Royal Society of London*, **B244**, 379–421.
- Coope, G.R., Morgan, A. and Osborne, P.J. (1971) Fossil coleoptera as indicators of climatic fluctuations during the last glaciation in Britain. *Palaeogeography, Palaeoecology, Palaeoclimatology*, **10**, 87–101.
- Coope, G.R., Lamdahl, G., Lowe, J.J. and Walking, A. (1998) Temperature gradients in northern Europe during the last

glacial–Holocene transition (14–9<sup>14</sup>C kyr BP) interpreted from coleopteran assemblages. *Journal of Quaternary Science*, **13**, 419–33.

- Cooper, E.A. and Proctor, M.C.F. (1998) Malham Tarn National Nature Reserve: the Vegetation of the Malham Tarn Moss and Fens. *Field Studies*, 9, 277–312.
- Cope, F. (1999) *The Peak District*, 3rd edn (ed. J.T. Greensmith), Geologists' Association Guide, No 26, Geologists' Association, London, 78 pp.
- Cope, F.W. (1939) Oil occurrences in south-west Lancashire. Bulletin of the Geological Survey of Great Britain, 2, 18–25.
- Cope, J.C. (1984) The Mesozoic history of Wales. Proceedings of the Geologists' Association, 95, 373–85.
- Corbel, J. (1957) Les Karsts du Nord Ouest de l'Europe et de quelques régions de comparison: étude sur le rôle du climat dans l'érosion des calcaires, Institut des Etudes Rhodaniennes de l'Universite de Lyon Memoires et Documents, No. 12, Ministère de l'Éducation Nationale, Lyon, 541 pp.
- Corbel, J. (1959) Erosion en terrain calcaires. Annales de Géographie, 68, 97–120.
- Coupland, G. and Woolacott, D. (1926) The superficial deposits near Sunderland and the Quaternary sequence in east Durham. *Geological Magazine*, 63, 1–12.
- Cowell, M.R. and Craddock, P.T. (1995) Copper in the skin of Lindow Man. In *Bog Bodies. New Discoveries and New Perspectives* (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 74–5.
- Cowell, R.W. and Innes, J.B. (1994) *The Wetlands* of *Merseyside 1*, National Museums and Galleries on Merseyside and Lancaster University Archaeological Unit, Short Run Press, Exeter.
- Cowell, R.W., Milles, A. and Roberts, G. (1993) Prehistoric footprints on Formby Point beach, Merseyside. *North West Wetlands, Annual Report*, **1993**, Lancaster, pp. 43–8.
- Crampton, C.B. and Taylor, J.A. (1967) Solifluction terraces in South Wales. *Biuletyn Peryglacjalny*, 16, 15–36.
- Crisp, D.T., Rawes, M. and Welch, D. (1964) A Pennine peat slide. *Geographical Journal*, **130**, 519–24.
- Crofts, W.H. (1906) Notes on the indications of a raised beach at Hessle. *Transactions of the Hull Geological Society*, 6, 58–64.
- Crompton, E. (1966) Soils of the Preston District

of Lancashire (sheet 75), Memoirs of the Soil Survey of Great Britain (England and Wales), Soil Survey and Land Research Centre, Harpenden, 128 pp.

- Crow, J. (1995) English Heritage Book of Housesteads, B.T. Batsford and English Heritage, London, 126 pp.
- Crowther, D.R. (1987) Sediments and archaeology of the Humber foreshore. In *East Yorkshire: field guide* (ed S. Ellis), *Quaternary Research Association Field Guide*, Quaternary Research Association, Cambridge, pp. 99–105.
- Cundill, P.R. (1976) Late Flandrian vegetation and soils in Carlingill valley, Howgill Fells. *Transactions of the Institute of British Geographers, New Series*, 1, 301–9.
- Cundill, P.R. (1981) The history of vegetation and land-use of two peat mosses in southwest Lancashire. *Manchester Geographer*, 2, 35-44.
- Cunningham, F. F. (1964) A detail of process on scarp edges of Millstone Grit. *East Midland Geographer*, **3**, 322–5.
- Cunningham, F. F. (1965) Tor theories in the light of South Pennine evidence. *East Midland Geographer*, 3, 424–33.
- Currant, A. and Jacobi, R. (2001) A formal mammalian biostratigraphy for the Late Pleistocene of Britain. *Quaternary Science Reviews*, **20**, 1707–16.
- Cwynar, L.C. and Watts, W.A. (1989) Accelerator mass spectrometer ages for Late Glacial events at Ballybetagh, Ireland. *Quaternary Research*, 31, 377–80.
- Czudek, T. (1964) Periglacial slope development in the area of the Bohemian Massif in Northern Moravia. *Biuletyn Peryglacjalny*, 14, 169–93.
- Dahms, D.E. (1998) Reconstructing paleoenvironments from ancient soils: a critical review. *Quaternary International*, **51–2**, 58–60.
- Dakyns, J.R. (1879) Glacial beds at Bridlington. Proceedings of the Yorkshire Geological and Polytechnic Society, 7, 123–8.
- Dakyns, J.R. (1880) Glacial deposits north of Bridlington. Proceedings of the Yorkshire Geological and Polytechnic Society, 7, 246–52.
- Dakyns, J.R., Fox-Strangways, C. and Cameron, A.G. (1886) *The Geology of the Country between York and Hull*, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – Old Series

(93SE-94S), HMSO, London, 54 pp.

- Dakyns, J.R., Tiddeman, R.H., Gunn, W. and Strahan, A. (1890) The Geology of the Country around Ingleborough, with part of Wensleydale and Wharfedale: (Quarter-sheet 97SW), Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – Old Series, HMSO, London, 103 pp.
- Dakyns, J.R., Tiddeman, R.H., Russell, R., Clough, C.T. and Strahan, A. (1891) The Geology of the Country around Mallerstang with parts of Wensleydale, Swaledale and Arkendale (Sheet 97NW), Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – Old Series, HMSO, London, 213 pp.
- Daley, B and Balson, P. (1999) British Tertiary Stratigraphy, Geological Conservation Review Series, No. 15, Joint Nature Conservation Committee, Peterborough, 388 pp.
- Dansgaard, W., Johnsen, S.J., Clausen, H.B. and Langway, C.C. (1971) Climatic record revealed by the Camp century ice core. In *The Late Cenozoic glacial ages* (ed. K.K. Turekian), *Mrs Hepsa Ely Silliman Memorial Lectures*, No. 43, Yale University Press, New Haven, pp. 37-56.
- Dansgaard, W., Johnsen, S.J., Clausen, H.B. *et al.* (1993) Evidence for general instability of past climate from a 250 kyr ice core record. *Nature*, 364, 218–20.
- Dale, E. (1900) *The Scenery and Geology of the Peak of Derbyshire*, Sampson Low, Marston and Co, London, 176 pp.
- Dardis, G.F. (1985) Till facies associations in drumlins and some implications for their mode of formation. *Geografiska Annaler*, 67A, 13–22.
- Dardis, G.F. (1987) Sedimentology of late Pleistocene drumlins in south-central Ulster, Northern Ireland. In Drumlin Symposium: proceedings of the Drumlin Symposium, first International Conference on Geomorphology, Manchester, 16–18 September 1985 (eds J. Menzies and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 215–24.
- Dardis, G.F. and Hanvey, P.M. (1994) Sedimentation in a drumlin lee-side wave cavity, northwest Ireland. *Sedimentary Geology*, **91**, 97–114.
- Dardis, G.F. and McCabe, A.M. (1983) Facies of subglacial channel sedimentation in late Pleistocene drumlins, Northern Ireland.

Boreas, 12, 263-78.

- Dardis, G.F. and McCabe, A.M. (1987) Subglacial sheet-wash and debris flow deposits in late Pleistocene drumlins, Northern Ireland. In Drumlin Symposium: proceedings of the Drumlin Symposium, first International Conference on Geomorphology, Manchester, 16–18 September 1985 (eds J. Menzies and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 225–40.
- Dark, P. (1998a) Interpretation of the lake-edge sequences. In Star Carr in Context: new archaeological and palaeoecological investigations at the Early Mesolithic site of Star Carr, North Yorkshire (eds PA. Mellars and P. Dark), McDonald Institute Monographs, McDonald Institute for Archaeological Research, Cambridge, pp. 153–62.
- Dark, P. (1998b) The lake-centre sequence: results. In Star Carr in Context: new archaeological and palaeoecological investigations at the Early Mesolithic site of Star Carr, North Yorkshire (eds P.A. Mellars and P. Dark), McDonald Institute Monographs, McDonald Institute for Archaeological Research, Cambridge, pp. 163–78.
- Darling, F.F. (1937) A Herd of Red Deer: a study in animal behaviour, Oxford University Press, London, 215 pp.
- Davenport, C.A. and Ringrose, P. (1987)
  Deformation of Scottish Quaternary sediment sequences by strong earthquake motions. In Deformation of Sediments and Sedimentary Rocks (eds M.E. Jones and R.M.F. Preston), Geological Society of London Special Publication, No. 29, Blackwell Scientific Publications, Oxford, pp. 299-314.
- Davies, C. and Turner, J. (1979) Pollen diagrams from Northumberland. *New Phytologist*, 82, 783–804.
- Davis, M.B., Brubaker, L.B. and Webb, T. III. (1973) Calibration of absolute pollen influx. In *Quaternary Plant Ecology: the 14th Symposium of the British Ecological Society*, University of Cambridge, 28–30 March 1972 (eds H.J.B. Birks and R.G. West), Blackwell Scientific Publications, Oxford, pp. 9–26.
- Davis, W.M. (1890) Structure and origin of glacial sand plains. *Bulletin of the Geological Society of America*, **1**, 195–202.
- Davis, W.M. (1895) The development of certain English rivers. *Geographical Journal*, **5**, 127–46.
- Dawkins, W.B. (1876) On the Mammalia and

traces of man in Robin Hood's cave. Quarterly Journal of the Geological Society of London, **32**, 240–59.

- Dawkins, W.B. (1877) The exploration of the ossiferous deposit at Windy Knoll, Castleton, Derbyshire by Rooke Pennington, Esq., LL.B, F.G.S. and Prof. Boyd Dawkins, M.A., F.R.S. Quarterly Journal of the Geological Society of London, 33, 724–9.
- Dawkins, W.B. (1903) On the discovery of an ossiferous cavern of Pliocene age at Dove Holes, Buxton (Derbyshire). Quarterly Journal of the Geological Society of London, 59, 105-32.
- Day, S.P. (1993) Preliminary results of high-resolution palaeoecological analyses at Star Carr, Yorkshire. Cambridge Archaeological Journal, 3, 129–33.
- Day, S.P. (1995) Devensian late glacial and early Flandrian environmental history of the Vale of Pickering. *Journal of Quaternary Science*, **11**, 9–24.
- Day, S.P. (1996) Dogs, deer and diet at Star Carr: a reconsideration of C-isotope evidence from early Mesolithic dog remains from the Vale of Pickering, Yorkshire, England. *Journal of Archaeological Science*, 23, 783–7.
- Day, S.P. and Mellars, P.A. (1994) 'Absolute' dating of mesolithic human activity at Star Carr, Yorkshire: new palaeoecological studies and identification of the 9600 BP radiocarbon 'plateau'. *Proceedings of the Prebistoric Society*, 60, 417–42.
- Dayan, E. (1993) Morphodynamics and morphogenesis of cuesta and hogback landforms around Tunceli. Zeitschrift für Geomorphologie, 37, 423–45.
- Dayton, J.A. (1986) Animal remains the Cladocera and Chironomidae. In *Lindow Man. Body in the Bog* (eds I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 93–8.
- de Boer, G. (1945) A system of glacier lakes in the Yorkshire Wolds. *Proceedings of the Yorkshire Geological Society*, **25**, 223–33.
- de Boer, G. (1974) Physiographic evolution. In The Geology and Mineral Resources of Yorkshire (eds D.H. Rayner and J.E. Hemingway), Yorkshire Geological Society Occasional Publication, No. 2, Yorkshire Geological Society, Leeds.
- de Boer, G., Neale, J.W. and Penny, L.F. (1958) A guide to the geology of the area between Market Weighton and the Humber.

Proceedings of the Yorkshire Geological Society, **31**, 157–209.

- De Jong, M. and Rappol, M. (1983) Ice-marginal debris-flow deposits in western Allgau, Southern West Germany. *Boreas*, **12**, 57–70.
- De Rance, C.E. (1869a) On the surface geology of the Lake District. *Geological Magazine*, 6, 489–94.
- De Rance, C.E. (1869b) The Geology of the Country between Liverpool and Southport: and explanation of geological map 90SE, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – Old Series, HMSO, London, 9 pp.
- De Rance, C.E. (1870) On the glacial phenomena of western Lancashire and Cheshire. *Quarterly Journal of the Geological Society of London*, 26, 641–55.
- De Rance, C.E. (1877) The Superficial Geology of the Country adjoining the Coasts of Southwest Lancashire: comprised in sheet 90, quarter-sheet 91SW, parts of 89NW and SW, 79NE, and 91SE, of the 1-inch geological survey map of England and Wales, Memoir (District) of the Geological Survey of Great Britain, HMSO, London, 139 pp.
- Dean, V. (1947) An unrecorded overflow channel in north-east Lancashire. *Proceedings of the Yorkshire Geological Society*, **27**, 33–5.
- Dean, V. (1953) Some unrecorded overflow channels in north-east Lancashire. *Liverpool* and Manchester Geological Journal, 1, 153-60.
- Demek, J. (1964). Castle koppies and tors on the Bohemian Highland (Czechoslovakia). *Biuletyn Peryglacjalny*, 14, 195–216.
- Demek, J. (1968) Cryoplanation terraces in Yakutia. *Biuletyn Peryglacjalny*, **17**, 91–116.
- Demek, J. (1969). Cryogene processes and the development of cryoplanation terraces. *Biuletyn Peryglacjalny*, 18, 115–25.
- Denny, H. (1854a) On the discovery of hippopotane and other remains in the neighbourhood of Leeds. Proceedings of the Yorksbire Geological and Polytechnic Society, 3, 321-36.
- Denny, H. (1854b) On the remains of *Hippopotamus* found in the Aire valley deposit near Leeds. *Report of the British* Association for the Advancement of Science, 1853, 51-2.
- Denny, H. (1871) Notice of the discovery of a pair of ancient shoes and a human skeleton in the peat moss on Austwick Common, near

Clapham, Yorkshire. Proceedings of the Geological and Polytechnic Society of the West Riding of Yorkshire, 5, 162–78.

- Derbyshire, E. (1961) Subglacial col gullies and the deglaciation of the northeast Cheviots. *Transactions of the Institute of British Geographers*, 29, 31–45.
- Dewey, J.F. (1982) Plate tectonics and the evolution of the British Isles. *Journal of the Geological Society, London*, **139**, 371–412.
- Dickinson, W. (1975) Recurrence surfaces in Rusland Moss, Cumbria (formerly North Lancashire). *Journal of Ecology*, 63, 913–35.
- Dickson, J. (1973) Bryophytes of the Pleistocene: the British record and its chorological and ecological implications, Cambridge University Press, London, 256 pp.
- Dimbleby, G.W. (1962) The Development of British Heathlands and their Soils, Oxford Forestry Memoirs, No. 23, Clarendon Press, Oxford, 120 pp.
- Dimbleby, G.W. and Simmons, I.G. (1974) The possible role of ivy (*Hedera belix* L.) in the Mesolithic economy of western Europe. *Journal of Archaeological Science*, 1, 291–6.
- Dines, H.G. (1958) The West Shropshire mining region. Bulletin of the Geological Survey of Great Britain, 14, 1–43.
- Dingle, R.V. (1971) Buried tunnel valleys of the Northumberland coast, western North Sea. *Geologie en Mijnbouw*, **50**, 679–86.
- Dinnin, M. (1995) Introduction to the palaeoenvironmental survey. In Wetland Heritage of Holderness: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project University of Hull, Hull, pp. 27–48.
- Dinnin, M. (1997a) Introduction to the palaeoenvironmental survey. In Wetland Heritage of the Humberbead Levels: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 31–45.
- Dinnin, M. (1997b) The palaeoenvironmental survey of West, Thorne and Hatfield Moors. In Wetland Heritage of the Humberbead Levels: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 157–89.
- Dinnin, M. and Lillie, M. (1995a) The palaeoenvironmental survey of the meres of Holderness. In Wetland Heritage of Holderness: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 49–85.

### References

- Dinnin, M. and Lillie, M. (1995b) The palaeoenvironmental survey of southern Holderness and evidence for sea-level change. In Wetland Heritage of Holderness: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 87–120.
- Dinnin, M.H. and Skidmore, P. (1995) The insect assemblages associated with Lindow III and the environmental implications. In *Bog Bodies. New Discoveries and New Perspectives* (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 31–8.
- Dixon, E.E.L. (1922) The retreat of the Lake District ice-cap in the Ennerdale area, West Cumberland. Summary of Progress of the Geological Survey of Great Britain and the Museum of Practical Geology (1921), 118-25.
- Dixon, E.E.L. (1926) The Geology of the Carlisle, Longtown and Silloth District: explanation of sheets 11, 16 and 17, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series, HMSO, London, 118 pp.
- Dohrenwend, J.C. (1984) Nivation landforms in the western Great-Basin and their paleoclimatic significance. *Quaternary Research*, 22, 275–88.
- Domack, E.W. and Lawson, D.E. (1985) Pebble fabric in an ice-rafted diamicton. *Journal of Geology*, 93, 577–92.
- Donaldson, A.M. and Rackham, D.J. (1984) Environmental work in Northern England. In Environmental Archaeology: a Regional Review (ed. H.C.M. Keeley), Directorate of Ancient Monuments and Historic Buildings Occasional Papers, No. 6, Department of the Environment, London, pp. 134–51.
- Donaldson, A.M. and Turner, J. (1977) A pollen diagram from Hallowell Moss, near Durham City, U.K. *Journal of Biogeography*, 4, 25–33.
- Doody, P. (1989) Conservation and development of the coastal dunes in Great Britain. In Perspectives in Coastal Dune Management: proceedings of the European Symposium, 7-11 September 1987, Leiden (eds F. Van der Meulen, P.D. Jungerius and J.H. Visser), SPB Academic Publishing, The Hague, pp. 53-67.
- Double, I.S. (1924) The petrography of the later Tertiary deposits of the east of England. *Proceedings of the Geologists' Association*, 35, 332–58.
- Doughty, P.S. (1968) Joint densities and their

relation to lithology in the Great Scar limestone. *Proceedings of the Yorkshire Geological Society*, **36**, 479–512.

- Douglas, G.R. (1980) Magnitude frequency study of rockfall in County Antrim, Northern Ireland. *Earth Surface Processes*, **5**, 123–9.
- Douglas, T.D. (1991) Glacial deposits of Northumbria. In *Glacial Deposits in Great Britain* and Ireland (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 169–74.
- Douglas, T.D. and Harrison, S. (1985) Periglacial landforms and sediments in the Cheviots. In *Field Guide to the Periglacial Landforms of Northern England* (ed. J. Boardman), Quaternary Research Association, Cambridge, pp. 68–76.
- Dowdeswell, J.A. and Sharp, M. (1986) Characterization of pebble fabrics in modern terrestrial glacigenic sediments. *Sedimentology*, **33**, 699–710.
- Dowdeswell, J.A., Hambrey, M.J. and Wu, R. (1985) A comparison of clast fabric and shape in late Precambrian and modern glacigenic sediments. *Journal of Sedimentary Petrology*, 55, 691–704.
- Dowdeswell, J.A., Whittington, R.J. and Marienfeld, P. (1994) The origin of massive diamicton facies by iceberg rafting and scouring, Scoresby Sund, East Greenland. *Sedimentology*, **41**, 21–35.
- Dreimanis, A. (1976) Tills: their origin and properties. In *Glacial Till: an interdisciplinary* study (ed. R.F. Leggett), *Royal Society of Canada Special Publication*, No. 12, Royal Society of Canada, Ottawa, pp. 11–49.
- Dreimanis, A. (1989) Tills: their genetic terminology and classification. In Genetic Classification of Glacigenic Deposits: final report of the Commission on Genesis and Lithology of Glacial Quaternary Deposits of the International Union for Quaternary Research (INQUA) (eds R.P. Goldthwait and C.L. Matsch), A.A. Balkema Publishers, Rotterdam, pp. 85–8.
- Dumayne, L. (1992) Late Holocene palaeoecology and human impact on the environment of northern Britain. Unpublished PhD thesis, University of Southampton.
- Dumayne, L. (1993) Invader or native? vegetation clearance in northern Britain during Romano-British times. *Vegetation History and Archaeobotany*, **2**, 29–36.
- Dumayne, L. and Barber, K.E. (1994) The impact

of the Romans on the environment of northern Britain: pollen data from three sites close to Hadrian's Wall. *The Holocene*, 4, 165–73.

- Dumayne-Peaty, L. and Barber, K.E. (1997) Archaeological and environmental evidence for Roman impact on vegetation near Carlisle, Cumbria: a comment on McCarthy. *The Holocene*, 7, 243–5.
- Dumayne-Peaty, L. and Barber, K.E. (1998) Late Holocene vegetational history, human impact and pollen representativity variations in northern Cumbria. *Journal of Quaternary Science*, **13**, 147–64.
- Dumont, J.V. (1987) Mesolithic microwear research in Northwest Europe. In Mesolithic Northwest Europe: Recent Trends (eds P. Rowley-Conwy, M. Zvelebil and H.P. Blankholm), Recent Trends Series, No. 2, Department of Archaeology and Prehistory, University of Sheffield, Sheffield.
- Dunham, A.C. and Kaye, J. (1965) The petrology of the Little Whin Sill, County Durham. *Proceedings of the Yorkshire Geological Society*, 35, 229–76.
- Dunham, K.C. (1990) Geology of the Northern Pennine Orefield, Vol. 1, Tyne to Stainmore, 2nd edn, Memoir (Economic) of the Geological Survey of Great Britain, HMSO, London, 299 pp.
- Dupont, L.M. (1986) Temperature and rainfall variation in the late Holocene based on comparative palaeoecology and isotope geology of a hummock and hollow (Bourtangerveen, The Netherlands). *Review of Paleobotany and Palynology*, **48**, 71–159.
- Dwerryhouse, A.R. (1902) The glaciation of Teesdale, Weardale, the Tyne valley and their tributary valleys. *Quarterly Journal of the Geological Society of London*, **58**, 572–608.
- Dwerryhouse, A.R. and Miller, A.A. (1930) The glaciation of Clun Forest, Radnor Forest and some adjoining districts. *Quarterly Journal of the Geological Society of London*, **66**, 96–129.
- Dyke, A.S. (1993) Landscapes of cold-centred Late Wisconsinan ice caps, Arctic Canada. *Progress in Physical Geography*, **17**, 223–47.
- Dylik, J. (1960) Rhythmically stratified slope waste deposits. *Biuletyn Peryglacjalny*, 8, 31–41.
- Earp, J.R. and Taylor, B.J. (1986) Geology of the Country around Chester and Winsford, Memoir (Sheet) of the British Geological Survey (England and Wales) (109), 119 pp.

Earp, J.R., Magraw, D., Poole, E.G., Land, A. and

Whiteman, A.J. (1961) The Geology of the Country around Clitheroe and Nelson, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (68), HMSO, London, 346 pp.

- Eastwood, T., Dixon, E.E.L., Hollingworth, S.E. and Smith, B. (1931) *The Geology of the Whitehaven and Workington district*, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (28), HMSO, London, 304 pp.
- Eastwood, T., Hollingworth, S.E., Rose, W.C.C. and Trotter, F.M. (1968) *The Geology of the Country around Cockermouth and Caldbeck*, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (23), HMSO, London, 298 pp.
- Eaton, G.P. (1996) Interpretation of the BNFL/Nirex offshore high resolution seismic data. *GeoConsultants Report*, GEO/95/17 (Superseded by *Nirex Science Report*, SA/97/042).
- Eaton, G.P. (1997) Deformation of the St. Bees Moraine. In *The Quaternary Geology of West Cumbria Field Guide* (eds M. Browne, R.J. Heath, D. Huddart and P. Nathanail), Environment Group of the Geological Society of London, London, pp. 54–7.
- Eaton, G.P. and Curtis, N. (1995) 2–D transects through drift deposits in West Cumbria. *GeoScience Report*, GEO/95/10 (Superseded by *Nirex Science Report*, SA/97/003).
- Eaton, G.P. and Williams, G.D. (1993) The Quaternary geology of the Sellafield Area. *Nirex Report*, **519**.
- Eden, M.J. and Green, C.P. (1971) Some aspects of granite weathering and tor formation on Dartmoor, England. *Geografiska Annaler*, **53A**, 92–9.
- Eden, R.A., Stevenson, I.P. and Edwards, W. (1957) *The Geology of the Country around Sheffield*, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (100), HMSO, London. 238 pp.
- Edwards, B.J.N. (1969) Lancashire archaeological notes. *Transactions of the Historical Society of Lancashire and Cheshire*, **121**, 101–3.
- Edwards, C.A. (1978) The Quaternary History and Stratigraphy of North East Yorkshire. Unpublished PhD thesis, University of Hull.
- Edwards, C.A. (1981) The tills of Filey Bay. In *The Quaternary in Britain* (eds J. Neale and J. Flenley), Pergamon Press, Oxford, pp.

108-18.

- Edwards, C.A. (1987) The Quaternary deposits of Filey Bay. In *East Yorkshire: field guide* (ed. S. Ellis), *Quaternary Research Association Field Guide*, Quaternary Research Association, Cambridge, pp. 15–21.
- Edwards, W. (1937) A Pleistocene strandline in the Vale of York. *Proceedings of the Yorkshire Geological Society*, 23, 103–18.
- Edwards, W., Mitchell, G.H. and Whitehead, T.H. (1950) Geology of the District North and East of Leeds: Explanation of Sheet 70, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series, HMSO, London, 93 pp.
- Ehlers, J., Gibbard, P.L. and Rose, J. (1991) Glacial deposits of Britain and Europe: general overview. In *Glacial Deposits in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 493–502.
- Eichler, H. (1981) Rock temperatures and insolation weathering in the high Arctic, Oobloyah Bay, northern Ellesmere Island, NWT, Canada. Results of the Heidelberg Ellesmere Island Expedition, Heidelberg Geographisches Institut, Universitat Heidelberg Arbeiter, 69, 441-64.
- Ekwall, E. (1922) *The Place-names of Lancashire*, University Press, Manchester, 280 pp.
- Elgee, F. (1908). The glaciation of north Cleveland. Proceedings of the Yorkshire Geological Society, 16, 372-82.
- Ellis, N.V. (ed.), Bowen, D.Q., Campbell, S. et al. (1996) An Introduction to the Geological Conservation Review, Geological Conservation Review Series, No. 1, Joint Nature Conservation Committee, Peterborough, 131 pp.
- Ellis, S. (1990) Soils. In *Humber Perspectives. A Region Through the Ages* (eds S. Ellis and D.R. Crowther), Hull University Press, Hull, pp. 29–42.
- Ellis, S. and Newsome, D. (1991) Chalkland soil formation and erosion on the Yorkshire Wolds, northern England. *Geoderma*, **48**, 59–72.
- Erdtman, G. (1927) The peat deposits of the Cleveland Hills. *Naturalist*, *February 1927*, 39–46.
- Erdtman, G. (1928) Studies in the post-arctic history of the forest of north-west Europe. I–Investigations in the British Isles. Geologiska Föreningens i Stockholm

Förhandlingar, 50, 123-92.

- Evans, D.J.A., Owen, L.A. and Roberts, D. (1995) Stratigraphy and sedimentology of Devensian (Dimlington Stadial) glacial deposits, east Yorkshire, England. *Journal of Quaternary Science*, **10**, 241–65.
- Evans, G.H. (1970) Pollen and diatom analyses of Late-Quaternary deposits in the Blelham basin, north Lancashire. *New Phytologist*, 69, 821–74.
- Evans, I.S. (1987) The morphometry of specific landforms. In International Geomorphology: proceedings of the First International Conference on Geomorphology (ed. V. Gardiner), John Wiley and Sons Ltd, Chichester, pp. 105–24.
- Evans, I.S. (1997) Cirques and moraines of the Helvellyn Range, Cumbria: Grisedale and Ullswater. In *Geomorphology of the Lake District: a Field Guide* (ed. J. Boardman), Environmental Change Unit for the British Geomorphological Research Group, Oxford, pp. 63–87.
- Evans, I.S. (1999) Castle Eden Dene and Blunts Dene. In *The Quaternary of North-East England: field guide* (eds D.R Bridgland, B.P. Horton and J.B. Innes), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 57–64.
- Evans, I.S. and Cox, N.J. (1995) The form of glacial cirques in the English Lake District, Cumbria. Zeitschrift für Geomorphologie, 39(2), 175–202.
- Evans, J.G. (1976) Observations on a stripe pattern. *Biuletyn Peryglacjalyny*, 25, 9–22.
- Evans, J.G. and Dimbleby, G.W. (1976) Appendix I: The pre-barrow environment. In The Excavation of Kilham Long Barrow, East Riding of Yorkshire (ed. T.G. Manby). *Proceedings of the Prebistoric Society*, **42**, 150–9.
- Evans, R. (1977) Overgrazing and soil erosion on hill pastures with particular reference to the Peak District. *Journal of the British Grassland Society*, **32**, 65–76.
- Evans, 'W.B. and Arthurton, R.S. (1973) Northwest England. In A Correlation of the Quaternary Deposits of the British Isles (eds G.F. Mitchell, L.F. Penny, F.W. Shotton and R.G. West), Geological Society of London Special Report, No. 4, Scottish Academic Press, Edinburgh, pp. 28–36.
- Evans, W.B., Wilson, A.A., Taylor, B.J. and Price, D. (1968) Geology of the Country around

### References

Macclesfield, Congleton, Crewe and Middlewich, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (110), HMSO, London, 328 pp.

- Evens, E.D., Grinsell, L.V., Piggott, S. and Wallis, F.S. (1962) Fourth report of the south-western group of museums and art galleries on the petrological identification of stone axes. *Proceedings of the Prehistoric Society*, **28**, 209–66.
- Eyles, C.H (1988) A model for striated boulder pavement formation on glaciated shallow marine shelves, an example from the Yakataga Formation, Alaska. *Journal of Sedimentary Petrology*, **58**, 62–71.
- Eyles, C.H. and Eyles, N. (1984) Glaciomarine sediments in the Isle of Man as a key to Late Pleistocene stratigraphic investigations in the Irish Sea Basin. *Geology*, **12**, 359–64.
- Eyles, C.H. and Lagoe, M.B. (1990) Sedimentation patterns and facies geometries on a temperate glacially-influenced continental shelf; the Yakataga Formation, Middleton Island, Alaska. In *Glacimarine Environments*, *Processes and Sediments* (eds J.A. Dowdeswell and J.D. Scourse). *Geological Society of London Special Publication*, No. 53, Geological Society of London, London, pp. 363–86.
- Eyles, N. (1983) Glacial geology: a landsystems approach. In *Glacial Geology: an introduction for engineers and earth scientists* (ed. N. Eyles), Pergamon Press, Oxford, pp. 1–18.
- Eyles, N. and Dearman, W. (1981) A glacial terrain map of Britain for engineering purposes. Bulletin of the International Association of Engineering Geology, 24, 173–84.
- Eyles, N. and McCabe, A.M. (1989) The Late Devensian (<22,000 ybp) Irish Sea basin: the sedimentary record of a collapsed ice sheet margin. *Quaternary Science Reviews*, **8**, 307–51.
- Eyles, N. and McCabe, A.M. (1991) Glaciomarine deposits of the Irish Sea Basin: the role of glacio-isostatic disequilibrium. In *Glacial Deposits in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 311–32.
- Eyles, N. and Menzies, J. (1983) The subglacial landsystem. In *Glacial Geology: an introduction for engineers and earth scientists* (ed. N. Eyles), Pergamon Press, Oxford, pp. 19–70.

Eyles, N. and Sladen, J.A. (1981) Stratigraphy

and geotechnical properties of weathered lodgement till in Northumberland, England. *Quarterly Journal of Engineering Geology*, 14, 129–41.

- Eyles, N., Sladen, J.A. and Gilroy, S. (1982) A depositional model for stratigraphic complexes and facies superimposition in lodgment tills. *Boreas*, **11**, 317–33.
- Eyles, N., McCabe, A.M. and Bowen, D.Q. (1994) The stratigraphic and sedimentological significance of Late Devensian ice sheet surging in Holderness, Yorkshire, U.K. Quaternary Science Reviews, 13, 727–59.
- Fairclough, A.J. (1999) Unsupported <sup>226</sup>Ra chronology of Holocene lake sediments. Unpublished PhD thesis, University of Liverpool.
- Farey, J. (1813) A General View of the Agriculture of Derbyshire, with Observations on the Means of its Improvement, Vol. II, Board of Agriculture, London.
- Farrimond, P. and Flanagan, R.L. (1996) Lipid stratigraphy of a Flandrian peat bed (Northumberland, UK): comparison with the pollen record. *The Holocene*, **6**, 69–74.
- Farrington, A. and Mitchell, G.F. (1951) The end moraine north of Flamborough Head. *Proceedings of the Geologists' Association*, 62, 100-6.
- Fearnsides, W.G. (1932) The valley of the Derbyshire Derwent. *Proceedings of the Geologists' Association*, 43, 153–178.
- Ferguson, N.P. and Lee, J.A. (1983) Past and present sulphur pollution in the southern Pennines. *Atmospheric Environment*, **17**, 1131–7.
- Fischer, U.H. and Clarke, G.K.C. (1997) Stick-slip sliding behaviour at the base of a glacier. *Annals of Glaciology*, 24, 390–6.
- Fisher, E. (1999) The impact of land use change on lacustrine organic geochemistry. Unpublished PhD thesis, University of Liverpool.
- Fishwick, H. (1907) The history of the parish of Lytham in the County of Lancaster. *Cheetham Society*, *New Series*, **60**, 1–118.
- Fitch, F.J. and Miller, J.A. (1967) The age of the Whin Sill. *Geological Journal*, **5**, 233–50.
- Fitzpatrick, E.A. (1963) Deeply weathered rock in Scotland, its occurrence, age and contribution to the soils. *Journal of Soil Science*, 14, 33–43.
- Fitzpatrick, E.A. (1993) Soil Microscopy and Micromorphology, John Wiley and Sons Ltd,

620

Chichester, 304 pp.

- Fleming, A. (1971) Territorial patterns in the British Bronze Age, Wessex. Proceedings of the Prehistoric Society, 37, 138–66.
- Flenley, J.R. (1984) Towards a vegetational history of the meres in Holderness. In Late Quaternary Environments and Man in Holderness (ed. D.D. Gilbertson), British Archaeological Reports British Series, 134, British Archaeological Reports, Oxford, pp. 165-75.
- Flenley, J.R. (1987) The meres of Holderness. In East Yorkshire: field guide (ed S. Ellis), Quaternary Research Association Field Guide, Quaternary Research Association, Cambridge, pp. 73–81.
- Flenley, J.R. (1990) Vegetational history. In Humber Perspectives. A Region Through the Ages (eds S. Ellis and D.R. Crowther), Hull University Press, Hull, pp. 43–53.
- Flenley, J.R. and Maloney, B.K. (1976) Reply to a comment by P.A. Tallantire. *Nature*, **261**, 347.
- Flenley, J.R., Maloney, B.K., Ford, D. and Hallam G. (1975) *Trapa natans* in the British Flandrian. *Nature*, 257, 39–41.
- Fletcher, T.P. (1981) Geology of the Ancholme Valley. In The Brigg Raft and her Prehistoric Environment, (ed S. McGrail), Archaeological Series/National Maritime Museum, No. 6; British Archaeological Reports British Series, 89, British Archaeological Reports, Oxford, pp. 189–95.
- Flinn, D. and Pentecost, A. (1995) Travertinecemented screes on the serpentinite seacliffs of Unst and Fetlar, Shetland. *Mineralogical Magazine*, **59** (395), 259–65.
- Follmer, L.R. (1998) A scale for judging degree of soil and paleosol development. *Quaternary International*, 51–2, 12–13.
- Ford, D.C. and Williams, P.W. (1989) Karst Geomorphology and Hydrology, Unwin Hyman, London, 601 pp.
- Ford, T.D. (1963) The dolomite tors of Derbyshire. *East Midland Geographer*, 3, 148–53.
- Ford, T.D. (1964) Fossil karst in Derbyshire. Proceedings of the Speleological Association, 2, 59–62.
- Ford, T.D. (1967) Deep weathering, glaciation and tor formation in Charnwood Forest, Leicestershire. *Mercian Geologist*, 2, 3–14.
- Ford, T.D. (1969) Dolomite tors and sandfilled sink holes in the Carboniferous Limestone of Derbyshire, England. In *The Periglacial*

*Environment: past and present* (ed. T.L. Pewe), McGill-Queen's University Press, Montreal, pp. 387–97.

- Ford, T.D. (1972) Evidence of early stages in the evolution of the Derbyshire Karst. *Transactions of the Cave Research group of Great Britain*, 14, 73–7.
- Ford, T.D. (1985) The Castleton Caves: results of speleothem dating. In *Peak District and Northern Dukeries: field guide* (eds D.J. Briggs, D.D. Gilbertson and R.D.S. Jenkinson), *Quaternary Research Association Field Guide*, Quaternary Research Association, Cambridge, pp. 77–83.
- Ford, T.D. and King, R.J. (1968) Outliers of possible Tertiary age. In *The Geology of the East Midlands* (eds P.C. Sylvester-Bradley and T.D. Ford), Leicester University Press, Leicester, pp. 324–31.
- Ford, T.D.and King, R.J. (1969) The origin of the silica sand pockets in the Derbyshire Limestone. *Mercian Geologist*, **3**, 51–69.
- Ford, T.D., Gascoyne, M. and Beck, J.S. (1983) Speleothem dates and Pleistocene chronology. *Cave Science*, **10**, 103–15.
- Foster, S.W. (1986) The Late Glacial and Post Glacial history of the Vale of Pickering and northern Yorkshire Wolds. Unpublished PhD thesis, University of Hull.
- Foster, S.W. (1987) The dry drainage system on the northern Yorkshire Wolds. In *East* Yorkshire: field guide (ed S. Ellis), Quaternary Research Association Field Guide, Quaternary Research Association, Cambridge, pp. 36–8.
- Fowler, G. (1932) Old river-beds in the Fenlands. Geographical Journal, 79, 210–12.
- Fowler, G. (1934) The extinct waterways of the Fens. *Geographical Journal*, **83**, 30–6.
- Fox, C. (1926) A 'dug-out' canoe from South Wales: with notes on the chronology, typology and distribution of monoxylous craft in England and Wales. *Antiquaries Journal*, 6, 121.
- Fox-Strangways, C. (1892) The Jurassic rocks of Britain, Vol. 1, Yorkshire, Memoir of the Geological Survey of the United Kingdom, HMSO, London, 551 pp.
- Francis, E.A. (1970) The Quaternary. In The Geology of Durham County (eds G.A.L. Johnston and G. Hickling). Transactions of the Natural History Society of Northumberland, 41, 134–52.

Francis, E.A., Phillips, L.S. and Smith, D.B.

(1963) Field meeting in central and south-east Durham. *Proceedings of the Yorkshire Geological Society*, 34, 104–12.

- Francou, B. (1990) Stratification mechanisms in slope deposits in high subequatorial mountains. *Permafrost and Periglacial Processes*, 1, 249–63.
- Frank, R.M. (1982) A Holocene peat and dunesand sequence on the coast of northeast England – a preliminary report. *Quaternary Newsletter*, 36, 24–32.
- Franks, J.W. and Johnson, R.H. (1964). Pollen analytical dating of a Derbyshire landslip: the Cown Edge Landslips, Charlesworth. *New Phytologist*, **63**, 209–16.
- Franks, J.W. and Pennington, W. (1961) The lateglacial and post-glacial deposits of the Esthwaite basin, north Lancashire. *New Phytologist*, **60**, 27–42.
- Fraser, F.C. and King, J.E. (1954) Faunal remains. In Excavations at Star Carr: an early Mesolithic site at Seamer near Scarborough (ed. J.D. Clark), Cambridge University Press, Cambridge, pp. 70–95.
- French, C.N. and Moore, P.D. (1986) Deforestation, cannabis cultivation and schwingmoor formation at Cors Llyn (Llyn Mire), central Wales. *New Phytologist*, **102**, 469–82.
- French, H.M. (1996) *The Periglacial Environment*, 2nd edn, Longmans and Co., London, 341 pp.
- Fulford, M., Champion, T. and Long, A. (eds) (1997) England's Coastal Heritage: a Survey for English Heritage and the RCHME, Archaeological Report, No. 15, English Heritage, London, 268 pp.
- Funnell, B.M. (1995) Global sea-level and the (pen-)insularity of late Cenozoic Britain. In Island Britain: A Quaternary Perspective, (ed. R.C. Preece), Geological Society of London Special Publication, No. 96, Geological Society of London, London, pp. 3-13.
- Funnell, B.M. and Pearson, I. (1989) Holocene sedimentation on the north Norfolk barrier coast in relation to relative sea-level change. *Journal of Quaternary Science*, 4, 25–36.
- Funnell, B.M. and West, R.G. (1962) The early Pleistocene of Easton Bavents, Suffolk. *Quarterly Journal of the Geological Society of London*, **118**, 125–41.
- Gale, S.J. (1981) The geomorphology of the Morecambe Bay karst and its implications for

landscape chronology. Zeitschrift für Geomorphologie, Neue Folge, 25, 457-69.

- Gale, S.J. (1984) Palaeomagnetic studies of Late-Devensian lake deposits at Skipsea Withow Mere. In Late Quaternary Environments and Man in Holderness (ed. D.D. Gilbertson), British Archaeological Reports British Series, 134, British Archaeological Reports, Oxford, pp. 73–80.
- Gale, S.J. (1985) The Late- and Post-glacial environmental history of the southern Cumbrian massif and its surrounding lowlands. In *The Geomorphology of North-West England* (ed. R.H. Johnson), Manchester University Press, Manchester, 282–98.
- Gale, S.J. and Hunt, C.O. (1985) The stratigraphy of Kirkhead cave, an Upper Palaeolithic site in northern England. *Proceedings of the Prehistoric Society*, **51**, 283–304.
- Garland, A.N. (1995) Worsley Man, England. In Bog Bodies. New Discoveries and New Perspectives (eds. R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 104-7.
- Garrard, R.A. and Dobson, M.R. (1974) The nature and maximum extent of glacial sediments off the west coast of Wales. *Marine Geology*, 16, 31–44.
- Garwood, E.J. (1893) Geology. In A History of Northumberland (ed. E. Bateson), A. Reid, Newcastle upon Tyne, pp. 3–9, 13–17, 357–62, 417–18.
- Gascoyne, M., Currant, A.P. and Lord, T.C. (1981) Ipswichian fauna of Victoria Cave and the marine palaeoclimate record. *Nature*, **294**, 652–4.
- Gascoyne, M., Schwarcz, H.P. and Ford, D.C. (1983) Uranium-series ages of speleothem from north-west England: correlation with Quaternary climate. *Philosophical Transactions of the Royal Society of London*, **B301**, 143–64.
- Gaunt, G.D. (1970a) A temporary section across the Escrick Moraine at Wheldrake, east Yorkshire. *Journal of Earth Sciences (Leeds)*, 8, 163-70.
- Gaunt, G.D. (1970b) The occurrence of Pleistocene ventifacts at Aldborough, near Boroughbridge, West Yorkshire. *Journal of Earth Sciences (Leeds)*, 8, 159–61.
- Gaunt, G.D. (1974) A radiocarbon date relating to Lake Humber. *Proceedings of the Yorkshire Geological Society*, 40, 195–7.
- Gaunt, G.D. (1976) The Devensian maximum ice

limit in the Vale of York. *Proceedings of the Yorkshire Geological Society*, **40**, 631–7.

- Gaunt, G.D. (1981) Quaternary history of the southern part of the Vale of York. In *The Quaternary in Britain* (eds J. Neale and J. Flenley), Pergamon Press, Oxford, pp. 82–97.
- Gaunt, G.D. (1994) Geology of the Country around Goole, Doncaster and the Isle of Axholme, Memoir (Sheet) of the British Geological Survey (England and Wales) (79 and 88), HMSO, London, 169 pp.
- Gaunt, G.D., Coope, G.R. and Franks, J.W. (1970) Quaternary deposits at Oxbow opencast coal site in the Aire Valley, Yorkshire. *Proceedings of the Yorkshire Geological Society*, **38**, 175–200.
- Gaunt, G.D., Jarvis, R.A. and Matthews, B. (1971) The late Weichselian sequence in the Vale of York. *Proceedings of the Yorkshire Geological Society*, **38**, 281–4.
- Gaunt, G.D., Coope, G.R., Osborne, P.J. and Franks, J.W. (1972) An Interglacial Deposit near Austerfield, Southern Yorkshire, Report of the Institute of Geological Sciences, 72/4, HMSO, London, 13 pp.
- Gaunt, G.D., Bartley, D.D. and Harland, R. (1974) Two interglacial deposits proved in boreholes in the southern part of the Vale of York and their bearing on contemporaneous sea levels. *Bulletin of the Geological Survey of Great Britain*, 48, 1–23.
- Gaunt, G.D., Fletcher, T.P. and Wood, C.J. (1992) Geology of the Country around Kingston upon Hull and Brigg, Memoir (Sheet) of the British Geological Survey (England and Wales) (80 and 89), HMSO, London, 172 pp.
- Gearey, B. and Lillie, M. (1999) Aspects of Holocene vegetational change in the Vale of York: palaeoenvironmental investigations at Askham Bog. In *Wetland Heritage of the Vale* of York: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 109–122.
- Gehrels, W.R. and Innes, J.B. (1995) Holocene sea-level changes on the Northumberland coast. In Holocene Sea-level Changes, Raised Bog Ecosystems, Glacial Morphology and Stratigraphy in the Border-Region and Scotland (ed. S.J.P. Bohncke), Field Excursion Guide, Free University, Amsterdam, pp. 38-47.
- Geikie, A. (1865) The Scenery of Scotland Viewed in Connection with its Physical Geology, MacMillan, Cambridge, 60 pp.

- Geikie, A. (1868) On denudation now in progress. *Geological Magazine*, 5, 249–54.
- Geikie, J. (1876) The Cheviot Hills. Good Words, 18, 11–15, 81–6, 264–70, 331–7, 550–6.
- Geikie, J. (1877) The Great Ice Age and its Relation to the Antiquity of Man, Edward Stanford, London, 624 pp.
- George, T.N., Johnson, G.A.L., Mitchell, M. et al. (1976) A Correlation of the Dinantian Rocks of the British Isles, Geological Society of London Special Report, No. 7, Scottish Academic Press, Edinburgh, 87 pp.
- Gerrard, A.J. (1974) The geomorphological importance of jointing on Dartmoor granite. In Progress in Geomorphology: papers in bonour of David L. Linton (eds E.H. Brown and R.S. Waters), Institute of British Geographers Special Publication, No. 7, Institute of British Geographers, London, pp. 39-51.
- Gerrard, A.J. (1978) Tors and granite landforms of Dartmoor and eastern Bodmin Moor. *Proceedings of the Ussher Society*, 4, 204–10.
- Gerrard, A.J. (1988) Rocks and Landforms, Unwin Hyman, London, 319 pp.
- Gibbard, P.L., Wintle, A.G., and Catt, J.A. (1987) Age and origin of clayey silt 'brickearth' in west London, England. *Journal of Quaternary Science*, 2, 3–10.
- Gibbard, P., West, R.G., Zagwijn, W.H. *et al.* (1991) Early and early Middle Pleistocene correlations in the southern North Sea basin. *Quaternary Science Reviews*, **10**, 23–52.
- Gibbard, P., Andrew, R. and Pettit, M. (1992) The margin of a Middle Pleistocene ice advance at Tottenhill, Norfolk, England. *Geological Magazine*, **129**, 59–76.
- Gibson, W., Wedd, C.B. and Scott, A. (1925) Geology of the Country around Stoke upon Trent, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (123), HMSO, London, 112 pp.
- Gilbertson, D.D. (1984a) Late Quaternary Environments and Man in Holderness, British Archaeological Reports British Series, 134, British Archaeological Reports, Oxford, 243 pp
- Gilbertson D.D. (1984b) Early Neolithic utilisation and management of alder carr at Skipsea
  Withow mere, Holderness. Yorkshire Archaeological Journal, 56, 17–22.
- Gilbertson D.D. (1990) The Holderness meres: stratigraphy, archaeology and environment. In Humber Perspectives. A Region Through the

Ages (eds S. Ellis and D.R. Crowther), Hull University Press, Hull, pp. 89–101.

- Gilbertson, D.D., Briggs, D.J., Harkness, D.A. et al. (1984) The Late Quaternary sequence at the Skipsea Withow Gap. In Late Quaternary Environments and Man in Holderness (ed. D.D. Gilbertson), British Archaeological Reports British Series, 134, British Archaeological Reports, Oxford, pp. 47–72.
- Gilbertson, D.D., Briggs, D.J., Blackham, A.M. et al. (1987) The Late Quaternary lake margin sequence at Skipsea Withow Mere. In East Yorkshire: field guide (ed. S. Ellis), Quaternary Research Association Field Guide, Quaternary Research Association, Cambridge, pp. 58-68.
- Giles, J.R.A. (1992) Late Devensian and early Flandrian environments at Dishforth Bog, North Yorkshire. *Proceedings of the Yorkshire Geological Society*, **49**, 1–9.
- Gilligan, A. (1918) Alluvial deposits at Woodlesford and Rothwell Haigh, Leeds. Proceedings of the Yorkshire Geological Society, 19, 255-71.
- Girling, M. (1986) The insects associated with Lindow Man. In *Lindow Man. Body in the Bog* (eds I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 90–1.
- Glasser, N.F. (1995) Modelling the effect of topography on ice sheet erosion, Scotland. *Geografiska Annaler*, 77A, 67–82.
- Glasser, N.F. (1997) The origin and significance of sheet joints in the Cairngorm granite. *Scottish Journal of Geology*, **33**, 125–31.
- Glasser, N.F. and Hall, A.M. (1997) Calculating Quaternary glacial erosion rates in North East Scotland. *Geomorphology*, 20, 29–48.
- Glasser, N.F. and Hambrey, M.J. (1998) Subglacial meltwater channels at Thurstaston Hill, Wirral and their significance for Late Devensian ice sheet dynamics. *Proceedings of the Geologists' Association*, **109**, 139–48.
- Glasser, N.F. and Sambrook Smith, G.H. (1999) Glacial meltwater erosion of the Mid-Cheshire Ridge: implications for ice dynamics during the Late Devensian glaciation of northwest England. *Journal of Quaternary Science*, 14, 703–10
- Glasser, N.F. and Warren, C.R. (1990) Medium scale landforms of glacial erosion in south Greenland: process and form. *Geografiska Annaler*, 72A, 211–15.
- Glasser, N.F., Crawford, K.R., Hambrey, M.J. et

*al.* (1998) Lithological and structural controls on the surface wear characteristics of glaciated metamorphic bedrock surfaces: Ossian Sarsfjellet, Svalbard. *Journal of Geology*, **106**, 319–29.

- Glasser, N.F., Hambrey, M.J., Huddart, D., Gonzalez, S., Crawford, K.R. and Maltman, A.J. (2001) Terrestrial glacial sedimentation on the eastern margin of the Irish Sea basin: Thurstaston, Wirral. *Proceedings of the Geologists' Association*, **112**, 131–46.
- Godsen, M.S. (1965) Peat deposits of Scar Close, Ingleborough, Yorkshire. *Journal of Ecology*, 56, 345–53.
- Godwin, H. (1938) The origin of roddons. Geographical Journal, 91, 241-50.
- Godwin, H. (1940) Pollen analysis and forest history of England and Wales. *New Phytologist*, 39, 370–400.
- Godwin, H. (1949) The spreading of the British flora considered in relation to conditions of the late-glacial period. *Journal of Ecology*, **37**, 140–7.
- Godwin, H. (1954) Recurrence-surfaces. Danmarks Geologiska Undersökning, II Raekke, 80, 22-30.
- Godwin, H. (1956) The History of the British Flora: a factual basis for phytogeography, Cambridge University Press, Cambridge, 383 pp.
- Godwin, H. (1959) Studies in the Postglacial history of British vegetation. XIV. Late Glacial deposits at Moss Lake, Liverpool. *Philosophical Transactions of the Royal Society of London*, **B242**, 127–49.
- Godwin, H. (1960a) Radiocarbon dating and Quaternary history in Britain. *Proceedings of the Royal Society of London*, **B153**, 287–320.
- Godwin, H. (1960b) Prehistoric wooden trackways of the Somerset Levels: their construction age and relation to climatic change. *Proceedings of the Prehistoric Society*, 26, 1.
- Godwin, H. (1975) *History of the British Flora: a Factual Basis for Phytogeography*, 2nd edn, Cambridge University Press, Cambridge, 541 pp.
- Godwin, H. and Clapham, A. R. (1951) Peat deposits on Cross Fell, Cumberland. *New Phytologist*, **50**, 167–71.
- Godwin, H. and Godwin, M.E. (1933) British Maglemose harpoon sites. *Antiquity*, 7, 36–48.
- Godwin, H. and Switsur, V.R. (1966) Cambridge University natural radiocarbon measure-

ments. VIII. Radiocarbon, 8, 390-400.

- Godwin, H. and Willis, E.H. (1959) Cambridge University natural radiocarbon measurements. I. *Radiocarbon*, 1, 63–75.
- Godwin, H. and Willis, E.H. (1964) Cambridge University Natural Radiocarbon Measurements. VI. *Radiocarbon*, 6, 116–37.
- Godwin, H., Walker, D. and Willis, E. (1957) Radiocarbon dating and post-glacial vegetational history: Scaleby Moss. *Proceedings of the Royal Society of London*, **B147**, 352–66.
- Goldie, H.S. (1973) The limestone pavements of Craven. *Transactions of the Cave Research Group of Great Britain*, **15**, 175–90.
- Goldie, H.S. (1981) Morphometry of limestone pavements of Farleton Knott (Cumbria, England). *Transactions of the British Cave Research Association*, 8, 207–24.
- Goldie, H. S. (1996) The limestone pavements of Great Asby Scar, Cumbria, UK. *Environmental* Geology, 28, 128–36.
- Gonzalez, S., Huddart, D. and Roberts, G. (1997) Holocene development of the Sefton coast: a multidisciplinary approach to understanding the archaeology. In Archaeological Science 1995: proceedings of a conference on the application of scientific techniques to the study of archaeology, Liverpool, July 1995, (eds A. Sinclair, E. Slater and J. Gowlett), Oxbow Monograph, No. 64, Oxbow Books, Oxford, pp. 271–81.
- Gonzalez, S., Kitchener, A.C. and Lister, A.M. (2000) Survival of the Irish elk into the Holocene. *Nature*, **405**, 763–4.
- Goodchild, J.G. (1875) The glacial phenomena of the Eden Valley. *Quarterly Journal of the Geological Society of London*, **31**, 55–99.
- Goodchild, J.G. (1887) Ice work in Edenside and some of the adjoining parts of North West England. *Transactions of the Cumberland and Westmorland Advancement of Literature and Science*, **12**, 111–67.
- Goodchild, J.G. (1889/90) The history of the Eden and some rivers adjacent. *Transactions* of the Cumberland and Westmorland Association, 14, 73–90.
- Goodchild, J.G. (1890) On the weathering of limestones. *Geological Magazine*, 7, 463-66.
- Goodess, C.M., Palutikof, J.P. and Davies, T.D. (1991) Studies of Climatic Effects and Impacts Relative to Deep Underground Disposal of Radioactive Waste. *Nirex Report*, NSS/R267.
- Goodess, C.M., Palutikof, J.P. and Davies, T.D. (1992) The Nature and Causes of Climatic

Change: Assessing the Long Term Future, Studies in climatology series, Belhaven Press, London, 248 pp.

- Gordon, D., Smart, P.L., Ford, D.C. *et al.* (1989) Dating of Late Pleistocene interglacial and interstadial periods in the United Kingdom from speleothem growth frequency. *Quaternary Research*, **31**, 14–26.
- Gordon, J.E. (1979) Reconstructed Pleistocene ice sheet temperatures and glacial erosion in northern Scotland. *Journal of Glaciology*, 22, 331–44.
- Gordon, J.E. (1981) Ice-scoured topography and its relationships to bedrock structure and ice movement in parts of northern Scotland and west Greenland. *Geografiska Annaler*, 63A, 55–65.
- Gordon, J.E. (1993) The Cairngorms. In *Quaternary of Scotland* (eds J.E. Gordon and D.G. Sutherland), Geological Conservation Review Series, No. 6, Chapman and Hall, London, pp. 259–76.
- Gordon, J.E. and Sutherland, D.G. (1993) *Quaternary of Scotland*, Geological Conservation Review Series, No. 6, Chapman and Hall, London, 695 pp.
- Gorham, E. (1957) The chemical composition of some waters from lowland lakes in Shropshire. *Tellus*, 9, 174.
- Gorell, C.T. and Shaw, J. (1991) Deposition in an esker, bead and fan complex, Lanark, Ontario, Canada. *Sedimentary Geology*, **72**, 285–314.
- Gosden, S. (1968) Peat deposits of Scar Close, Ingleborough, Yorkshire. *Journal of Ecology*, 56, 345–54
- Goudie, A. (1990) *The Landforms of England and Wales*, Basil Blackwell, Oxford, 394 pp.
- Goudie, A.S. and Piggott, N.R. (1981) Quartzite tors, stone stripes and slopes at The Stiperstones, Shropshire, England. *Biuletyn Peryglacjalyny*, 28, 47–56.
- Gowlett, J. A.J., Hedges, R.E.M. and Law, I.A. (1989) Radiocarbon accelerator (AMS) dating of Lindow Man. *Antiquity*, 63, 71–9.
- Gowlett, J.A.J., Gillespie, R., Hall, E.T. and Hedges, R.E.M. (1986) Accelerator radiocarbon dating of ancient human remains from Lindow Moss. In *Lindow Man. Body in the Bog* (eds I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 22–4.
- Gray, J.M. and Coxon, P.M. (1991) The Loch Lomond Stadial glaciation in Britain and Ireland. In *Glacial Deposits in Great Britain*

*and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publications, Rotterdam, pp. 89–105.

- Green, A.H., Russell, R., Dakyns, J.R. et al. (1878) The Geology of the Yorkshire Coalfield, Coalfied Memoir of the Geological Survey of England and Wales, HMSO, London, 823 pp. check
- Green, B.H. (1965) Some studies of water/peat/plant relationships with special reference to Wybunbury Moss, Cheshire. Unpublished PhD thesis, University of Nottingham.
- Green, B.H. and Pearson, M.C. (1968) The ecology of Wybunbury Moss, Cheshire. I. The present vegetation and some physical, chemical and historical factors controlling its nature and distribution. *Journal of Ecology*, **56**, 245–67.
- Green, B.H. and Pearson, M.C. (1977). The ecology of Wybunbury Moss, Cheshire II. Post-Glacial history and the formation of the Cheshire mere and mire landscape. *Journal of Ecology*, **65**, 793–814.
- Green, C.P. and McGregor, D.F.M. (1980) Quaternary evolution of the River Thames. In *The Shaping of Southern England* (ed. D.K.C. Jones), *Institute of British Geographers Special Publication*, No. 11, Academic Press, London, pp. 177–202.
- Green, C.P., Coope, G.R., Holyoak, D.T. *et al.* (1984) Evidence of two temperate episodes in late Pleistocene deposits at Marsworth, U.K. *Nature*, **309**, 778–81.
- Green, H.S. (1984) Pontnewydd Cave: a lower Palaeolithic hominid site in Wales: the first report, National Museum of Wales Quaternary Studies Monographs, No. 1, Amgueddfa Genedlaethol Cymru, Cardiff, 227 pp.
- Green, P.F. (1986) On the thermo-tectonic evolution of Northern England: evidence from fission track analysis. *Geological Magazine*, **123**, 493–506.
- Greenwood, G. (1857) Rain and Rivers, London.
- Gregory, J.W. (1913) The Polmont kame and on the classification of Scottish kames. *Transactions of the Geological Society of Glasgow*, 14, 199–218.
- Gregory, J.W. (1921) The Irish Eskers. *Philosophical Transactions of the Royal Society*, **B210**, 115–51.
- Gregory, J.W. (1922) The English 'eskers' their

structure and distribution. *Geological Magazine*, **59**, 25–44.

- Gregory, K.J. (1962a) Contributions to the geomorphology of the North York Moors. Unpublished PhD thesis, University of London.
- Gregory, K.J. (1962b) The deglaciation of eastern Eskdale, Yorkshire. *Proceedings of the Yorkshire Geological Society*, **33**, 363–80.
- Gregory, K.J. (1965) Proglacial Lake Eskdale after sixty years. *Transactions of the Institute of British Geographers*, 34, 149–62.
- Gregory, K.J. (1966) Aspect and landforms in northeast Yorkshire. *Biuletyn Peryglacjalny*, 15, 115–20.
- Gregory, K.J. (ed.) (1997) *Fluvial Geomorphology of Great Britain*, Geological Conservation Review Series, No. 13, Joint Nature Conservation Committee, Peterborough, 347 pp.
- Greig, J. (1982). Past and present limewoods of Europe. In Archaeological Aspects of Woodland Ecology (eds M. Bell and S. Limbrey), Symposia of the Association for Environmental Archaeology, No. 2; British Archaeological Reports International Series, 146, British Archaeological Reports, Oxford, pp. 23-55.
- Greig, J. (1996) Great Britain England. In Palaeoecological Events During the Last 15 000 Years: Regional Syntheses of Palaeoecological Studies of Lakes and Mires in Europe (eds B.E. Berglund, H.J.B. Birks, M. Ralska-Jasiewiczowa and H.E. Wright), John Wiley and Sons Ltd, Chichester, pp. 15–76.
- Gresswell, R.K. (1937) The geomorphology of the south-west Lancashire coast-line. *Geographical Journal*, **90**, 335–49.
- Gresswell, R.K. (1953) Sandy Shores in South Lancashire: The Geomorphology of Southwest Lancashire, Liverpool Studies in Geography, University Press, Liverpool, 194 pp.
- Gresswell, R.K. (1957) Hillhouse coastal deposits of south Lancashire. *Liverpool and Manchester Geological Journal*, 2, 60–78.
- Gresswell, R.K. (1962) The glaciology of the Coniston Basin. *Geological Journal*, 3, 83–96.
- Gresswell, R.K. (1964) The origin of the Mersey and Dee estuaries. *Geological Journal*, 4, 77–85.
- Gresswell, R.K. (1967) The geomorphology of the Fylde. In *Liverpool Essays in Geography: a Jubilee Collection* (eds R.W. Steel and R. Lawton), Longmans and Co., London, pp.

25-42.

- Grieve, W. and Hammersley, A.D. (1971) A reexamination of the Quaternary deposits of the Barrow area. *Proceedings of the Barrow Natural History Field Club*, **10**, 5–25.
- Grigson, C. (1981) Fauna. In *The Environment* in British Prehistory (eds I. Simmons and M.J. Tooley), Duckworth, London, pp. 110–24.
- Grootes, P.M., Stuiver, M., White, J.W.C., Johnsen, S. and Jouzel, J. (1993) Comparison of oxygen isotope records from the GISP2 and GRIP Greenland ice cores. *Nature*, **366**, 552–4.
- Guilcher, A. (1950) Nivation, cryoplanation et solifluction quaternaires dans les colins de Bretagne Occidentale et du Nord de Devonshire. *Revue de Geomorphologie Dynamique*, 1, 53–78.
- Gullentops, F., Janssen, J. and Paulissen, E. (1993) Saalian nivation activity in the Bosbeek Valley, NE Belgium. *Geologie en Mijnbouw*, 72, 125–30.
- Gunn, W. (1900) The Geology of Belford, Holy Island and the Farne Islands (quarter-sheet 110SE), Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – Old Series, HMSO, London, 155 pp.
- Gunson, A.R. (1991) Garths. In Western Pennines: field guide (ed. W.A. Mitchell), Quaternary Research Association Field Guides, Quaternary Research Association, London, pp. 99–103.
- Haggart, B. (1988) The stratigraphy, depositional environment and dating of a possible tidal surge deposit in the Beuly Firth area, Northeast Scotland. *Palaeogeography*, *Palaeoclimatology and Palaeoecology*, 66, 215–30.
- Haldorsen, S. and Shaw, J. (1982) The problem of recognising melt-out till. *Boreas*, **11**, 261–77.
- Hale, W.G. (1985) *Martin Mere: its History and Natural History*, The Wildfowl Trust, Martin Mere, Burscough, 24 pp.
- Halkon, P. (1999) The early landscape of the Foulness valley, East Yorkshire. In The Quaternary of North-East England: field guide (eds D.R. Bridgland, B.P. Horton and J.B. Innes), Quaternary Research Association Field Guides, Quaternary Research Association, London, pp. 173–5.
- Hall, A. M. (1985) Cenozoic weathering covers in Buchan, Scotland, and their significance. *Nature*, **315**, 392–5.
- Hall, A.M. (1986a) Weathering and relief devel-

opment in Buchan, Scotland. In International Geomorphology: proceedings of the First International Conference on Geomorphology (ed. V. Gardiner), John Wiley and Sons Ltd, Chichester, pp. 991–1005.

- Hall, A.M. (1986b) Deep weathering patterns in north-east Scotland and their geomorphological significance. *Zeitschrift für Geomorphologie*, **30**, 407–22.
- Hall, A. M. (1991) Pre-Quaternary landscape evolution in the Scottish Highlands. *Transactions* of the Royal Society of Edinburgh: Earth Sciences, 82, 1–26.
- Hall, A.M. and Mellor, T. (1988) The characteristics and significance of deep weathering in the Gaick area, Grampian Highlands, Scotland. *Geografiska Annaler*, **70A**, 309–14.
- Hall, A.M. and Sugden, D.E. (1987) Limited modification of mid-latitude landscapes by ice sheets: the case of north-east Scotland. *Earth Surface Processes and Landforms*, **12**, 531–42.
- Hall, A.M., Mellor, T. and Wilson, M.J. (1989) The clay mineralogy and age of deeply weathered rock in north-east Scotland. *Zeitschrift für Geomorphologie, Supplement Band*, 72, 97–108.
- Hall, A.R. (1984) Flandrian plant macrofossils from Skipsea Withow Mere. In Late Quaternary Environments and Man in Holderness (ed. D.D. Gilbertson), British Archaeological Reports British Series, 134, British Archaeological Reports, Oxford, pp. 164-5.
- Hall, B.R. (1956) Borehole Records from the Mosses of South-west Lancashire, Soil Survey of England and Wales, MS65, Harpenden.
- Hall, B.R. and Folland, C.J. (1967) Soils of the South-West Lancashire Coastal Plain (Sheets 74 and 83), Memoir of the Soil Survey of Great Britain (England and Wales), Soil Survey of Great Britain, Harpenden.
- Hall, D., Wells, C.E. and Huckerby, E. (1995) The Wetlands of Greater Manchester, North West Wetlands Survey, 2; Lancaster Imprints, 3, Lancaster University Archaeological Unit, Lancaster, 188 pp.
- Hallam, J.S., Edwards, B.J.N., Barnes, B. and Stuart, A.J. (1973) The remains of a Late glacial elk associated with barbed points from High Furlong, near Blackpool, Lancashire. *Proceedings of the Prehistoric Society*, 39, 100–28.
- Hallet, B. and Prestrud, S. (1986) Dynamics of

periglacial sorted circles in western Spitzbergen. Quaternary Research, 26, 81-9.

- Halliday, G. (1997) A Flora of Cumbria: comprising the vice-counties of Westmorland with Furness (v.c.69), Cumberland (v.c.70) and parts of North-West Yorkshire (v.c.65) and North Lancashire (v.c.60), Centre for North-West Regional Studies, University of Lancaster, Lancaster, 611 pp.
- Hancock, J.M. and Rawson, P.F. (1992) Cretaceous. In Atlas of Palaeogeography and Lithofacies (eds J.C. Cope, J.K. Ingham and P.F. Rawson), Geological Society of London Memoir, No. 13, Geological Society of London, London, pp. 131–9.
- Hardiman, M.A., Fairchild, J.E. and Longworth, G. (1992) Harwell radiocarbon measurements XI. *Radiocarbon*, **34**, 47–70.
- Hardy, E.M. (1939) Studies of the Post-glacial history of British vegetation. V. The Shropshire and Flint Maelor Mosses. *New Phytologist*, 38, 364.
- Harkness, D.D. (1981) Scottish Universities Research and Reactor Centre. Radiocarbon measurements IV. Radiocarbon, 23, 252–304.
- Harkness, D.D., Gaunt, G.D. and Nunney, J.H. (1977) Radiocarbon dating versus the Leeds Hippopotamus – a cautionary tale. *Proceedings of the Yorkshire Geological Society*, **41**, 223–30.
- Harmer, F.W. (1928) The distribution of erratics and drift. *Proceedings of the Yorkshire Geological Society*, **21**, 79–150.
- Harmsworth, R.V. (1968) The developmental history of Blelham Tarn (England) as shown by animal microfossils, with special reference to the Cladocera. *Ecological Monographs*, **38**, 232–41.
- Harris, C. (1981) Periglacial Mass-wasting: a Review of Research, British Geomorphological Research Group, Monograph Series, No. 4, Geo Books, Norwich, 204 pp.
- Harris, C. (1998) The micromorphology of paraglacial and periglacial slope deposits: a case study from Morfa Bychan, west Wales, UK. *Journal of Quaternary Science*, 13(1), 73–84.
- Harris, C. and McCarroll, D. (1990) Glanllynau.
  In North Wales: field guide (eds K. Addison,
  M.J. Edge and R. Watkins), Quaternary
  Research Association Field Guide, Quaternary
  Research Association, Coventry, pp. 38–47.
- Harris, C. and Wright, M.D. (1980) Some last glaciation drift deposits near Pontypridd,

South Wales. Geological Journal, 15, 7-20.

- Harris, C., Williams, G., Brabham, P., Eaton, G. and McCarroll, D. (1997) Glaciotectonized Quaternary sediments at Dinas Dinlle, Gwynedd, North Wales, and their bearing on the style of deglaciation in the eastern Irish Sea. *Quaternary Science Reviews*, 16, 109–27.
- Harris, S.A., French, H.M., Heginbottom, J.A. et al. (1988) Glossary of Permafrost and Related Ground-ice Terms, National Research Council of Canada Technical Memorandum, No. 142, National Research Council of Canada, Ottawa, pp. 156.
- Harrison, B.C. (1993) New settlements in the North York Moors. In Medieval Rural Settlement in North-East England (ed. B. Vyner), Architectural and Archaeological Society of Durham and Northumberland Research Report, No. 2, Architectural and Archaeological Society of Durham and Northumberland, Durham, pp. 19–32.
- Harrison, B.J.D. and Roberts, B.K. (1999) The Medieval Landscape. In *The North York Moors: Landscape Heritage* (eds D.A Spratt and B.J.D Harrison), David and Charles Publishers, London, pp. 72–112.
- Harrison, S. (1991) A possible paraglacial origin for the drift sheets of upland Britain. *Quaternary Newsletter*, 64, 14–18.
- Harrison, S. (1994) The upper reaches of the Breamish Valley. In *The Geomorphology and Late Quaternary Evolution of the Cheviot Hills* (eds S. Harrison and R.M. Tipping), British Geomorphological Research Group, Durham, pp. 50-6.
- Harrison, S. (1996) Paraglacial or periglacial? The sedimentology of slope deposits in upland Northumberland. In Advances in Hillslope Processes (eds M.G. Anderson and S.M. Brooks), British Geomorphological Research Group, Symposia Series, John Wiley and Sons Ltd, Chichester, pp. 1197–218.
- Harrison, S.S.C. and Hildrew, A.G. (1998) Distribution dynamics of epilithic insects in a lake littoral. *Archiv Fur Hydrobiologie*, 143, 275–293.
- Harrop, S. (1985) Old Birkdale and Ainsdale: Life on the South-west Lancashire Coast 1600–1851, The Birkdale and Ainsdale Historical Research Society, Southport, 68 pp.
- Hart, J.K. (1994) Till fabric associated with deformable beds. *Earth Surface Processes and Landforms*, **19**, 15–32.

- Hart, J.K. (1995) Drumlin formation in southern Anglesey and Arvon, northwest Wales. *Journal* of *Quaternary Science*, **10**, 3–14.
- Hart, J. K. (1997) The relationship between drumlins and other forms of subglacial glaciotectonic deformation. *Quaternary Science Reviews*, 16, 93–107.
- Hart, J.K. (1998) The deforming bed/debris-rich basal ice continuum and its implications for the deformation of glacial landforms (flutes) and sediments (melt-out till). *Quaternary Science Reviews*, **17**, 737–54.
- Hart, J.K. and Boulton, G.S. (1991) The interrelation of glaciotectonic and glaciodepositional processes within the glacial environment. *Quaternary Science Reviews*, 10, 335–50.
- Hart, J.K. and Roberts, D. (1994) Criteria to distinguish between subglacial glaciotectonic and glaciomarine sedimentation, I.
  Deformation styles and sedimentology. Sedimentary Geology, 91, 191–213.
- Hart, J.K., Hindmarsh, R.C.A. and Boulton, G.S. (1990) Different styles of subglacial glaciotectonic deformation in the context of the Anglian ice sheet. *Earth Surface Processes* and Landforms, 15, 227–41.
- Harvey, A.M. (1985) The river systems of northwest England. In *The Geomorphology of North-West England* (ed. R.H. Johnson), Manchester University Press, Manchester, pp. 122–42.
- Haslam, C.J. (1987) Late Holocene peat stratigraphy and climatic change – a macrofossil investigation from the raised mires of northwestern England. Unpublished PhD thesis, University of Southampton.
- Hather, J.G. (1998) Identification of Macroscopic Charcoal Assemblages. In Star Carr in Context: new archaeological and palaeoecological investigations at the Early Mesolithic site of Star Carr, North Yorkshire (eds P.A. Mellars and P. Dark), McDonald Institute Monographs, McDonald Institute for Archaeological Research, Cambridge, pp. 183-96.
- Haworth, E.Y. (1969) The diatoms of a sediment core from Blea Tarn, Langdale. *Journal of Ecology*, **57**, 429–39.
- Hay, T. (1936) Stone stripes. Geographical Journal, 87, 47-50.
- Hay, T. (1937) Physiographical notes on the Ullswater area. *Geographical Journal*, 90, 426-45.

- Hay, T. (1943). Notes on glacial erosion and stone stripes. *Geographical Journal*, 103, 13–20.
- Hay, T. (1934) The glaciology of the Ullswater area. *Geographical Journal*, 84, 136-48.
- Hay, T. (1944) Rosthwaite moraines and other Lakeland notes. *Geographical Journal*, **103**, 119–24.
- Haynes, J.R., Kiteley, R.J., Whatley, R.C. and Wilks, P.J. (1977) Microfaunas, microfloras and the environmental stratigraphy of the Late Glacial and Holocene in Cardigan Bay. *Geological Journal*, **12**, 129–58.
- Haynes, J., McCabe, A.M. and Eyles, N. (1995) Microfaunas from Late Devensian glaciomarine deposits in the Irish Sea Basin. *Irish Journal of Earth Sciences*, 14, 81–103.
- Head, R., Fenwick, H., Van de Noort, R., Dinnin,
  M. and Lillie, M. (1995a) The meres and coastal survey. In Wetland Heritage of Holderness: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 163–239.
- Head, R., Fenwick, H., Van de Noort, R., Dinnin, M. and Lillie, M. (1995b) The survey of southern Holderness. In Wetland Heritage of Holderness: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 241–310.
- Heathcote, J., McMillan, A., Merritt, J.W., Klink, B.A. and Green, H.R. (1997) Synthesis of the Hydrological Characteristics of the Onshore Quaternary Domains at Sellafield. *Nirex Science Report*, SA/97/001.
- Hedges, R.E.M., Housley, R.A., Law, I.A. and Bronk, C.R. (1990) Radiocarbon dates from the Oxford AMS system: Archaeometry date list 10. Archaeometry, **32**, 101–8.
- Heijnis, H. and Vanderplicht, J. (1992) Uranium/thorium dating of Late Pleistocene peat deposits in NW Europe, Uranium/thorium isotope systematics and open-system behaviour of peat layers. *Chemical Geology*, 94, 161–71.
- Hein, F.J. and Walker, R.G. (1977) Bar evolution and development of stratification in the gravelly braided Kicking Horse River, British Columbia. *Canadian Journal of Earth Sciences*, 14, 562–70.
- Heinrich, H. (1988) Origin and consequences of cyclic ice rafting in the northeast Atlantic Ocean during the past 130,000 years. *Quaternary Research*, 29, 142–52.
- Hemingway, J.E. (1993) Geology and topogra-
phy of North-East Yorkshire. In *Prebistoric* and Roman Archaeology of North-East Yorkshire (ed. D.A. Spratt), Council for British Archaeology Research Report, 87; British Archaeological Reports British Series, 104, Council for British Archaeology, London, pp. 4–14.

- Hershey, O.H. (1897) Eskers indicating stages of glacial recession in the Kansan epoch in northern Illinois. *American Geologist*, 19, 245–53.
- Hétu, B. (1995) Le tilage des éboulis stratifiés cryonivaux en Gaspésie (Québec, Canada); rôle de la sédimentation nivéo-eolienne et des transites supranivaux. *Permafrost and Periglacial Processes*, 6, 147–71.
- Hey, R.W. (1976) Provenance of far-travelled pebbles in the pre-Anglian Pleistocene of East Anglia. *Proceedings of the Geologists' Association*, **87**, 69–82.
- Hey, R.W. (1980) Equivalents of the Westland Green Gravels in Essex and East Anglia. *Proceedings of the Geologists' Association*, 91, 279–90.
- Hey, R.W. (1986) A re-examination of the Northern Drift of Oxfordshire. *Proceedings of the Geologists' Association*, 97, 291–301.
- Hey, R.W. (1991) Pre-Anglian glacial deposits and glaciations in Britain. In *Glacial Deposits in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 13–16.
- Heyworth, A. (1978) Submerged forests around the British Isles: their dating and relevance as indicators of post-glacial land and sea level changes. In Dendrochronology in Europe: Principles, Interpretations and Applications to Archaeology and History (ed. J. Fletcher), University of Oxford Research Laboratory for Archaeology and History of Art, No. 2; Archaeological Series/National Maritime Museum, No. 4, British Archaeological Reports International Series, 51, British Archaeological Reports, Oxford, pp. 279–88.
- Heyworth, A. (1986) Submerged forests as sealevel indicators. In *Sea-level Research: a Manual for the Collection and Evaluation of Data* (ed. O. von de Plassche), Geo Books, Norwich, pp. 401–11.
- Hibbert, F.A. and Switsur, V.R. (1976) Radiocarbon dating of Flandrian pollen zones in Wales and Northern England. *New Pbytologist*, 77, 793–807.
- Hibbert, F.A., Switsur, V.R. and West, R.G. (1971)

Radiocarbon dating of Flandrian pollen zones at Red Moss, Lancashire. *Proceedings of the Royal Society of London*, **B177**, 161–76.

- Hicks, S.P. (1971) Pollen-analytical evidence for the effect of prehistoric agriculture on the vegetation of north Derbyshire. *New Phytologist*, **70**, 647–67.
- Hicock, S.R. (1991) On subglacial stone pavements in till. *Journal of Geology*, **99**, 607–19.
- Hicock, S.R. and Dreimanis, A. (1992) Deformation till in the Great Lakes region: implications for rapid flow along the south-central margin of the Laurentide Ice Sheet. *Canadian Journal of Earth Sciences*, 29, 1565–79.
- Hicock, S.R., Goff, J.R., Lian, O.B. and Little, E.C. (1996) On the interpretation of subglacial till fabric. *Journal of Sedimentary Research*, 66, 928–34.
- Higgs, E.S. (1975) Site catchment analysis: a concise guide to field methods. In *Palaeoeconomy* (ed. E.S. Higgs), Cambridge University Press, Cambridge, pp. 223–4.
- Hillis, R.R. (1991) Chalk porosity and Tertiary uplift, western approaches trough, SW UK and NW French continental shelves. *Journal* of the Geological Society, London, 148, 669–79.
- Hillman, G.C. (1986) Plant foods in ancient diet: the archaeological role of palaeofaeces in general and Lindow Man in particular. In *Lindow Man. Body in the Bog* (eds. I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 99–115.
- Hindle, B.P.(1980) *Cave Formation in Northern England*, Lyon Ladders, Dent, 37 pp.
- Hindmarsh, R.C.A. (1999) Drumlinization and drumlin-forming instabilities: viscous till mechanisms. *Journal of Glaciology*, **45**, 293–314.
- Hinton, M.A.C. (1919) Description of the Rodent Teeth. In On a deposit of interglacial loess and some transported preglacial freshwater clays on the Durham coast (C.T. Trechmann). *Quarterly Journal of the Geological Society of* London, 75, 175–203.
- Hobby, R. (1990) Palaeoenvironmental significance of Holocene lake-level fluctuations in Shropshire. Unpublished PhD thesis, University of Southampton.
- Hodgson, E. (1862) On a deposit containing Diatomacae, leaves, etc. in the iron-ore mines near Ulverston. *Journal of the Geological Society, London*, **19**, 19–31.
- Hodgson, J.M., Catt, J.A. and Weir, A.H. (1967)

The origin and development of clay with flints and associated soil horizons on the South Downs. *Journal of Soil Science*, **18**, 85–102.

- Hogg, S. (1972) Post-Weichselian history of the north Northumberland coastal zone.
  Unpublished BA Dissertation, University of Durham, UK, 86 pp.
- Holden, T.G. (1986) Plant remains from Lindow Man's last meal. In *Lindow Man. Body in the Bog* (eds I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 117–25.
- Holden, T.G. (1995) The last meals of the Lindow Bog Men. In Bog Bodies. New Discoveries and New Perspectives (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 76–82.
- Holliday, D.W. (1993) Mesozoic cover over northern England: interpretation of apatite fission track data. *Journal of the Geological Society*, *London*, **150**, 657–60.
- Hollingworth, S.E. (1931) Glaciation of western Edenside and adjoining areas and the drumlins of the Edenside and Solway basin. *Quarterly Journal of the Geological Society of London*, 87, 281–359.
- Hollingworth, S.E. (1934) Some solifluction phenomena in the northern part of the Lake District. *Proceedings of the Geologists' Association*, 45, 167–88.
- Hollingworth, S.E. (1935) High level erosional platforms of Cumberland. *Proceedings of the Yorksbire Geological Society*, **23**, 159–77.
- Hollingworth, S.E. (1938) The recognition and correlation of High Level Erosion Surfaces in Britain: a statistical study. *Quarterly Journal* of the Geological Society of London, 94, 55-84.
- Hollingworth, S.E. (1951) The influence of glaciation in the Lake District. *Journal of the Institute of Water Engineers*, **5**, 486–96.
- Hollingworth, S.E. and Taylor, J.H. (1946) An outline of the geology of the Kettering district. *Proceedings of the Geologists' Association*, 57, 204–33.
- 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, P.F. (1965) The natural history of Malham Tarn. *Field Studies*, 2, 199–223.
- Holt, G. (1786) Remains of a large forest not far from Liverpool. *Gentleman's Magazine*, 66, 549-51.

- Holyoak, D.T. (1983) The identity and origin of *Picea abies* (L.) Karsten from the Chelford interstadial (Late Pleistocene) of England. *New Phytologist*, 95, 153–57.
- Honeyman, A. (1985) Studies in the Holocene vegetation history of Wensleydale. Unpublished PhD thesis, University of Leeds.
- Hooke, J.M., Harvey, A.M., Miller, S.Y. and Redmond, C.E. (1990) The chronology and stratigraphy of the alluvial terraces of the River Dane Valley, Cheshire. *Earth Surface Processes and Landforms*, **15**, 717–37.
- Hooke, R.LeB. (1991) Positive feedbacks associated with erosion of glacial cirques and overdeepenings. *Bulletin of the Geological Society of America*, **103**, 1104–8.
- Horbury, A.D. (1987) Sedimentology of the Urswick Limestone in South Cumbria and North Lancashire. Unpublished PhD thesis, University of Manchester.
- Horbury, A.D. (1989) The relative roles of tectonism and eustacy in the deposition of the Urswick Limestone in South Cumbria and North Lancashire. 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. 153–69.
- Hornung, M. and Hatton, A.A. (1974) Deep weathering in the Great Whin Sill, Northern England. *Proceedings of the Yorkshire Geological Society*, 40, 105–14.
- Horton, A. (1970) The Drift Sequence and Subglacial Topography in parts of the Ouse and Nene Basin, Report of the Institute of Geological Sciences, 70/9, HMSO, London, 30 pp.
- Horton, B.P., Innes, J.B. and Shennan, I. (1999a)
  Late Devensian and Holocene sea-level changes in Northumberland, England. In *The Quaternary of North-East England: field guide* (eds D.R. Bridgland, B.P. Horton and J.B. Innes), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 35–47.
- Horton, B.P., Innes, J.B., Shennan, I. et al. (1999b) The Northumberland coast. In The Quaternary of North-East England: field guide (eds D.R. Bridgland, B.P. Horton and J.B. Innes), Quaternary Research Association Field Guide, Quaternary Research Association, London, pp. 147–65.

- Horton, B.P., Innes, J.B., Plater, A.J., Tooley, M.J. and Wright, M.R. (1999c) Post-glacial evolution and relative sea-level changes in Hartlepool Bay and the Tees estuary. In *The Quaternary of North-East England: Field Guide* (eds D.R. Bridgland, B.P. Horton and J.B. Innes), Quaternary Research Association, London, pp. 65–86.
- Housley, R.A. (1991) AMS dates from the Late Glacial and early Postglacial in north-west Europe: a review. In *The Late Glacial in North-west Europe: Human Adaptation and Environmental Change at the end of the Pleistocene* (eds N. Barton, A.J. Roberts and D.A. Roe), *Council for British Archaeology Research Report*, 77, Council for British Archaeology, London, pp. 25–39.
- Housley, R.A., Walker, A.J., Otlet, R.L. and Hedges, R.E.M. (1995) Radiocarbon dating of the Lindow III Bog Body. In *Bog Bodies. New Discoveries and New Perspectives* (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 39–46.
- Housman, J. (1800) A Topographical Description of Cumberland, Westmorland, Lancashire and a part of the West Riding of Yorkshire, C. Law and W. Clarke, Carlisle.
- Howard, A.J., Macklin, M.G., Black, S. and Hudson-Edwards, K.A. (2000) Holocene river development and environmental change in Upper Wharfedale, Yorkshire Dales, England. *Journal of Quaternary Science*, **15**, 239–52.
- Howarth, P.J. and Bones, J.G. (1972) Relationships between process and geometrical form on High Arctic debris slopes, south-west Devon Island, Canada. In *Polar Geomorph*ology (eds R.J. Price and D.E. Sugden), *Institute of British Geographers Special Publication*, No. 4, Institute of British Geographers, London, pp. 139–53.
- Howe, J.A. (1897) Notes on the pockets of sand and clay in the limestone of Derbyshire and Staffordshire. *Transactions and Report of the North Staffordshire Field Club*, **31**, 143–9.
- Howell, F.T. (1971) A continuous seismic profile survey of Windermere. *Geological Journal*, 7, 329–34.
- Howell, F.T. (1973) The sub-drift surface of the Mersey and Weaver catchment and adjacent areas. *Geological Journal*, **8**, 285–96.
- Howse, R. (1864) On the glaciation of the Counties of Durham and Northumberland. *Transactions of the North of England Institute of Mining and Mechanical Engineers*, 13,

169-85.

- Howson, W. (1850) An Illustrated Guide to the Curiosities of Craven, Whittaker and Company, London, 134 pp.
- Huckerby, E. and Wells, C.E. (1993) Recent work at Solway Moss, Cumbria. In North West Wetlands Survey Annual Report, 1993 (ed. R. Middleton), Lancaster University Press, Lancaster, pp. 37–42.
- Huddart, D. (1970) Aspects of glacial sedimentation in the Cumberland lowland. Unpublished PhD thesis, University of Reading, 340 pp.
- Huddart, D. (1971a) Textural distinction between Main Glaciation and Scottish Readvance tills in the Cumberland lowland. *Geological Magazine*, **108**, 317–24.
- Huddart, D. (1971b) A relative glacial chronology from the tills of the Cumberland lowland. *Proceedings of the Cumberland Geological Society*, 3(1), 21–32.
- Huddart, D. (1972) Late Devensian glacial history.
  ry. In *Cumberland Lowland Handbook* (eds D. Huddart and M.J. Tooley), Quaternary Research Association, Cambridge, pp. 3–47.
- Huddart, D. (1973) The origin of esker sediments, Thursby, Cumberland. Proceedings of the Cumberland Geological Society, 4, 59–69.
- Huddart, D. (1977) Ice-walled lacustrine sediments associated with a stagnating Devensian ice sheet, the Petteril Valley, Cumbria. X INQUA Congress Abstracts, p. 217.
- Huddart, D. (1981a) Pleistocene foraminifera from south-east Ireland – some problems of interpretation. *Quaternary Newsletter*, 33, 28-41.
- Huddart, D. (1981b) Knocknasilloge Member of Wexford: glacio-marine, marine or glaciolacustrine? *Quaternary Newsletter*, 35, 6–11.
- Huddart, D. (1981c) Fluvioglacial systems in Edenside (middle Eden valley and Brampton kame belt). In *Eastern Cumbria Field Meeting: 15-18 May 1981* (ed. J. Boardman), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 81-103.
- Huddart, D. (1981d) Periglacial landforms of Great and Little Dun Fells. In *Eastern Cumbria Field Meeting: 15–18 May 1981* (ed. J. Boardman), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 76–8.
- Huddart, D. (1983) Flow tills and ice-walled lacustrine sediments, the Petteril valley, Cumbria, England. In *Tills and Related*

Deposits: genesis / petrology / application / stratigraphy: proceedings of the INQUA Symposia on the Genesis and Lithology of Quaternary Deposits (eds E.B. Evenson, C. Schlüchter and J. Rabassa), A.A. Balkema Publishers, Rotterdam, pp. 81–94.

- Huddart, D. (1991) The glacial history and glacial deposits of the north and west Cumbrian lowlands. In *Glacial Deposits in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 151–68.
- Huddart, D. (1992) Coastal environmental changes and morphostratigraphy in southwest Lancashire, England. *Proceedings of the Geologists' Association*, 103, 217–36.
- Huddart, D. (1993) Controversial Irish Sea basin glacial models: some answers from the Cumbrian lowlands. Proceedings of the Cumberland Geological Society, 5(4), 476-80.
- Huddart, D. (1994) The late Quaternary glaciogenic sequence: landforms and environments in coastal Cumbria. In *Cumbria: field guide* (eds J. Boardman and J. Walden), *Quaternary Research Association Field Guide*, Quaternary Research Association, Oxford, pp. 59–77.
- Huddart, D. (1997) Overview of the Quaternary sedimentary sequence and its evolution in West and South Cumbria. In *The Quaternary Geology of West Cumbria Field Guide* (eds M. Browne, R.J. Heath, D. Huddart and P. Nathanail), Environment Group of the Geological Society of London, London, pp. 8–23.
- Huddart, D. (1999) Supraglacial trough fills, southern Scotland: origins and implications for deglacial processes. *Glacial Geology* and Geomorphology, http://boris.qub.ac.uk/ 1999.papers/full/1999/rp041999/rp04.html, 1–13.
- Huddart, D. and Bennett, M.R. (1997) The Carstairs Kames (Lanarkshire, Scotland): morphology, sedimentology and formation. *Journal of Quaternary Science*, **12**, 467–84.
- Huddart, D. and Clark, R. (1994) Conflicting interpretations of glacial sediments and landforms in Cumbria. *Proceedings of the Cumberland Geological Society*, 5(4), 419-36.
- Huddart, D. and Peacock, J.D. (1989) Early Holocene morainal bank sedimentology and marine ecology, Skjoldungebrae gorge, North Scoresby Land, East Greenland. In

Glacimarine Environments: Processes and Sediments (eds J.A. Dowdeswell and J.D. Scourse), Geological Society of London Special Publication, No. 53, Geological Society of London, London, pp. 289–306.

- Huddart, D. and Tooley, M.J. (1972) The Cumberland Lowland 26–28 May 1972 Handbook, Quaternary Research Association, Cambridge, 96 pp.
- Huddart, D., Tooley, M.J. and Carter, P. (1977) The coasts of north-west England. In *The Quaternary History of the Irish Sea* (eds C. Kidson and M.J. Tooley), *Geological Journal Special Issue*, No. 7, Seel House Press, Liverpool, pp. 119–54.
- Huddart, D., Gonzalez, S. and Roberts, G. (1999a) The archaeological record and mid-Holocene marginal coastal palaeoenvironments around Liverpool Bay. *Quaternary Proceedings*, 7, 563–74.
- Huddart, D., Roberts, G. and Gonzalez, S. (1999b) Holocene human and animal footprints and their relationships with coastal environmental change, Formby Point, NW England. *Quaternary International*, 55, 29–41.
- Hudson, R.G.S. (1930) The Carboniferous of the Craven Reef Belt; and the Namurian unconformity at Scaleber, near Settle. *Proceedings of the Geologists' Association*, **41**, 290–322.
- Hudson, R.G.S. (1933) The scenery and geology of North-West Yorkshire. *Proceedings of the Geologists' Association*, 44, 228–55.
- Hudson, R.G.S. (1938) The general geology and the Carboniferous Rocks. In The Geology of the Country around Harrogate. *Proceedings* of the Geologists' Association, 49, 295–352.
- Hudson, R.G.S. (1944) A pre-Namurian fault scarp at Malham. Proceedings of the Leeds Philosophical Society (Science Section), 4, 226-32.
- Hudson, R.G.S. and Dunnington, H.V. (1944) The Carboniferous rocks of the Swinden Anticline, Yorkshire. *Proceedings of the Geologists' Association*, 55, 195–215.
- Hudson; R.G.S. and Mitchell, G.H. (1937) The Carboniferous geology of the Skipton Anticline. Summary of Progress of the Geological Survey of Great Britain and the Museum of Practical Geology (1935), part 2, 1-45.
- Hughes, D.B. and Teasdale, D.A. (1999) Herrington Colliery opencast coal site. In *The Quaternary of North-East England: field*

guide (eds D.R. Bridgland, B.P. Horton and J.B. Innes), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 137–46.

- Hughes, D.B., Clarke, B.G. and Money, M.S. (1998) The glacial succession in lowland Northern England. *Quarterly Journal of Engineering Geology*, **31**, 211–34.
- Hughes, P.D.M., Mauquoy, D., Barber, K.E. and Langdon, P.G. (2000) Mire-development pathways and palaeoclimatic records from a full Holocene peat archive at Walton Moss, Cumbria, England. *The Holocene*, **10**, 465–79.
- Hughes, T.McK. (1886) On some perched blocks and associated phenomena. *Quarterly Journal of the Geological Society of London*, 42, 527–39.
- Hull, E. (1864) Geology of the Country around Oldham, including Manchester and its Suburbs (Sheet 88SW), Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – Old Series, HMSO, London, 67 pp.
- Hume, A. (1863) Ancient Meols: or some account of the Antiquities found near Dove Point on the Sea-Coast of Cheshire, J.R. Smith, London, 411 pp.
- Hume, A. (1865) Changes of the sea coast of Lancashire and Cheshire. *Transactions of the Historical Society of Lancashire and Cheshire*, 6, 1–88.
- Hunt, C.O., Hall, A.R. and Gilbertson, D.D. (1984) The palaeobotany of the Late-Devensian sequence at Skipsea Withow Mere. In Late Quaternary Environments and Man in Holderness (ed. D.D. Gilbertson), British Archaeological Reports British Series, 134, British Archaeological Reports, Oxford, pp. 81–108.
- Huntley, J. (1995) Low Hauxley, Northumberland: an Assessment of the Plant Remains. *Durbam Environmental Archaeology Report*, 6/95.
- Huntley, B. and Birks, H.J.B. (1983) An Atlas of Past and Present Pollen Maps for Europe: 0-13 000 Years Ago, Cambridge University Press, Cambridge, 667 pp.
- Hutchinson, T.C. (1966) The occurrence of living and sub-fossil remains of *Betula nana* L. in Upper Teesdale. *New Phytologist*, 65, 351–7.
- Ikeda, S., Kasuya, M. and Ikeya, M. (1991) ESR ages of Middle Pleistocene corals from the Ryuku Islands. *Quaternary Research*, 36,

61-71.

- Imbrie, J, Hays, J.D., Martinson, D.G. et al. (1984) The orbital theory of Pleistocene climate: support from a revised chronology of the marine <sup>18</sup>O record. In *Milankovitch and Climate* (eds A. Berger, J. Imbrie, J. Hays, G. Kukla and B. Saltzman), Reidel, Dordrecht, pp. 269–305
- Ingebrigtsen, O. (1924) Hjortens Utbredelse i Norge. Bergens Museums Årbok 1922–23, Naturvidenskabelig Række, 6, 1–58.
- Innes, J.B. (1986). The history of the Shirdley Hill Sand revealed by examination of associated organic deposits. *Proceedings of the North of England Soils Discussion Group*, **21**, 31–43.
- Innes, J.B. (1989) Pollen analysis. In The Foxholes Project, North Yorkshire (N. Lang). Northern Archaeology, 7, 11–13.
- Innes, J.B. (1999) Regional vegetational history. In *The Quaternary of North-East England: field guide* (eds D.R. Bridgland, B.P. Horton and J.B. Innes), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 21–34.
- Innes, J.B. and Frank, R.M. (1988) Palynological evidence for Late Flandrian coastal changes at Druridge Bay, Northumberland. *Scottish Geographical Magazine*, **104**, 14–23.
- Innes J.B. and Simmons I.G. (1988) Disturbance and diversity: floristic changes associated with pre-elm decline woodland recession in north east Yorkshire. In Archaeology and the Flora of the British Isles (ed. M. Jones), Oxford University Committee for Archaeology Monograph, No. 14; Botanical Society for the British Isles Conference Report, No. 19, Oxford University Committee for Archaeology, Oxford, pp. 7–20.
- Innes J.B. and Simmons I.G. (1999) North Gill. In *The Quaternary of North-East England: field guide* (eds D.R. Bridgland, B.P. Horton and J.B. Innes), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 99–112.
- Innes, J B. and Tooley, M.J. (1993). The age and vegetational history of the Sefton coast dunes. In *The Sand Dunes of the Sefton Coast: proceedings of the Sefton Coast Research Seminar*, 31 May 1991, Liverpool (eds D. Atkinson and J. Houston), National Museums and Galleries on Merseyside with Sefton Metropolitan Borough Council, Liverpool, pp. 35–40.

- Innes, J.B., Tooley, M.J.C. and Tomlinson, P.R. (1989) A comparison of the age and palaeoecology of some sub-Shirdley Hill Sand peat deposits from Merseyside and south-west Lancashire. *The Naturalist*, 114, 65–9.
- Innes, J.B., Smith, D.B., Tooley, M.J., Twiddy, E. and Zong, Y. (1993) Palaeoclimate '93 Field Guide – Durham Coast, Department of Geography, University of Durham.
- Innes, J.B., Lloyd, J.M. and Austin, W.E.N. (1997) Sea-level Changes on the Northumberland Coast, International Geological Correlation Programme, Project 396 Field Guide, Department of Geography, University of Durham.
- Innes, J.B., Tooley, M.J. and Lageard, J.G.A. (1999) Vegetational changes before the Norman Conquest. In Ecology and Landscape Development: a History of the Mersey Basin: proceedings of a conference beld at Merseyside Maritime museum Liverpool, 5–6 July 1996 (ed. E.F. Greenwood), Liverpool University Press, Liverpool, pp. 21–31.
- Islam, J. and Tooley, M.J. (1999) Coastal and sealevel changes during the Holocene in Bangladesh. *Quaternary International*, **55**, 61–75.
- Issar, A. (1983) Emerging groundwater, a triggering factor in the formation of the makhteshim (erosion cirques) in the Negev and Sinai. *Israeli Journal of Earth Science*, **32**, 53–61.
- Issit, M., Kenward, H. and Milles, A. (1995) Invertebrate Remains from Excavations at Low Hauxley: an Assessment, EAU 95/16.
- Iversen, J. (1941) Landnam i Danmarks stenalder. Danmarks Geologiske Undersøgelse, II, 66, 1–68.
- Iversen, J. (1954) The late-glacial flora of Denmark and its relation to climate and soil. Danmarks Geologiske Undersøgelse, II, 80, 87-119.
- Iverson, N.R. (1991) Potential effects of subglacial water pressure fluctuations on quarrying. *Journal of Glaciology*, 37(125), 27–36.
- Jackson, D.I., Mulholland, P., Jones, S.M. and Warrington, G. (1987) The geological framework of the East Irish Sea Basin. In Petroleum Geology of N.W. Europe: proceedings of the 3rd Conference on Petroleum Geology of North West Europe held at the Barbican Centre, London, 26–29 October 1986 (eds J. Brooks and K.W. Glennie), Vol. 1, Graham and Trotman, London, pp. 191–203.

- Jackson, J.W. and Mattinson, W.K. (1932) A cave on Giggleswick Scar near Settle, Yorkshire. *The Naturalist*, 5–9.
- Jacobi, R.M. (1978) Northern England in the eighth millennium BC: an essay. In *The Early Postglacial Settlement of Northern Europe: an Ecological Perspective* (ed P. Mellars), *New Approaches in Archaeology*, Duckworth, London, pp. 295–332.
- Jacobi, R.M., Tallis, J.H. and Mellars, PA. (1976) The southern Pennine Mesolithic and the ecological record. *Journal of Archaeological Science*, **3**, 307–20.
- Jacobi, R.M., Rowe, P.J., Gilmour, M.A., Grün, R. and Atkinson, T.C. (1998) Radiometric dating of the Middle Palaeolithic tool industry and associated fauna of Pin Hole Cave, Cresswell Crags, England. *Journal of Quaternary Science*, **13**, 19–42.
- James, J.W.C. (1982) The Sand and Gravel Resources of the Country North and West of Billingham, Cleveland: description of 1:25 000 sheets NZ42 and part of NZ52, Institute of Geological Sciences Mineral Assessment Report, 99, HMSO, London, 58 pp.
- James, W.C., Mack, G.H. and Monger, H.C. (1998) Paleosol classification. *Quaternary International*, **51–2**, 8–9.
- Japsen, P. (1997) Regional Neogene exhumation of Great Britain and the western North Sea. Journal of the Geological Society, London, 154, 239–47.
- Jarman, M.R. (1972) European deer economies and the advent of the neolithic. In *Papers in Economic Prehistory* (ed. E.S. Higgs), Cambridge University Press, Cambridge, pp. 125–47.
- Jehu, T.J. (1909) The glacial deposits of western Caernarvonshire. *Transactions of the Royal Society of Edinburgb*, 47, 17–56.
- Jelgermsa, S. and Tooley, M.J. (1993) Sea-level changes during the recent geological past. In *Holocene Cycles: Climate, Sea Levels and Sedimentation* (ed. C.W Finkl, Jr.), *Journal of Coastal Research Special Issue*, No. 17, Coastal Education and Research Foundation, Charlottesville, pp. 123–39.
- Jelgersma, S., de Jong, J., Zagwijn, W.H. and van Regteren Altena, J.F. (1970) The coastal dunes of the western Netherlands: geology, vegetational history and archaeology. *Mededelingen Rijks Geologiske Dienst, New Series*, 21, 93–167.

- Jenkin, B.M. and Mortimer, C.H. (1938) Sampling lake deposits. *Nature, London*, 142 (3601), 834–5.
- Jenkinson, R.D.S. (1984) Late Devensian vertebrate remains. In Late Quaternary Environments and Man in Holderness (ed. D.D. Gilbertson), British Archaeological Reports British Series British Series, 134, British Archaeological Reports, Oxford, pp. 218-20.
- Jenkinson, R.D.S., Hunt, C.O. and Brooks, I. (1985) Pinhole Cave. In *Peak District and Northern Dukeries: field guide* (eds D.J. Briggs, D.D. Gilbertson and R.D.S. Jenkinson), *Quaternary Research Association Field Guide*, Quaternary Research Association, Cambridge, pp. 135–8.
- Jennings, J.N. (1985) *Karst Geomorphology*, Blackwell Scientific Publications, Oxford, 293 pp.
- Jessen K. (1938) Some west Baltic pollen diagrams. *Quatär*, 1, 124–39.
- Jessen, K. and Farrington, A. (1938) The bogs of Ballybetagh near Dublin, with remarks on late-glacial conditions in Ireland. *Proceedings* of the Royal Irish Academy, **B44**, 10–205.
- Johnsen, S.J., Dansgaard, W., Clausen, H.B. and Langway, C.C. (1972) Oxygen isotope profiles through the Antarctic and Greenland ice sheets. *Nature*, **235**, 429–34.
- Johnsen S.J., Hammer C.U., Iversen P., Jouzel J., Stauffer N., and Steffensen J.P. (1992) Irregular glacial interstadials recorded in a new Greenland ice core. *Nature*, **359**, 311–13.
- Johnsen, S.J., Dahl-Jensen, D, Gundestrup, N. et al. (2001) Oxygen isotope and palaeotemperature records from six Greenland ice-core stations: Camp Century, Dye-3, GRIP, GISP2, Renland and NorthGRIP. Journal of Quaternary Science, 16, 299–307.
- Johnson, D.L. (1998) Paleosols are buried soils. Quaternary International, 51-2, 7.
- Johnson, G.A.L. (1952) A glacial erratic boulder of Shap Granite in south Northumberland. *Geological Magazine*, **89**, 361–4.
- Johnson, G.A.L. (1959) The Carboniferous stratigraphy of the Roman Wall Districts in Western Northumberland. *Proceedings of the Yorksbire Geological Society*, **32**, 83–130.
- Johnson, G.A.L. (1967) Basement control of Carboniferous sedimentation in northern England. *Proceedings of the Yorkshire Geological Society*, 6, 175–94.

- Johnson, G.A.L. (1997) *Geology of Hadrian's Wall*, Geologists' Association Guide, No. **59**, The Geologists' Association, London, 89 pp.
- Johnson, G.A.L. and Dunham, K. C. (1963) The Geology of Moor House: a National Nature Reserve in North-East Westmoorland, Monographs of the Nature Conservancy Council, No. 2, HMSO, London, 182 pp.
- Johnson, G.A.L. and Hickling, G. (1970) Geology of Durham County. *Transactions of the Natural History Society*, *Northumberland*, 41, 1–158.
- Johnson, G.A.L., Robinson, D. and Hornung, M. (1971) Unique bedrock and soils associated with the Teesdale Flora. *Nature*, **232**, 453–6.
- Johnson, R.H. (1957) Observations on the stream pattern of some peat moorlands in the southern Pennines. *Memoirs and Proceedings* of the Manchester Literary and Philosophical Society, 99, 110–27.
- Johnson, R.H. (1963) The Roosedyche, Whalley Bridge: a new appraisal. *East Midland Geographer*, 3, 155–62.
- Johnson, R.H. (1965a) Glacial geomorphology of the west Pennine slopes. In *Essays in Geography for A.A. Miller* (eds J.B. Whittow and P.D. Wood), University of Reading Press, Reading, pp. 58–93.
- Johnson, R.H. (1965b) The origin of the Churnet and Rudyard Valleys. North Staffordshire Journal of Field Studies, 5, 95-105.
- Johnson, R.H. (1967) Some glacial, periglacial and karstic landforms in the Sparrowpit–Dove Holes area of north Derbyshire. *East Midland Geographer*, 4, 224–238.
- Johnson, R.H. (1968) Four temporary exposures of solifluction deposits on Pennine hillslopes in north east Cheshire. *Mercian Geologist*, 2, 379–87.
- Johnson, R.H. (1969) The Derwent-Wye confluence re-examined. *East Midland Geographer*, 4, 421–6.
- Johnson, R.H. (1975) Some late Pleistocene involutions at Dalton-in-Furness, northern England. Geographical Journal, 10(1), 23-34.
- Johnson, R.H. (1985a) The geomorphology of the regions around Manchester: an introductory review. In *The Geomorphology of North-West England* (ed. R.H. Johnson), Manchester University Press, Manchester, pp. 1–23.
- Johnson, R.H. (1985b) The imprint of glaciation on the West Pennine Uplands. In *The Geomorphology of North-West England* (ed.

R.H. Johnson), Manchester University Press, Manchester, pp. 237-62.

- Johnson, R.H. and Rice, R.J. (1961) Denudation chronology of the south-west Pennine Upland. *Proceedings of the Geologists' Association*, 72, 21-31.
- Johnson, R.H. and Walthall, S. (1979) The Longdendale Landslides. *Geological Journal*, 14, 135–58.
- Johnson, R.H., Franks, J.W. and Pollard, J.E. (1970). Some Holocene faunal and floral remains in the Whitemoor meltwater channel at Bosley, east Cheshire. *North Staffordsbire Journal of Field Studies*, **10**, 65–74.
- Johnson, R.H., Tallis, J.H. and Pearson, M. (1972) A temporary section through Late-Denensian sediments at Green Lane, Daltonin-Furness, Lancashire. *New Phytologist*, 71, 533–44.
- Johnson, R.H., Tallis, J.H. and Wilson, P. (1990) The Seal Edge Coombes, North Derbyshire – a study of their erosional and depositional history. *Journal of Quaternary Science*, **5**, 83–94.
- Johnson, S. (1989) English Heritage Book of Hadrian's Wall, B.T. Batsford, London, 143 pp.
- Johnston, G. (1873) Our Visit to Holy Island in 1854. Proceedings of the Berwickshire Naturalists' Club, VII, 27-52.
- Jones, A. (1990) The Pleistocene deposits at Thurstaston, Wirral. In *Field Excursions in North West England* (ed. C. Park), University of Lancaster, Lancaster, pp. 221–9.
- Jones, C.R., Houston, J.A. and Bateman, D. (1993) A history of human influence on the coastal landscape. In *The Sand Dunes of the Sefton Coast: proceedings of the Sefton Coast Research Seminar*, 31 May 1991, Liverpool (eds D. Atkinson and J. Houston), National Museums and Galleries on Merseyside with Sefton Metropolitan Council, Liverpool, pp. 3–20.
- Jones, D.K.C. (1981) South East and Southern England, Geomorphology of the British Isles, Methuen, London, 332 pp.
- Jones, P.F. and Stanley, M.F. (1974) Ipswichian mammalian fauna from the Beeston Terrace at Boulton Moor, near Derby. *Geological Magazine*, **111**, 515–20.
- Jones, R.L. (1971) A contribution to the Late Quaternary ecological history of Cleveland, north-east Yorkshire. Unpublished PhD thesis, University of Durham.

Jones, R.L. (1976a) Late Quaternary vegetational

history of the North York Moors. IV. Seamer Carrs. Journal of Biogeography, 3, 397-406.

- Jones, R.L. (1976b) The activities of Mesolithic man: further palaeobotanical evidence from north-east Yorkshire. In *Geoarchaeology: Earth Science and the Past* (eds D.A. Davidson and M.L. Shackley), Duckworth, London, pp. 35–67.
- Jones, R.L. (1977a) Late Devensian deposits from Kildale, north-east Yorkshire. *Proceedings of the Yorkshire Geological Society*, **41**, 185–8.
- Jones, R.L. (1977b) Late Quaternary vegetational history of the North York Moors. V. The Cleveland dales. *Journal of Biogeography*, 4, 353–62.
- Jones, R.L. (1978) Late Quaternary vegetational history of the North York Moors. VI. The Cleveland moors. *Journal of Biogeography*, **5**, 81–92.
- Jones, R.L. (1999) The Pleistocene of north-east Yorkshire. In *The Quaternary of North-East England: field guide* (eds D.R. Bridgland, B.P. Horton and J.B. Innes), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 18–20.
- Jones, R.L. and Gaunt, G.D. (1976) A dated late Devensian organic deposit at Cawood near Selby. *Naturalist*, **101**, 121–3.
- Jones, R.L. and Keen, D.H. (1993) *Pleistocene Environments in the British Isles*, Chapman and Hall, London, 346 pp.
- Jones, R.L., Cundill, P.R. and Simmons, I.G. (1979) Archaeology and palaeobotany on the North York Moors and their environs. *Yorkshire Archaeological Journal*, **51**, 15–22.
- Jones, RT. (1999) A high resolution, multi-proxy reassessment of the Late-glacial in NW England: the palaeoenvironmental record of Hawes Water and Cunswick Tarn, south Lakeland. Unpublished PhD thesis, University of Lancaster.
- Jones, T.A. (1912) Petrographic studies of local erratics. *Proceedings of the Liverpool Geological Society*, **11**, 183–200.
- Jowett, A. and Charlesworth, J.K. (1929) The glacial geology of the Derbyshire Domeland and the western slopes of the southern Pennines. *Quarterly Journal of the Geological Society of London*, **85**, 307–34.
- Jukes, J.B. (1862) On the mode of formation of some of the river valleys in the South of Ireland. *Journal of the Geological Society*, *London*, 18, 378–403.

Kann, E. (1941) Krustenstein in Seen. Archiven für Hydrobiologie, 37, 432–504.

Kapsner, W.R., Alley, R.B., Shuman, C.A., Amandakrishnan, S. and Grootes, P.M. (1995) Dominant influence of atmospheric circulation on snow accumulation in Greenland over the past 18,000 years. *Nature*, **373**, 52–4.

- Kear B.S. (1977) Shirdley Hill Sand Formation. In The Isle of Man, Lancashire Coast and Lake District (ed. M.J. Tooley), international Union for Quaternary Research Guidebook for Excursion, A4, International Union for Quaternary Research, Birmingham, pp. 11–12.
- Kear, B.S. (1985) Soil development and soil patterns in north-west England. In *The Geomorphology of North-West England* (ed. R.H. Johnson), Manchester University Press, Manchester, pp. 80–93.
- Keen, D.H. (1995) Raised beaches and sea levels in the English Channel in the Middle and Late Pleistocene: problems of interpretation and implications for the isolation of the British Isles. In Island Britain: A Quaternary Perspective (ed. R.C. Preece), Geological Society of London Special Publication, No. 96, Geological Society of London, London, pp. 63–74.
- Keen, D.H., Jones, R.L. and Robinson, J.E. (1984) A Late Devensian and early Flandrian fauna and flora from Kildale, north-east Yorkshire. *Proceedings of the Yorkshire Geological Society*, 44, 385–97.
- Keen, D.H., Jones, R.L., Evans, R.A. and Robinson, J.E. (1988) Faunal and floral assemblages from Bingley Bog, West Yorkshire, and their significance for Late Devensian and early Flandrian environmental changes. *Proceedings of the Yorkshire Geological Society*, 47, 125–38.
- Keen, D.H., Coope, G.R., Jones, R.L. *et al.* (1997) Middle Pleistocene deposits at Fog Hall Pit, Stretton-on-Dunsmore, Warwickshire, English Midlands, and their implication for the age of the type Wolstonian. *Journal of Quaternary Science*, **12**, 183–208.
- Kellar, B.A. (1927) Description of the vegetation on the Plains of European Russia. *Journal of Ecology*, **15**, 189–233.
- Kemp, R.A. (1985a) Soil Micromorphology and the Quaternary, Quaternary Research Association Technical Guide, No. 2, Quaternary Research Association, London, 80 pp.
- Kemp, R.A. (1985b) The Valley Farm Soil in

southern East Anglia. In Soils and Quaternary Landscape Evolution (ed. J. Boardman), John Wiley and Sons Ltd, Chichester, pp. 179–96.

- Kemp, R.A. (1998) Role of micromorphology in paleopedological research. *Quaternary International*, 51–2, 133–41.
- Kendall, J.D. (1881) Interglacial deposits of west Cumberland and north Lancashire. *Quarterly Journal of the Geological Society of London*, 37, 29–39.
- Kendall, P.F. (1902) A system of glacier lakes in the Cleveland Hills. Quarterly Journal of the Geological Society of London, 58, 471–571.
- Kendall, P.F. (1903) The glacier lakes of Cleveland. Proceedings of the Yorkshire Geological Society, 15, 1-40.
- Kendall, P.F. and Muff, H.B. (1901) Evidence of ancient glacier-dammed lakes in the Cheviots. *Geological Magazine*, New Series, 8, 513–15.
- Kendall, P.F. and Muff, H.B. (1903) The evidence for glacier-dammed lakes in the Cheviot Hills. *Transactions of the Edinburgh Geological Society*, 8, 226–30.
- Kendall, P.F. and Wroot, H.E. (1924) Geology of Yorkshire: an illustration of the Evolution of Northern England, Scholar Press, Menton.
- Kenna, R.J.B. (1986) The Flandrian Sequence of North Wirral (N.W. England). Geological Journal, 21, 1–27.
- Kennard, A.S. and Musham, J.F. (1937) On the mollusca from the Holocene tufaceous deposit at Broughton-Brigg, Lincolnshire. *Proceedings of the Malacological Society of* London, 22, 374–9.
- Kennard, A.S. and Woodward, B.B. (1919) Description of the non-marine Mollusca. In On the deposit of interglacial loess and some transported preglacial freshwater clays on the Durham coast (C.T. Trechmann). Quarterly Journal of the Geological Society of London, 75, 175–203.
- Kent, P.E. (1957) Triassic Relics and the 1,000 foot Surface in the Southern Pennines. *East Midland Geographer*, 1, 3–10.
- Kenward, H.K. (1984) Insects, beetles and ants. In Late Quaternary Environments and Man in Holderness, (ed. D.D. Gilbertson), British Archaeological Reports British Series, 134, British Archaeological Reports, Oxford, pp. 220-1.
- Kenward, H., Williams, D., Spencer, P., Greig, J.R., Rackham, J.D. and Brinklow, D. (1978) The environment of Anglo-Scandinavian York.

In Viking Age York and the North (ed. R.A. Hall), Council for British Archaeology Research Report, No. 27, Council for British Archaeology, London, pp. 58–73.

- Kerney, M.P., Preece, R.C. and Turner, C. (1980) Molluscan and plant biostratigraphy of some Late Devensian and Flandrian deposits in Kent. *Philosophical Transactions of the Royal Society of London*, **B291**, 1–43.
- King, A. (1974) A review of archaeological work in the caves of North-West England. In *Limestones and Caves of North-West England* (ed. A.C. Waltham), David and Charles, Newton Abbot, pp. 182–200.
- King, C.A.M. (1960) *The Yorkshire Dales, British Landscapes through Maps*, No. 2, The Geographical Association, Sheffield, 24 pp.
- King, C.A.M. (1963) Some problems concerning marine planation and the formation of erosion surfaces. *Transactions of the Institute of British Geographers*, 33, 29–43.
- King, C.A.M. (1969) Trend surface analysis of central Pennine erosion surfaces. Transactions of the Institute of British Geographers, 47, 47–59.
- King, C.A.M. (1976) Northern England, Geomorphology of the British Isles, Methuen, London, 213 pp.
- King, C.A.M. (1977) The early Quaternary landscape with considerations of neotectonics matters. In *British Quaternary Studies: Recent Advances* (ed. F.W. Shotton), Clarendon Press, Oxford, pp. 137–52.
- King, L. (1958) Correspondence on the problem of tors. *Geographical Journal*, **124**, 289–91.
- King, R.B. (1968) Periglacial features in the Cairngorm Mountains. Unpublished PhD thesis, University of Edinburgh.
- King, R.B. (1971) Boulder polygons and stripes in the Cairngorm Mountains. Journal of Glaciology, 10, 375–86.
- Kitchener, A.C. and Bonsall, C. (1999) Further AMS radiocarbon dates for extinct Scottish mammals. *Quaternary Newsletter*, 88, 1–10.
- Kleman, J. (1994) Preservation of landforms under ice sheets and ice caps. *Geomorphology*, 9, 19–32.
- Kleman, J. and Borgström, I. (1994) Glacial landforms indicative of a partly frozen bed. *Journal of Glaciology*, 40, 255–64.
- Kleman, J., Borgström, I, Robertsson, A.M. and Lillieskold, M. (1992) Morphology and stratigraphy from several deglaciations in the Transtrand Mountains, western Sweden.

Journal of Quaternary Science, 7, 1-17.

- Kleman, J. Borgström, I and Hattestrand, C. (1994) Evidence for a relict glacial landscape in Quebec-Labrador. *Palaeogeography*, *Palaeoclimatology*, *Palaeoecology*, **111**, 217–28.
- Klimaszewski, M (1964) On the effect of the preglacial relief on the course and the magnitude of glacial erosion in the Tatra Mountains. *Geographica Polonica*, **2**, 11–21.
- Knight, J. (1998) Origin and significance of calcareous concretions within glacial outwash in the Tempo Valley, north-central Ireland. *Boreas*, 27, 81–7.
- Knight, J. and McCabe, A.M. (1997a) Drumlin evolution and ice sheet oscillations along the NE Atlantic margin, Donegal bay, Western Ireland. Sedimentary Geology, 111, 57–72.
- Knight, J. and McCabe, A.M. (1997b) Identification and significance of ice-flowtransverse subglacial ridges (Rögen moraines) in north central Ireland. Journal of Quaternary Science, 12, 519–24.
- Knight, J.L., Auton, C.A., Busby, J.P. et al. (1997) A synthesis of the nature and origin of deformational features within the Quaternary sequences, Sellafield. Nirex Science Report, SA/97/004.
- Knudsen, K.L. and Sejrup, H.P. (1988) Amino acid geochronology of the selected interglacial sites in the North Sea area. *Boreas*, 17, 347–54.
- Koster, E.A. (1988) Ancient and modern cold-climate aeolian sand deposition: a review. *Journal of Quaternary Science*, **3**, 69–83.
- Kruger, J. and Marcussen, I. (1976) Lodgement till and flow till: a discussion. *Boreas*, 5, 61–4.
- Kukla, G. (1987) Loess stratigraphy in central China. *Quaternary Science Reviews*, 6, 191–219.
- Kukla, G., Heller, F., Ming, L.X. et al. (1988) Pleistocene climates in China dated by magnetic susceptibility. Geology, 16, 811–14.
- Kurtén, N.B. (1968) Pleistocene Mammals of Europe, Weidenfeld and Nicolson, London, 317 pp.
- Lageard, J.G.A. (1992) Vegetational History and Palaeoforest Reconstruction at White Moss, South Cheshire, UK. Unpublished PhD thesis, Keele University.
- Lageard, J.G.A., Chambers, F.M. and Thomas PA. (1995) Recording and reconstruction of wood macrofossils in three-dimensions. *Journal of Archaeological Science*, 22, 561–7.

- Lageard, J.G.A., Chambers, F.M. and Thomas, P.A. (1999) Climatic significance of the marginalization of Scots pine (*Pinus sylvestris* L.) c. 2500 BC at White Moss, south Cheshire, UK. *The Holocene*, 9, 321–31.
- Laing, R. (1889) On the bone caves of Creswell and the discovery of an extinct Pleiocene feline (*Felis brevirostris*), new to Great Britain. *Report of the British Association for the Advancement of Science*, **1889**, 582-4.
- Lamb, A. L. and Ballantyne, C. K. (1998) Palaeonunataks and the altitude of the last ice sheet in the SW Lake District, England. *Proceedings of the Geologists' Association*, 109, 305–16.
- Lamb, H.H. (1977) Climate: Past, Present and Future, Methuen, London.
- Lamb, H.H. (1982) Climate, History and the Modern World, Methuen, London, 387 pp.
- Lambeck, K. (1991) Glacial rebound and sealevel change in Great Britain. *Terra Nova*, 3, 379–89.
- Lambeck, K. (1993a) Glacial rebound of the British Isles – I. Preliminary model results. *Geophysical Journal International*, **115**, 941–59.
- Lambeck, K. (1993b) Glacial rebound of the British Isles – II. A high-resolution, high-precision model. *Geophysical Journal International*, 115, 960–90.
- Lambeck, K. (1995). Late Devensian and Holocene shorelines of the British Isles and North Sea from models of glacio-hydro-isostatic rebound. *Journal of the Geological Society, London*, **152**, 437–48.
- Lambeck, K. (1996) Glaciation and sea-level change for Ireland and the Irish Sea since Late Devensian/Midlandian time. *Journal of the Geological Society, London*, **153**, 853–72.
- Lamplugh, G.W. (1879) On the divisions of the glacial beds in Filey Bay. *Proceedings of the Yorksbire Geological Society*, 7, 167–77.
- Lamplugh, G.W. (1881a) On glacial sections near Bridlington. Proceedings of the Yorkshire Geological Society, 7, 383–97.
- Lamplugh, G.W. (1881b) On the Bridlington and Dimlington glacial shell beds. *Geological Magazine*, 8, 535–46.
- Lamplugh, G.W. (1881c) On a shell bed at the base of the drift at Speeton, near Filey, on the Yorkshire coast. *Geological Magazine*, 8, 174–80.
- Lamplugh, G.W. (1882) Glacial sections near Bridlington. Part II. Cliff section extending

900 yards south of the harbour. Proceedings of the Yorkshire Geological Society, 8, 27–38.

- Lamplugh, G.W. (1884a) Glacial sections near Bridlington. Part III. The drainage sections. Proceedings of the Yorkshire Geological Society, 8, 240-54.
- Lamplugh, G.W. (1884b) On a recent exposure of the shelly patches in the boulder clay at Bridlington Quay. *Quarterly Journal of the Geological Society of London*, 40, 312–28.
- Lamplugh, G.W. (1887) Report on the buried cliff at Sewerby, near Bridlington. *Proceedings of the Yorkshire Geological Society*, 9, 381–92.
- Lamplugh, G.W. (1889) Report of the committee.....appointed for the purpose of investigating an ancient sea beach near Bridlington Quay. *Report of the British Association for the Advancement of Science*, **1888**, 328–38.
- Lamplugh, G.W. (1890) Glacial sections near Bridlington. Part IV. Proceedings of the Yorksbire Geological Society, **11**, 275–307.
- Lamplugh, G.W. (1891a) On the drifts of Flamborough Head. Quarterly Journal of the Geological Society of London, 47, 384-41.
- Lamplugh, G.W. (1891b) Final report of the Committee ... appointed for the purpose of investigating an ancient sea beach near Bridlington Quay. *Report of the British* Association for the Advancement of Science, 1890, 375–77.
- Lamplugh, G.W. (1903) Land-shells in the infraglacial chalk-rubble at Sewerby, near Bridlington Quay. *Proceedings of the Yorksbire Geological Society*, **15**, 91–5.
- Lamplugh, G.W. (1911) On the shelly moraine of the Sefström glacier and other Spitzbergen phenomena illustrative of British glacial conditions. *Proceedings of the Yorkshire Geological Society*, 17, 216–41.
- Lamplugh, G.W. (1919) On a boring at Kilnsea, Holderness. Summary of Progress of the Geological Survey of Great Britain and the Museum of Practical Geology (1918), 63-4.
- Lamplugh, G.W. (1925) Kelsey Hill, Kirmingham and other drift problems. *Transactions of the Hull Geological Society*, 6, 259–75.
- Land, D.H. (1974) Geology of the Tynemouth District, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (15), HMSO, London, 176 pp.
- Lancaster University Archaeological Unit (1995) Low Hauxley Northumberland Archaeological Evaluation Report, LUAU, Lancaster.
- Larsen, E. and Sjerup, H-P. (1990) Weichselian

land-sea interactions: western Norway-Norwegian Sea. *Quaternary Science Reviews*, 6, 85-97.

- Laurent, M., Falgueres, J., Bahain, J., Rousseau, L. and Van Vliet Lanoe, B. (1998) ESR dating of quartz extracted from Quaternary and Neogene sediments: method, potential and actual limits. *Quaternary International*, **17**, 1057–62.
- Lawson, D.E. (1979a) A comparison of the pebble orientations in ice and deposits of the Matanuska Glacier, Alaska. *Journal of Geology*, **87**, 629–45.
- Lawson, D.E. (1979b) Sedimentological Analysis of the Western Terminus Region of the Matanuska Glacier, Alaska, Cold Regions Research and Engineering Laboratory Report, 79–9, U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, 112 pp.
- Lawson, D.E. (1981) Distinguishing characteristics of diamictons at the margin of the Matanuska Glacier, Alaska. *Annals of Glaciology*, 2, 78–84.
- Lawson, D.E. (1982) Mobilization, movement and deposition of active subaerial sediment flows, Matanuska Glacier, Alaska. *Journal of Geology*, 90, 279–300.
- Lawson, D.E. (1989) Glacigenic resedimentation: classification concepts and application to mass movement processes and products. In Genetic Classification of Glacigenic Deposits: final report of the Commission on Genesis and Lithology of Glacial Quaternary Deposits of the International Union for Quaternary Research (INQUA) (eds R.P Goldthwait and C.I. Matsch), A.A. Balkema Publishers, Rotterdam, pp. 147–72.
- Leach, W. (1930) A preliminary account of the vegetation of some non-calcareous British screes (Gerölle). *Journal of Ecology*, 18, 321–32.
- Leah, M., Wells, C.E., Huckerby, E. and Appleby,
  C. (1997) The Wetlands of Cheshire, North-West Wetlands Survey, 4; Lancaster Imprints,
  5, Lancaster University Archaeological Unit, Lancaster, 246 pp.
- Lee, J. (1981) Atmospheric pollution and the Peak District blanket bogs. In *Peak District Moorland Erosion Study: Phase I Report*, (eds J. Phillips, D. Yalden and J. Tallis), Peak Park Joint Planning Board, Bakewell, pp. 104–8.
- Lee, M.P. (1979) Loess from the Pleistocene of the Wirral Peninsula, Merseyside. *Proceedings*

of the Geologists' Association, 90, 21-6.

- Leeder, M.R. (1982) Upper Palaeozoic basins of the British Isles – Caledonide inheritance versus Hercynian plate margin processes. *Journal of the Geological Society, London*, 139, 479–91.
- Legge, A.J. and Rowley-Conwy, P.A. (1988) Star Carr revisited: a re-analysis of the large mammals, Centre for Extra-Mural Studies, Birkbeck College, London, 145 pp.
- Leighton, M.M. (1959) Stagnancy of the Illinoian glacial lobe east of the Illinois and Mississippi Rivers. *Journal of Geology*, **67**, 337–44.
- Le Roux, M. (1908) Récherches biologiques sur le lac d'Annecy. Annales Biologique lacustre, 2, 220–402.
- Lesne, P. (1920) Quelques insectes du pliocène supérieur du Comté de Durham. Bulletin Museum Historique et naturelle de Paris, 26, 388, 484.
- Lesne, P. (1926) Sur une faunule coléopterologique pliocène du nord de Angleterre. C.R. Academie Scientifique Paris, 182, 495.
- Letzer, J.M. (1978) The Glacial Geomorphology of the region bounded by Shap Fells, Stainmore and the Howgill Fells in East Cumbria. Unpublished M.Phil. thesis, University of London.
- Letzer, J.M. (1981) The Upper Eden valley (Ravenstonedale). In *Eastern Cumbria Field Meeting: 15–18 May 1981* (ed. J. Boardman), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 43–60.
- Letzer, J. M. (1987) Drumlins of the southern Vale of Eden. In Drumlin Symposium: proceedings of the Drumlin Symposium, first International Conference on Geomorphology, Manchester, 16–18 September 1985 (eds J. Menzies and J Rose), A.A. Balkema Publishers, Rotterdam, pp. 323–34.
- Levesque, A.J., Mayle, F.E., Walker, I.R. and Cwynar, L.C. (1993) The amphi-Atlantic oscillation: a proposed Late-Glacial climatic event. *Quaternary Science Reviews*, **12**, 629–43.
- Lewin, J. (1969) The Yorkshire Wolds, a Study in Geomorphology, University of Hull Occasional Papers in Geography, No. 11, University of Hull, Hull, 89 pp.
- Lewis, C.L.E., Green, P.F., Carter, A. and Hurford, A.J. (1992) Elevated K/T palaeotemperatures throughout N.W. England: three kms of tertiary erosion? *Earth and Planetary Science Letters*, 112, 131–45.

- Lewis, F. J. (1904) Interglacial and post-glacial beds of the Cross Fell district. *Report of the British Association for the Advancement of Science*, **1904**, pp. 798–9.
- Lewis, H.C. (1887a) The terminal moraines of the great glaciers of England. Report of the British Association for the Advancement of Science, 1887, 691-2.
- Lewis, H.C. (1887b) The terminal moraines of the great glaciers of England. *Nature*, 36, 573.
- Lewis, H.C. (1894) Papers and Notes on the Glacial Geology of Great Britain and Ireland, Longman, Green and Co., London, 469 pp.
- Lewis, S.G. (1999) Eastern England. In A Revised Correlation of Quaternary Deposits in the British Isles (ed. D.Q. Bowen), Geological Society of London Special Report, No. 23, Geological Society of London, Bath, pp. 10-27.
- Lewis, W.V. (1960) The problem of cirque erosion. In *Investigations on Norwegian Cirque Glaciers* (ed. W.V. Lewis), Royal Geographical Society Research Series, No. 4, London, pp. 97–100.
- Libby, W.F. (1952) *Radiocarbon Dating*, Chicago University Press, Chicago, 124 pp.
- Likens, G.E. and Davis, M.B. (1975) Post-glacial history of Mirror lake and its watershed in New Hampshire, USA: an initial report. Verbandlungen International Vereinigung für Theoretische und Angewandte Limnologie, 19, 982–93.
- Lillie, M. (1995) Soil erosion in Holderness: geomorphological and archaeological perspectives. In Wetland Heritage of Holderness: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 129–48.
- Lillie, M. and Gearey, B. (1999) Introduction to the palaeoenvironmental survey. In Wetland Heritage of the Vale of York: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 21–33.
- Lillie, M. and Gearey, B. (2000) Palaeoenvironmental survey of the Hull valley and research at Routh Quarry. In *Wetland Heritage of the Hull Valley: an Archaeological Survey* (eds R. Van de Noort and S. Ellis), Humber Wetland Project, University of Hull, Kingston upon Hull, pp. 31–82.
- Lindsay, J.F. (1970) Clast fabric of till and its development. Journal of Sedimentary

Petrology, 40, 629-41.

- Lindström, E. (1988) Are roches moutonnées mainly preglacial forms? Geografiska Annaler, 70A, 323–31.
- Linton, D.L. (1949) Unglaciated areas in Scandanavia and Britain. Irish Geography, 2, 25-33.
- Linton, D.L. (1955) The problem of tors. Geographical Journal, 121, 470-87.
- Linton, D.L. (1956) Geomorphology. In Sheffield and its Region: A Scientific and Historical Survey (ed. D.L. Linton), British Association, Sheffield, pp. 24–43.
- Linton, D.L. (1957) Radiating valleys in glaciated lands. *Tijdschrift van het Koninklijke Nederlandsche Aardrijkskunkig Genootschap*, 74, 297–312.
- Linton, D.L. (1964) The origin of the Pennine tors – an essay in analysis. Zeitschrift für Geomorphologie, 8, 5–24.
- Lister, A.M. (1991) Late Glacial mammoths in Britain. In The Late Glacial in North-west Europe: Human Adaptation and Environmental Change at the end of the Pleistocene (eds N. Barton, A.J. Roberts and D.A. Roe), Council for British Archaeology Research Report, 77, Council for British Archaeology, London, pp. 51–9.
- Long, A.J. (1992) Coastal responses to changes in sea level in the East Kent Fens and southeast England, UK in the last 7500 years. *Proceedings of the Geologists' Association*, 103, 187–99.
- Long, A.J. and Shennan, I. (1993) Holocene relative sea-level and crustal movements in Southeast and Northeast England, UK. *Quaternary Proceedings*, 3, 15–19.
- Long, A.J., Innes, J.B., Kirby, J.R. et al. (1998) Holocene sea-level change and coastal evolution in the Humber Estuary, eastern England: an assessment of rapid coastal change. The Holocene, 8, 229–47.
- Long, D.C., Laban, C., Streif, H., Cameron, T.D.J. and Schüttenhelm, R.T.E. (1988) The sedimentary record of climatic variation in the southern North Sea. *Philosophical Transactions of the Royal Society of London*, B318, 523–37.
- Long, D.J. (1994) Prehistoric field systems and the vegetation development of the gritstone uplands of the Peak District. Unpublished PhD thesis, Keele University.
- Long, D.J., Chambers, F.M. and Barnatt, J. (1998) The palaeoenvironment and the vegetation

history of a Later Prehistoric field system at Stoke Flat on the gritstone uplands of the Peak District. *Journal of Archaeological Science*, **25**, 505–19.

- Longworth, D. (1985) The Quaternary history of the Lancashire Plain. In *The Geomorphology* of North-West England (ed. R.H. Johnson), Manchester University Press, Manchester, pp. 178–200.
- Lotter, A.F., Eicher U., Siegenthaler, U. and Birks, H.J.B. (1992) Late-glacial climatic oscillations as recorded in Swiss lake sediments: *Journal* of *Quaternary Science*, 7, 187–204.
- Lovell, J.H. (1982) The Sand and Gravel Resources of the Country around Catterick, North Yorkshire, Institute of Geological Sciences Mineral Assessment Report, 120, HMSO, London, 60 pp.
- Lovell, J.P.B. (1990) Cenozoic. In Introduction to the Petroleum Geology of the North Sea, 3rd edn (ed. K.W. Glennie), Blackwell Scientific Publications, Oxford, pp. 273–93.
- Lowe, J.J. (1991) Stratigraphic resolution and radiocarbon dating of Devensian late glacial sediments. *Quaternary Proceedings*, 1, 19-25.

Lowe, J.J. and Walker, M.J.C. (1984) *Reconstructing Quaternary Environments*, Longmans and Co., London, 389 pp.

Lowe, J.J. and Walker, M.J.C. (1997a) Reconstructing Quaternary Environments, 2nd edn, Longman and Co., London, 446 pp.

- Lowe, J.J. and Walker, M.J.C. (1997b) Temperature variation in NW Europe during the last glacial/interglacial transition (14–9 <sup>14</sup>C ka BP) based upon the analysis of coleopteran assemblages – the contribution of Professor G.R. Coope. *Quaternary Proceedings*, **5**, 165–75.
- Lowe, J.J., Ammann, B., Birks, H.H. et al. (1994a) Climatic changes in areas adjacent to the North Atlantic during the last glacial-interglacial transition (14-9 ka BP): a contribution to IGCP-253. Journal of Quaternary Science, 9, 185-98.
- Lowe, J.J., Coope, G.R., Keen, D. and Walker, M.J.C. (1994b) High resolution stratigraphy of the last Glacial-Interglacial transition (LGIT) and inferred climatic gradients. In Palaeoclimate of the Last Glacial/Interglacial Cycle: marking the conclusion of the NERC Earth Science Directorate Special Topic (eds B.M. Funnell and R.L.F. Kay), Natural Environment Research Council, Earth

Sciences Directorate Special Publication, 94/2, Natural Environment Research Council, Swindon, pp. 47–52.

- Lowe, J.J., Coope, G.R., Lemdahl, G. and Walker, M.J.C. (1995a) The Younger Dryas climate signal in land records from NW Europe. In The Younger Dryas: proceedings of a Workshop at the Royal Netherlands Academy of Arts and Sciences on 11–13 April 1994 (eds S.R. Troelstra, J.E. van Hinte and G.M. Ganssen), Verbandelingen der Koninklijke Nederlandse Akademie van Wetenschappen Afd Natuurkunde, Eerste reeks, 44, North-Holland, Amsterdam and Oxford, pp. 3–25.
- Lowe, J.J., Coope, G.R., Harkness, D.D., Sheldrick, C. and Walker M.J.C. (1995b) Direct comparison of UK temperatures and Greenland snow accumulation rates, 15–12 000 years ago. *Journal of Quaternary Science*, **10**, 175–80.
- Lowe, J.J., Birks, H.H., Brooks, S.J. *et al.* (1999) The chronology of palaeoenvironmental changes during the Last Glacial-Holocene transition: towards an event stratigraphy for the British Isles. *Journal of the Geological Society, London*, **156**, 397–410.
- Lund, J.W.G. (1961) The algae of the Malham Tarn district. *Field Studies*, 1, 58-72.
- Lundberg, J. and Ford, D.C. (1994) Late Pleistocene sea-level change in the Bahamas from mass spectrometric U-Series dating of submerged speleothem. *Quaternary Science Reviews*, 13, 1–14.
- Lunn, A.G. (1980) Quaternary. In The Geology of Northeast England (ed. D.A. Robson), Natural History Society of Northumbria Special Publication, The Natural History Society of Northumbria, Newcastle-upon-Tyne, pp. 48–60.
- Lunn, A.G. (1995) Quaternary. In Robson's Geology of North East England (ed. G.A.L. Johnson). Transactions of the Natural History Society of Northumberland, 56, 297-311.
- Lunn, A. G. (1996) The glaciation of the Northern Pennines. Proceedings of the Cumberland Geological Society, 6, 1994–5, 120–4.
- MacFadyen, W.A. (1933) Report on the silts and clay. In Report on an early Bronze Age Site in the south eastern Fens (ed. G. Clark). *The Antiquaries Journal*, **13**, 266–96.
- Mackay, A.W. and Tallis, J.H. (1994) The recent vegetational history of the Forest of Bowland,

Lancashire, UK. New Phytologist, 128, 571-84.

- Mackereth, F.J.H. (1958) A portable core sampler for lake deposits. *Limnology and Oceanography*, **3**, 181–91.
- Mackereth, F.J.H. (1966) Some chemical observations on Post-glacial lake sediments. *Philosophical Transactions of the Royal Society of London*, **B250**, 165–213.
- Mackereth, F.J.H. (1971) On the variation in direction of the horizontal component of remanent magnetisation in lake sediments. *Earth and Planetary Science Letters*, **12**, 332–8.
- Mackintosh, D. (1869) *The Scenery of England and Wales, its Character and Origin.* Longmans, Green and Co., London, 399 pp.
- Mackintosh, D. (1870) On the origin of the drifts, so called moraines and glaciated rock surfaces of the Lake District. *Geological Magazine*, 7, 445–60.
- Mackintosh, D. (1877) Tripartite origin of the boulder clays of the North West of England. *Geological Magazine*, 14, 575–6.
- Mackintosh, D. (1879) Results of a systematic survey in 1878 of the directions and limits of dispersion, mode of occurrence and relation to drift deposits of the erratic blocks or boulders of the west of England and east of Wales. *Quarterly Journal of the Geological Society of London*, 35, 425–52.
- Mackintosh, D. (1883) Estimates of limestone solution. Abstract. Proceedings of Geological Society, p. 67.
- Macklin, M.G. and Hunt, C.O. (1988) Late Quaternary alluviation and valley floor development in the Upper Axe Valley, Mendip, south west England. *Proceedings of the Geologists' Association*, **99**, 49–60.
- Macklin, M.G., Passmore, D.G., Stevenson, A.C., Cowley, D.C., Edwards, D.N. and O'Brien, C.F. (1991) Holocene alluviation and land-use change on Callaly Moor, Northumberland, England. *Journal of Quaternary Science*, 6, 225–32.
- Macklin, M.G., Passmore, D.G. and Rumsby, B.T. (1992) Climatic and cultural signals in Holocene alluvial sequences: the Tyne basin. In Alluvial Archaeology in Britain: proceedings of a conference sponsored by the RMC Group plc, 3–5 January 1991, British Museum (eds S. Needham and M.G. Macklin), Oxbow Monograph, No. 27, Oxbow Press, Oxford, pp. 123–40.

- Macklin, M.G., Taylor, M.P., Hudson-Edwards, K.A. and Howard, A.J. (2000) Holocene environmental change in the Yorkshire Ouse basin and its influence on river dynamics and sediment fluxes to the coastal zone. In Holocene Land-Ocean Interaction and Environmental Change around the North Sea (eds I. Shennan and J.E. Andrews), Geological Society of London Special Publication, No. 166, Geological Society of London, London, pp. 87–96.
- Maddy, D. (1997) Uplift-driven valley incision and river terrace formation in southern England. *Journal of Quaternary Science*, **12**, 539–45.
- Maddy, D., Keen, D.H., Bridgland, D.R. and Green, C.P. (1991) A revised model for the Pleistocene development of the River Avon, Warwickshire. *Journal of the Geological Society, London*, 148, 473–84.
- Madgett, P.A. (1975) Re-interpretation of Devensian till stratigraphy of eastern England. *Nature*, **253**, 105–7.
- Madgett, P.A. and Catt, J.A. (1978) Petrography, stratigraphy and weathering of Late Pleistocene tills in East Yorkshire, Lincolnshire and north Norfolk. *Proceedings of the Yorkshire Geological Society*, **42**, 55–108.
- Magilton, J.R. (1995) Lindow Man: the Celtic tradition and beyond. In Bog Bodies. New Discoveries and New Perspectives (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 183–7.
- Maltby, E., Legg, C.J. and Proctor, M.C.F. (1990) The ecology of severe moorland fire on the North York Moors: effects of the 1976 fires, and subsequent surface vegetation development. *Journal of Ecology*, **78**, 490–518.
- Maltman, A.J. (1994) Deformation structures preserved in rocks. In *The Geological Deformation of Sediments* (ed. A.J. Maltman), Chapman and Hall, London, pp. 261–307.
- Mangerud, J., Andersen, S.T., Berglund, B.E. and Donner, J. (1974) Quaternary stratigraphy of Norden, a proposal for terminology and classification. *Boreas*, **3**, 109–28.
- Manley, G. (1936) The climate of the Northern Pennines: the coldest part of England. Quarterly Journal of the Royal Meteorological Society, 62, 103–15.
- Manley, G. (1959) The late-glacial climate of north-west England. *Liverpool and Manchester Geological Journal*, 2, 188–215.
   Manley, G. (1962) The Late clacial climate of the
- Manley, G. (1962) The Late-glacial climate of the

Lake District. Weather, 17, 60-4.

- Manning, A., Birley, R. and Tipping, R. (1997) Roman impact on the environment at Hadrian's Wall: precisely dated pollen analysis from Vindolanda, northern England. *The Holocene*, 7, 175–86.
- Marcussen, I. (1973) Studies on flow till in Denmark. Boreas, 2, 213-31.
- Marcussen, I. (1975) Distinguishing between lodgment till and flow till in Weichselian deposits. *Boreas*, 4, 113–23.
- Mark, D.M. (1974) On the interpretation of till fabrics. *Geology*, 2, 101–4.
- Marr, J.E. (1906) The influence of the geological structure of the English Lakeland upon its present features. *Journal of the Geological Society, London*, 62, lxvi–cxxviii.
- Marr, J.E. (1916) *The Geology of the Lake District*, Cambridge University Press, Cambridge, 220 pp.
- Marr, J.E. and Fearnsides, W.G. (1909) The Howgill Fells and their topography. *Journal of the Geological Society, London*, **65**, 587–610.
- Mather, P.M. (1969) Analysis of some late Pleistocene sediments from south Lancashire and their relation to glacial and fluvioglacial processes. Unpublished PhD thesis, University of Nottingham.
- Matthews, B. (1970) Age and origin of aeolian sand in the Vale of York. *Nature*, 227, 1234-6.
- Mauquoy, D. and Barber, K.E. (1999a) A replicated 3000 yr proxy-climate record from Coom Rigg Moss and Felecia Moss, The Border Mires, northern England. *Journal of Quaternary Science*, 14, 263–75.
- Mauquoy, D. and Barber, K. (1999b) Evidence for climatic deteriorations associated with the decline of *Sphagnum imbricatum* Hornsch.ex.Russ. in six ombrotrophic mires from northern England and the Scottish Borders. *The Holocene*, 9, 423–37.
- Maw, G. (1867) On the distribution beyond the Tertiary Districts of white clays and sands subjacent to the Boulder Clay Drifts. *Geological Magazine*, 4, 240–51.
- May, VJ. and Hansom, J. (in press) *Coastal Geomorphology of Great Britain*, Geological Conservation Review Series, Joint Nature Conservation Committee, Peterborough.
- Mayfield, B. and Pearson, M.C. (1972) Human interference with the north Derbyshire blanket peat. *East Midland Geographer*, 5, 245-51.
- Mayle, F.E., Bell, M., Birks, H.H. et al. (1999)

Climate variations in Britain during the last Glacial-Holocene transition (15.0–11.5 cal ka BP): comparison with the GRIP ice-core record. *Journal of the Geological Society, London*, 156, 411–23.

- McAllister, M. (2001) Martin Mere south east. In The Wetlands of South-West Lancashire (eds R. Middleton, M.J. Tooley and J.B. Innes), North West Wetlands Survey, 7; Lancaster Imprints, 10, Lancaster University Archaeological Unit, Lancaster.
- McArthur, J.L. (1970) A geomorphological study of the upper Derwent basin, Derbyshire. Unpublished PhD thesis, University of Sheffield.
- McArthur, J.L. (1971) Periodicity in upland morphogenesis. *New Zealand Geographical Society Conference Series*, **6B**, 186–91.
- McArthur, J.L. (1977) Quaternary erosion in the upper Derwent basin and its bearing on the age of surface features in the southern Pennines. *Transactions of the Institute of British Geographers, New Series*, 2, 490–7.
- McArthur, J.L. (1981) Periglacial slope planations in the southern Pennines, England. *Biuletyn Peryglacjalny*, 28, 85–97.
- McAvoy, F. (1995) Excavation at the Withow Gap, Skipsea, Holderness. In *First Annual Report* of the Humber Wetlands Survey, 1994–95 (ed. R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 16.
- McCabe, A.M. (1986) Glaciomarine facies deposited by retreating tidewater glaciers: an example from the late Pleistocene of Northern Ireland. *Journal of Sedimentary Petrology*, 56, 880–94.
- McCabe, A.M. (1987). Quaternary deposits and glacial stratigraphy in Ireland: a review. *Quaternary Science Reviews*, 6, 259–300.
- McCabe, A.M. (1991) The distribution and stratigraphy of drumlins in Ireland. In *Glacial Deposits in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 421–36.
- McCabe, A.M. (1996) Dating and rhythmicity from the last deglacial cycle in the British Isles. Journal of the Geological Society, London, 153, 499–502.
- McCabe, A.M. and Clark, P.U. (1998) Ice-sheet variability around the North Atlantic Ocean during the last deglaciation. *Nature*, **392**, 373–7.
- McCabe, A.M. and Dardis, G.F. (1989)

Sedimentology and depositional setting of late Pleistocene drumlins, Galway Bay, western Ireland. *Journal of Sedimentary Petrology*, **59**, 944–59.

- McCabe, A.M. and Dardis, G.F. (1994) Glaciotectonically induced water-throughflow structures in a Late Pleistocene drumlin, Kanrawer, County Galway, western Ireland. *Sedimentary Geology*, **91**, 173–90.
- McCabe, A.M. and Haynes, J.R. (1996) A late Pleistocene intertidal boulder pavement from an isostatically emergent coast, Dundalk Bay, eastern Ireland. *Earth Surface Processes and Landforms*, **21**, 555–72.
- McCabe, A.M., Dardis, G.F. and Hanvey, P.M. (1987) Sedimentation at the margins of a late Pleistocene ice-lobe terminating in shallow water, Dundalk Bay, eastern Ireland. *Sedimentology*, 34, 473–93.
- McCabe, A.M., Eyles, N., Haynes, J. and Bowen, D.Q. (1990) Biofacies and sediments in an emergent Late Pleistocene glaciomarine sequence, Skerries, east central Ireland. *Marine Geology*, 94, 23–36.
- McCabe, A.M., Knight, J. and McCarron, S. (1998) Evidence for Heinrich Event 1 in the British Isles. *Journal of Quaternary Science*, 13, 549–68.
- McCarroll, D. (2001) Deglaciation of the Irish Sea Basin: a critique of the glaciomarine hypothesis. *Journal of Quaternary Science*, 16, 393–404.
- McCarroll, D. and Harris, C. (1992) The glacigenic deposits of western Lleyn, north Wales: terrestrial or marine? *Journal of Quaternary Science*, 7, 19–29.
- McCarthy, M.R. (1995) Archaeological and environmental evidence for the Roman impact on vegetation near Carlisle, Cumbria. *The Holocene*, **5**, 491–5.
- McCarthy, M.R. (1997) Archaeological and environmental evidence for Roman impact on vegetation near Carlisle, Cumbria: a reply to Dumayne-Peaty and Barber. *The Holocene*, 7, 245–6.
- McConnell, R.B. (1938) Residual erosion surfaces in mountain ranges. *Proceedings of the Yorkshire Geological Society*, 24, 31–59.
- McIntyre, A., Ruddiman, W.F. and Jantzen, R. (1972) Southward penetrations of the North Atlantic Polar Front: faunal and floral evidence of large-scale surface water mass movements over the last 225,000 years. *Deep-Sea Research*, **19**, 61–77.

- McQuillan, R. (1964) Geophysical investigations in a line of seismic shot holes in the Cheshire Basin. Bulletin of the Geological Survey of Great Britain, 21, 197–203.
- Mellars, P. (1976) Settlement patterns and industrial variability in the British Mesolithic. In Problems in Economic and Social Archaeology (eds G. de G. Sieveking, I.H. Longworth and K.E. Wilson), Duckworth, London, pp. 375–99.
- Mellars, P.A. (1984) Palaeolithic and Mesolithic finds from the Skipsea Withow deposits. In Late Quaternary Environments and Man in Holderness (ed. D.D. Gilbertson), British Archaeological Reports British Series, 134, British Archaeological Reports, Oxford, pp. 177–85.
- Mellars, P.A. (1998) Postscript: major issues in the interpretation of Star Carr. In Star Carr in Context: new archaeological and palaeoecological investigations at the Early Mesolithic site of Star Carr, North Yorkshire (eds P.A. Mellars and P. Dark), McDonald Institute Monographs, McDonald Institute for Archaeological Research, Cambridge, pp. 215-241.
- Mellars, P.A. and Dark, P. (1998) Star Carr in Context: new archaeological and palaeoecological investigations at the Early Mesolithic site of Star Carr, North Yorkshire (eds P.A. Mellars and P. Dark), McDonald Institute Monographs, McDonald Institute for Archaeological Research, Cambridge, 250 pp.
- Mello, J.M. (1875) On some bone caves in Cresswell Crags. *Quarterly Journal of the Geological Society of London*, **31**, 679–91.
- Mello, J.M. (1877) The bone caves of Creswell Crags. Quarterly Journal of the Geological Society, London, 33, 578-88.
- Melmore, S. (1935) *The Glacial Geology of Holderness and the Vale of York*, T. Buncle, Arbroath, 96 pp.
- Menzies, J. (1979a) A review on the literature on the formation and location of drumlins. *Earth Science Reviews*, 14, 315–59.
- Menzies, J. (1979b) The mechanics of drumlin formation with particular reference to the change in pore-water content of the till. *Journal of Glaciology*, 22, 373–84.
- Menzies, J. and Rose, J. (1987a) Drumlins: trends and perspectives. *Episodes*, 10, 29-31.
- Menzies, J. and Rose, J. (eds) (1987b) Drumlin Symposium: proceedings of the Drumlin Symposium, first International Conference

on Geomorphology, Manchester, 16–18 September 1985, A.A. Balkema Publishers, Rotterdam, 360 pp.

- Menzies, J. (1989) Drumlins products of controlled or uncontrolled glacio-dynamic response? Quaternary Science Reviews, 8, 151–8.
- Menzies, J. and Rose, J. (1989) Subglacial bedforms: an introduction. *Sedimentary Geology*, 62, 117–22.
- Menzies, J., Zaniewski, K. and Dreger, D. (1997) Evidence, from microstructures, of deformable bed conditions within drumlins, Chimney Bluffs, New York State. Sedimentary Geology, 111, 161–76.
- Mercer, R.J. and Tipping, R.M. (1994) The prehistory of soil erosion in the northern and eastern Cheviot Hills, Anglo-Scottish Borders. In *The History of Soils and Field Systems* (eds S. Foster and C.T. Smout), Scottish Cultural Press, Aberdeen, pp. 1–24.
- Merrett, S.P. and Macklin, M.G. (1999) Historic river response to extreme flooding in the Yorkshire Dales, northern England. In *Fluvial Processes and Environmental Change* (eds A.G. Brown and T. Quine), *British Geomorphological Research Group Symposia Series*, John Wiley and Sons Ltd, Chichester, pp. 345–60.
- Merritt, J.W. (1997a) Nethertown Cliff Sections. In *The Quaternary Geology of West Cumbria Field Guide* (eds M. Browne, R.J. Heath, D. Huddart and P. Nathanail), Environment Group of the Geological Society of London, London, pp. 58–9.
- Merritt, J.W. (1997b) The lithostratigraphy of the St Bees Moraine. In *The Quaternary Geology of West Cumbria Field Guide* (eds M. Browne, R.J. Heath, D. Huddart and P. Nathanail), Environment Group of the Geological Society of London, London.
- Merritt, J.W. and Auton, C.A. (1997a) The Quaternary Lithostratigraphy of the Sellafield District. *Nirex Science Report*, SA/97/045.
- Merritt, J.W. and Auton, C.A. (1997b) The Quaternary Lithostratigraphy of the Sellafield District, *British Geological Survey Technical Report*, WA/97/15C.
- Merritt, J.W. and Auton, C.A. (2000) An outline lithostratigraphy and depositional history of Quaternary deposits in the Sellafield district, west Cumbria. *Proceedings of the Yorkshire Geological Society*, **53**, 129–54.

Metcalfe, S., Ellis, S., Horton, B. et al. (2000) The

Holocene evolution of the Humber Estuary: reconstructing change in a dynamic environment. In Holocene Land-Ocean Interaction and Environmental Change around the North Sea (eds I. Shennan and J.E. Andrews), Geological Society of London Special Publication, No. 166, Geological Society of London, London, pp. 97–118.

- Miall, L.C. (1880) The (Raygill) Cave and its contents. *Proceedings of the Yorkshire Geological Society*, 7, 207–8.
- Middleton, R., Wells, C.E. and Huckerby, E. (1995) The Wetlands of North Lancashire, North West Wetlands Survey, 3; Lancaster Imprints, 4, Lancaster University Archaeological Unit, Lancaster, 280 pp.
- Middleton, R., Tooley, M.J. and Innes, J.B. (2001) The Wetlands of South-West Lancashire, North West Wetlands Survey, 7; Lancaster Imprints, 10, Lancaster University Archaeological Unit, Lancaster.
- Miller, A.A. (1938) Pre-glacial erosion surfaces around the Irish Sea. *Proceedings of the Yorksbire Geological Society*, 24, 31–59.
- Mills, D.A.C. and Holliday, D.W. (1998) The Geology of the District around Newcastleupon-Tyne, Gateshead and Consett, Memoir (Sheet) of the British Geological Survey (England and Wales) (No. 20), the Stationary Office for the British Geological Survey, London, 148 pp.
- Mitchell, G.F., Penny, L.F., Shotton, F.W. and West, R.G. (eds) (1973) A Correlation of Quaternary Deposits in the British Isles, Geological Society of London Special Report, No. 4, Scottish Academic Press, Edinburgh, 99 pp.
- Mitchell, J.G., Storetvedt, K.M., Robson, D.A., Abranches, M.C. and Ineson, P.R. (1993) Evidence for Carboniferous thermochemical overprinting in the Cheviot complex. *Scottish Journal of Geology*, 29, 55–68.
- Mitchell, W.A. (1991a) Glaciation of Upper Wensleydale and Adjoining Watershed Regions. Unpublished PhD thesis, University of London.
- Mitchell, W. A. (ed.) (1991b) Western Pennines: field guide, Quaternary Research Association Field Guides, Quaternary Research Association, London, 124 pp.
- Mitchell, W.A. (1991c) Dimlington Stadial ice sheet in the western Pennines. In Western Pennines: field guide (ed. W.A. Mitchell), Quaternary Research Association Field

*Guide*, Quaternary Research Association, London, pp. 25–42.

- Mitchell, W.A. (1991d) Loch Lomond Stadial landforms and palaeoglaciological reconstruction. In Western Pennines: field guide (ed. W.A. Mitchell), Quaternary Research Association Field Guide, Quaternary Research Association, London, pp. 43–53.
- Mitchell, W.A. (1994) Drumlins in ice sheet reconstruction with special reference to the Western Pennines. *Sedimentary Geology*, 91, 313–31.
- Mitchell, W.A. (1996) Significance of snowblow in the generation of Loch Lomond Stadial (Younger Dryas) glaciers in the western Pennines, northern England. *Journal of Quaternary Science*, **11**, 233–48.
- Mitchell, W.A. and Buggie, T.P. (1991) Bluecaster. In Western Pennines: field guide (ed. W.A. Mitchell), Quaternary Research Association Field Guide, Quaternary Research Association, London, pp. 91–3.
- Mitchell, W.A. and Clark, C.D. (1994) The Last Ice Sheet in Cumbria. In *Cumbria: field guide* (eds J. Boardman and J. Walden), *Quaternary Research Association Field Guide*, Quaternary Research Association, Oxford, pp. 4–14.
- Moore, J.W. (1950) Mesolithic sites in the neighbourhood of Flixton, north-east Yorkshire. Proceedings of the Prehistoric Society, 16, 101–8.
- Moore, J.W. (1951) Lake Flixton: a Late-glacial structure, Scarborough and District Archaeological Society Publication Series, No. 1, Scarborough and District Archaeological Society, Scarborough, 10 pp.
- Moore, J.W. (1954) Excavations at Flixton, site 2. In *Excavations at Star Carr: an early Mesolithic site at Seamer near Scarborougb*, (ed. J.G.D. Clark), Cambridge University Press, Cambridge, pp. 192–3.
- Moore, P.D. (1973) The influence of prehistoric cultures upon the initiation and spread of blanket bog in upland Wales. *Nature*, 241, 350–3.
- Moore, P.D. (1988) The development of moorlands and upland mires. In Archaeology and the Flora of the British Isles (ed. M. Jones), Oxford University Committee for Archaeology Monograph, No. 14; Botanical Society for the British Isles Conference Report, No. 19, Oxford University Committee for Archaeology, Oxford, pp. 116-22.

Moore, P.D. (1993) The origin of blanket mire,

revisited. In *Climate Change and Human Impact on the Landscape: studies in palaeoecology and environmental archaeology* (ed. F.M. Chambers), 1st edn, Chapman and Hall, London, New York, pp. 217–24.

- Morgan, A. (1973) Late Pleistocene environmental changes indicated by fossil insect faunas of the English Midlands. *Boreas*, 2, 173–212.
- Morgan, A.V. (1973) The Pleistocene geology of the area north and west of Wolverhampton, Staffordshire, England. *Philosophical Transactions of the Royal Society of London*, B265, 233–97.
- Morgan, A.V. and West, R.G. (1988) A pollen diagram from an interglacial deposit at Trysull, Staffordshire, England. *New Phytologist*, 109, 393–7.
- Morriss, S.H. (2001) Recent human impact and land use change in Britain and Ireland: a pollen analytical and geochemical study. Unpublished PhD thesis, University of Southampton.
- Mortimer, J.R. (1885) On the origin of the Chalk dales of Yorkshire. *Proceedings of the Yorkshire Geological Society*, 9, 29–42.
- Morton, G.H. (1860) Evidences of ancient iceaction near Liverpool. *The Geologist*, 3, 197.
- Morton, G.H. (1870) On the glaciated condition of the surface of the Triassic sandstone around Liverpool. *Report of the British Association for the Advancement of Science*, 1870, p. 81.
- Moseley, F. (1961) Erosion surfaces in the Forest of Bowland. *Proceedings of the Yorkshire Geological Society*, **33**, 173–96.
- Moseley, F, and Ahmed, S.M. (1967) Carboniferous joints in the north of England and their relation to earlier and later structures. *Proceedings of the Yorkshire Geological Society*, **36**, 61–90.
- Mottram, H.B. (1999) *Rbaxella* chert in East Anglia. *Quaternary Newsletter*, **88**, 11–18.
- Mottershead, D.N. (1967) The evolution of the Valley of the Rocks and its landforms. *Exmoor Review*, 69–72.
- Movius, H. (1949) Villafranchian stratigraphy in Southern and Southwestern Europe. *Journal* of Geology, **57**, 380–412.
- Muller, E. (1983) Dewatering during lodgement of till. In Tills and Related Deposits: genesis / petrology / application / stratigraphy: proceedings of the INQUA Symposia on the Genesis and Lithology of Quaternary Deposits (eds E.B. Evenson, C. Schlüchter

and J. Rabassa), A.A. Balkema Publishers, Rotterdam, pp. 13-18.

- Murray, J.W. and Hawkins, A.B. (1976) Sediment transport in the Severn Estuary during the past 8000–9000 years. *Journal of the Geological Society, London*, **132**, 385–98.
- Musham, J.F. (1933, 1934) Land and freshwater shells in the lime deposits around Broughton, near Brigg. In two parts. *Transactions of the Lincolnshire Naturalists Union*, 8, 145–50.
- Musk, L.F. (1985) Glacial and post-glacial climatic conditions in North-west England. In *The Geomorphology of North-West England* (ed. R.H. Johnson), Manchester University Press, Manchester, pp. 59–79.
- Myers, J.O. (1962) In British Caving: an Introduction to Speleology (ed. C.H.D. Cullingford), Routledge, London, pp. 226–57.
- Nash, S. (1995) A palaeoenvironmental reconstruction of the Hawes Water site during the Lateglacial. Unpublished MSc thesis, University of Liverpool.
- Neal, A. (1993) Sedimentology and morphodynamics of a Holocene coastal dune barrier complex, northwest England. Unpublished PhD thesis, University of Reading.
- NERC (1999) Land-Ocean Evolution Perspective Study (LOEPS). Understanding our Coasts, Rivers and Estuaries, LOIS Publication, No. 336, Natural Environment Research Council, Swindon.
- Nettleton, W.D., Brasher, B.R., Benham, E.C. and Ahrens, R.J. (1998) A classification system for buried paleosols. *Quaternary International*, 51–2, 175–83.
- Newson, M.D. and Leeks, G.J. (1985) Mountain bedload yields in the United Kingdom from undisturbed fluvial environments. *Earth Surface Processes and Landforms*, **10**, 413–16.
- Newton, C.B. (1925) New section across the buried cliff, Holderness. *Transactions of the Hull Geological Society*, 6, 290.
- Nicholson, F.H. (1976) Patterned ground formation and description as suggested by low arctic and subarctic examples. *Arctic and Alpine Research*, **8**, 329–42.
- Nicholson, F. (1990) Geology and landforms in the Ingleborough area. In *Field Excursions in North West England* (ed. C. Park), University of Lancaster, Lancaster; Cicerone Press, Milnthorpe, pp. 93–105.
- Nicols, R.L. (1963) Miniature nivation cirques near Marble Point, McMurdo Sound,

Antarctica. Journal of Glaciology, 4, 477-9.

- Nirex (1997a) Analytical Studies of the Provenance, Micropalaeontology and Chronology of Quaternary Sediments from the Sellafield Area during 1996. *Nirex Science Report*, SA/97/044.
- Nirex (1997b) Quaternary Evolution of the Sellafield Area. Nirex Science Report, SA/97/002.
- Noe-Nygaard, N. (1975) Two shoulder blades with healed lesions from Star Carr. *Proceedings of the Prehistoric Society*, **41**, 10-16.
- Nolan, S.R., Bloemendal, J., Boyle, J.F., Jones, R.T., Oldfield, F. and Whitney, M. (1999) Mineral magnetic and geochemical records of late Glacial climatic change from two northwest European carbonate lakes. *Journal of Paleolimnology*, 22, 97–107.
- Norbury, W.H. (1884) Lindow Common as a peat bog: its age and its people. *Transactions of the Lancashire and Cheshire Antiquarian Society*, **2**, 59–75.
- Norris, A., Bartley, D.D. and Gaunt, G.D. (1971) An account of the deposit of shell marl at Burton Salmon, West Yorkshire. *Naturalist*, 917, 57–63.
- Nyberg, R. (1991) Geomorphic processes at snowpatch sites in the Abisko Mountains, Northern Sweden. Zeitschrift für Geomorphologie, 35, 321–43.
- Nye, J.F. and Martin, P.C.S. (1968) Glacial erosion. *IASH Publication*, **79**, 78–86.
- O'Connor, J. (1964) The Geology of the Area around Malham Tarn, Yorkshire. *Field Studies*, 2, 53–82.
- O'Connor, J., Williams, D.S.F. and Davies, G.M. (1974) Karst features of Malham and the Craven Fault Zone. In *The Limestones and Caves of North-West England* (ed. A.C. Waltham), David and Charles, Newton Abbot, pp. 395–409.
- Ó Floinn, R.O. (1995a) Recent research into Irish bog bodies. In *Bog Bodies. New Discoveries and New Perspectives* (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 39–46.
- Ó Floinn, R.O. (1995b) Gazeteer of bog bodies in the British Isles. 2. Ireland. In *Bog Bodies*. *New Discoveries and New Perspectives* (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 221–34.
- Oldfield, F. (1960a) Studies in the post-glacial history of the British vegetation: lowland

Lonsdale. New Phytologist, 59, 192-217.

- Oldfield, F. (1960b) Late Quaternary changes in climate, vegetation and sea-level in lowland Lonsdale. *Transactions of the Institute of British Geographers*, **28**, 99–117.
- Oldfield, F. (1963) Pollen analysis and mans role in the ecological history of the south-east Lake District. *Geografiska Annaler*, **45**, 23–40.
- Oldfield, F. (1965) Problems of mid-Post-glacial pollen zonation in part of north-west England. *Journal of Ecology*, 53, 247-60.
- Oldfield, F. (1970) The ecological history of Blelham Bog National Nature Reserve. In Studies in the Vegetational History of the British Isles (eds D. Walker and R.G. West), Cambridge University Press, Cambridge, pp. 141–57.
- Oldfield, F., Krawiecki, A., Maher, B., Taylor, J.J. and Twigger, S. (1985) The role of mineral magnetic measurements in archaeology. In *Palaeoenvironmental Investigations: Research Design, Methods and Data Analysis* (eds N.R.J. Fieller, D.D. Gilbertson and N.G.A. Ralph), British Archaeological Research International Series 258, Oxford, pp. 22–9.
- Oldfield, F., Higgit, S.R., Richardson, N. and Yates, G. (1986) Pollen, charcoal, rhizopod and radiometric analysis. In *Lindow Man, the Body in the Bog* (eds I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 82–5.
- Oldfield, F., Battarbee, R.W., Thompson, R. and Wolff, G.A. (1999) A Lake Sediment Based Study of the Holocene History, Flux and Characterisation of Fine, Particulate, Terrestrially Derived Sediments in the Humber Region, (GST/02/754), Final Report LOIS Special Topic Project Number, 78.
- Orford, J.D., Wilson, P., Wintle, A.G., Knight, J. and Braley, S. (2000) Holocene coastal dune initiation in Northumberland and Norfolk, eastern UK: climate and sea-level changes as possible forcing agents for dune initiation. In Holocene Land-Ocean Interaction and Environmental Change around the North Sea (eds I. Shennan and J. Andrews), Geological Society of London Special Publication, 166, pp. 197–217.
- Osborne, P.J. (1972) Insect faunas of Late Devensian and Flandrian age from Church Stretton, Shropshire. *Philosophical Transactions of the Royal Society of London*, **B263**, 327–67.
- Osvald, H. (1923) Die vegetation des

Hochmoores Komosse. Svenske Växtsocial. Sallsk. Handlingar, 1, 1–436.

- Otlet, R.L., Walker, A.J. and Dadson, S.M. (1986) Report on radiocarbon dating of the Lindow man by AERE, Harwell. In *Lindow Man. The Body in the Bog* (eds I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 27–30.
- Owen, D.E. (1947) The Pleistocene history of the Wirral peninsular. *Proceedings of the Liverpool Geological Society*, **19**, 210–39.
- Oxford, S.P. (1985) Protalus ramparts, protalus rock glaciers and soliflucted till in the northwest part of the English Lake District. In *Field Guide to the Periglacial Landforms of Northern England* (ed. J. Boardman), Quaternary Research Association, Cambridge, pp. 38–46.
- Oxford, S.P. (1994) Periglacial snowbed landforms at Dead Crags, Cumbria. In *Cumbria: Field Guide* (eds J. Boardman and J. Walden), Quaternary Research Association, Oxford, pp. 158–64.
- Page, K.N. (1989) A stratigraphical revision for the English Lower Callovian. Proceedings of the Geologists' Association, 100, 363–82.
- Palmer, J. A. (1956) Tor formation at The Bridestones in North-East Yorkshire and its significance in relation to problems of valleyside development and regional glaciation. *Transactions of the Institute of British Geographers*, 22, 55–71.
- Palmer, J.A. (1967) Landforms. In *Leeds and its Region* (eds M.W. Beresford and G.R.J. Jones), British Association for the Advancement of Science, Leeds, pp. 16–29.
- Palmer, J. A. and Nielson, R.A. (1962) The origin of granite tors on Dartmoor, Devonshire. *Proceedings of the Yorkshire Geological Society*, 33, 315–39.
- Palmer, J. A. and Radley, J. (1961) Gritstone tors of the English Pennines. Zeitschrift für Geomorphologie, 5, 37–52.
- Pantin, H.M. (1978) Quaternary Sediments from the north-east Irish Sea: Isle of Man to Cumbria, *Bulletin of the Geological Survey of Great Britain*, 64, 1–43 pp.
- Pantin, H.M. and Evans, C.D.R. (1984) The Quaternary history of the central and southwestern Celtic Sea. *Marine Geology*, **57**, 259–93.
- Parizek, R. (1969) Glacial ice contact rings and ridges. In United States Contributions to Quaternary Research: papers prepared on

the occasion of the VIII Congress of the International Association for Quaternary Research, Paris, France, 1969 (eds S.A. Schumm and W.C Bradley), Geological Society of America Special Paper, No. 123, Geological Society of American, Boulder, pp. 49–102.

- Parker, A.G., Anderson D.E. and Boardman, J. (1994) Seathwaite valley: buried organic deposit. In *Cumbria: field guide* (eds J. Boardman and J. Walden), *Quaternary Research Association Field Guide*, Quaternary Research Association, Oxford, pp. 146–51.
- Parker, W.R. (1975) Sediment mobility and erosion on a multibarred foreshore (Southwest Lancashire). In Nearsbore Sediment Dynamics and Sedimentation (eds J. Hails and A. Carr), John Wiley and Sons Ltd, London, pp. 151–79.
- Parks, D.A. and Rendell, H.M. (1992) Thermoluminescence dating and geochemistry of loessic deposits in southeast England. *Journal of Quaternary Science*, 7, 99–107.
- Parry, J.T. (1960) The erosion surfaces of the south western Lake District. Transactions of the Institute of British Geographers, 28, 39-54.
- Parry, M.L. (1976) The significance of the variability of summer warmth in upland Britain. *Weather*, 31, 212–17.
- Parsons, A.R. (1966) Some aspects of the glacial geomorphology of north-eastern Northumberland. Unpublished MSc thesis, University of Leicester.
- Parsons, L.M. (1922) Dolomitization in the Carboniferous Limestone of the Midlands. *Geological Magazine*, 59, 41–53, 104–17.
- Passmore, D.G., Macklin, M.G., Stevenson, A.C., O'Brien, C.F. and Davies, B.A.S. (1992). A Holocene alluvial sequence in the lower Tyne valley, northern Britain: a record of river response to environmental change. *The Holocene*, 2, 138–47.
- Paterson, K. (1977) Scarp-face dry valleys near Wantage, Oxfordshire. *Transactions of the Institute of British Geographers*, 2, 192–204.
- Paul, M.A. (1983) The supraglacial landsystem. In *Glacial Geology* (ed. N. Eyles), Pergamon Press, Oxford, pp. 71–90.
- Paul, M.A. and Little, J.A. (1991) Geotechnical properties of glacial deposits in lowland Britain. In *Glacial Deposits in Great Britain* and Ireland (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 389–404.

- Payton, R.W. and Usai, M.R. (1995) Assessment of the Soils and Sediments from an Exploratory Excavation at Low Hauxley, Northumberland. EAU 95/42.
- Peake, D.S. (1961) Glacial changes in the Alyn river system and their significance in the glaciology of the north Welsh border. *Journal* of the Geological Society, London, **117**, 335–66.
- Peake, D.S. (1981) The Devensian glaciation on the north Welsh border. In *The Quaternary in Britain* (eds J. Neale and J. Flenley), Pergamon Press, Oxford, pp. 49–59.
- Peake, H.J.E. (1909) A few notes representing the entrenchments at Stockett. *Transactions* of the Shropshire Archaeological and Natural History Society, Series 3, 9. In: 'Miscellanea', pp. ix-x.
- Pearsall, W.H. (1950) Mountains and Moorlands, The New Naturalist, No. 11, Collins, London, 312 pp.
- Pearsall, W.H. and Pennington, W. (1973) The Lake District: a landscape History, The New Naturalist, No. 53, Collins, London, 320 pp.
- Pearson, R.G. (1962) The Coleoptera from a lateglacial deposit at St. Bees, West Cumberland. *Journal of Animal Ecology*, **31**, 129–60.
- Peel, R.F. (1949) A study of two Northumbrian spillways. *Transactions of the Institute of British Geographers*, **15**, 75–89.
- Peel, R.F. (1956) The profiles of glacial drainage channels. *Geographical Journal*, **122**, 483–7.
- Pennington, W. (1943) Lake sediments: the bottom deposits of the north basin of Windermere, with special reference to the diatom succession. *New Phytologist*, 42, 1–27.
- Pennington, W. (1947) Studies of the Post-glacial history of British vegetation. VII. Lake sediments: pollen diagrams from the bottom deposits of the north basin of Windermere. *Philosophical Transactions of the Royal Society of London*, B233, 137–75.
- Pennington, W. (1964) Pollen analyses from the deposits of six upland tarns in the Lake District. *Philosophical Transactions of the Royal Society of London*, **B248**, 205–44.
- Pennington, W. (1965) The interpretation of some Post-glacial vegetation diversities at different Lake District sites. *Proceedings of the Royal Society of London*, **B161**, 310–23.
- Pennington, W. (1969a) The History of the British Vegetation, Modern Biology, English Universities Press, London, 152 pp.

- Pennington, W. (1969b) The usefulness of pollen analysis in interpretation of stratigraphic horizons, both Late-glacial and Post-glacial. *Mitteilungen Internationale Vereinigung für Limnologie*, 17, 154–64.
- Pennington, W. (1970) Vegetation history in the north-west of England: a regional synthesis. In Studies in the Vegetational History of the British Isles (eds D. Walker and R.G. West), Cambridge University Press, Cambridge, pp. 41–79.
- Pennington, W. (1973) Absolute pollen frequencies in the sediments of lakes of different morphometry. In *Quaternary Plant Ecology: the* 14th Symposium of the British Ecological Society, University of Cambridge, 28–30 March 1972 (eds H.J.B. Birks and R.G. West), Blackwell Scientific Publications, Oxford, pp. 79–104.
- Pennington, W.F. (1974) The History of the British Vegetation, Modern Biology, 2nd edn, English Universities Press, London, 152 pp.
- Pennington, W. (1975a) A chronostratigraphic comparison of Late-Weichselian and Late-Devensian subdivisions, illustrated by two radiocarbon-dated profiles from western Britain. *Boreas*, 4, 157–71.
- Pennington, W. (1975b) An application of principal components analysis to the zonation of two Late-Devensian profiles: Section II. Interpretation of the numerical analyses in terms of Late-Devensian (Late-Weichselian) environmental history. *New Phytologist*, 75, 441–53.
- Pennington, W. (1975bc) The effect of Neolithic man on the environment in north-west England: the use of absolute pollen diagrams. In *The Effect of Man on the Landscape: the Higbland Zone* (eds J.G. Evans, S. Limbrey and H. Cleere), *Council for British Archaeology Research Report*, **11**, Council for British Archaeology, London, pp 74–86.
- Pennington, W. (1977) The Late Devensian flora and vegetation of Britain. *Philosophical Transactions of the Royal Society of London*, B280, 247–71.
- Pennington, W. (1978) Quaternary Geology. In The Geology of the Lake District (ed. F. Moseley), Yorkshire Geological Society Occasional Publication, No. 3, Yorkshire Geological Society, Leeds, pp. 207–25.
- Pennington, W. (1980) Modern pollen samples from West Greenland and the interpretation of pollen data from the British Late-Glacial

(Late Devensian). New Phytologist, 84, 171–201.

- Pennington, W. (1981) The representation of Betula in the Late Devensian deposits of Windermere, England. Striae, 14, 83-7.
- Pennington, W. (1986) Lags in adjustment of vegetation to climate caused by the pace of soil development: evidence from Britain. *Vegetatio*, 67, 105–18.
- Pennington, W. (1996) Limnic sediments and the taphonomy of Lateglacial pollen assemblages. *Quaternary Science Reviews*, **15**, 501–20.
- Pennington, W. and Bonny, A.P. (1970) Absolute pollen diagram from the British Late-Glacial. *Nature*, **226**, 871–3.
- Pennington, W. and Lishman, J.P. (1971) Iodine in lake sediments in northern England and Scotland. *Biology Reviews*, 46, 279–313.
- Pennington, W. and Sackin, M.J. (1975) An application of principal components analysis to the zonation of two Late-Devensian profiles. *New Phytologist*, **75**, 419–53.
- Penny, L.F. (1959) The Last Glaciation in East Yorkshire. *Transactions of the Leeds Geological Association*, 7, 4–14.
- Penny, L.F. (1963) Vertebrate remains from Kelsey Hill, Burstwick and Keyingham. Hull Museum Publication, 214, 5–14.
- Penny, L.F. (1974) Quaternary. In The Geology and Mineral Resources of Yorkshire (eds D.H. Rayner and J.E. Hemingway), Yorkshire Geological Society Occasional Publication, No. 2, Yorkshire Geological Society, Leeds, pp. 245–64.
- Penny, L.F. and Catt, J.A. (1967) Stone orientation and other structural features of tills in East Yorkshire. *Geological Magazine*, 104, 344-60.
- Penny, L.F. and Catt, J.A. (1972) The Specton Shell Bed. In *East Yorksbire and Lincolnshire: field guide* (eds L.F. Penny, A. Straw, J.A. Catt *et al.*), *Quaternary Research Association Field Guides*, Quaternary Research Association, Hull, pp. 18.
- Penny, L.F. and Rawson, P.F. (1969) Field meeting in East Yorkshire and North Lincolnshire. *Proceedings of the Geologists' Association*, 80, 193–18.
- Penny, L.F., Coope, G.R. and Catt, J.A. (1969) Age and insect fauna of the Dimlington Silts, East Yorkshire. *Nature*, 224, 65–7.
- Penny, L.F., Straw, A. and Catt, J.A. (1972) Kirmington. In *East Yorkshire and Lincolnshire: field guide* (eds L.F. Penny, A.

Straw, J.A. Catt *et al.*), *Quaternary Research Association Field Guides*, Quaternary Research Association, Hull, pp. 30–4.

- Pentecost, A. (1981) The tufa deposits of the Malham District, North Yorkshire. *Field Studies*, 5, 365–87.
- Perrin, R.M.S., Rose, J. and Davies, H. (1979) The distribution, variation and origins of pre-Devensian tills in eastern England. *Philosophical Transactions of the Royal Society of London*, **B287**, 535-70.
- Phemister, J. (1922) Notes on the Brandesburton kame, Yorkshire. *Geological Magazine*, 59, 323–26.
- Phillips, J. (1827) On the direction of the diluvial currents in Yorkshire. *Transactions of the Geological Society*, **3**, 13.
- Phillips, J. (1829) *Illustrations of the Geology of Yorkshire. Part 1: The Yorkshire Coast*, Thomas Wilson and sons, York.
- Phillips, J. (1836) Illustrations of the Geology of Yorkshire Part 2: The Mountain Limestone District, John Murray, London, 253 pp.
- Phillips, J. (1855) *The Rivers, Mountains and Sea-coast of Yorkshire*, John Murray, London, 316 pp.
- Phillips, J. (1875) *Illustrations of the Geology of Yorkshire. Part I, The Yorkshire Coast*, 3rd edn, John Murray, London.
- Pickering, R. (1878) Submerged forest at St. Bees. Transactions of the Cumberland Association for the Advancement of Literature and Science, 3, 109–14.
- Piggott, C.D. (1956) The vegetation of Upper Teesdale in the North Pennines. *Journal of Ecology*, 44, 545–86.
- Piggott, C.D. (1962) Soil formation and development on the Carboniferous Limestone of the Midlands. I. Parent Materials. *Journal of Ecology*, 50, 145–56.
- Piggott, C.D. (1965) The structure of limestone surfaces in Derbyshire. *Geographical Journal*, 131, 41–4.
- Piggott, C.D. and Huntley, J.P. (1978) Factors controlling the distribution of *Tilia cordata* at the northern limits of its geographical range.
  I. Distribution in north-west England. *New Phytologist*, 81, 429–41.
- Piggott, C.D. and Huntley, J.P. (1980) Factors controlling the distribution of *Tilia cordata* at the northern limits of its geographical range.
  II. History in north-west England. *New Phytologist*, 84, 145–64.
- Piggott, C.D. and Huntley, J.P. (1981) Factors

controlling the distribution of *Tilia cordata* at the northern limits of its geographical range. III. Nature and causes of seed sterility. *New Phytologist*, **87**, 817–39.

- Piggott, C.D. and Piggott, M.E. (1963) Late-glacial and post-glacial deposits at Malham, Yorkshire. *New Phytologist*, 62, 317–34.
- Piggott, C.D. and Walters, S.M. (1954) On the interpretation of the discontinuous distribution shown by certain British species of open habitats. *Journal of Ecology*, 42, 95–116.
- Piggott, M.E. and Piggott, C.D. (1959) Stratigraphy and pollen analysis of the Malham Tarn and Tarn Moss. *Field Studies*, 1, 84–101.
- Pilcher, J.R. and Hall, V.A. (1996) Tephrochronological studies in northern England. *The Holocene*, 6, 100–5.
- Pilkington, J. (1789) A View of the Present State of Derbyshire, J. Drewry, Derby, 2 vols, 469 and 464 pp.
- Piotrowski, J.A. and Kraus, A.M. (1997) Response of sediment to ice sheet loading in northwestern Germany: effective stresses and glacierbed stability. *Journal of Glaciology*, 43, 495–502.
- Pirazzoli, P.A., Radtke, U., Hantora, W.S. *et al.* (1991) Quaternary raised coral-reef terraces on Sumba island, Indonesia. *Science*, **252**, 1834–6.
- Pitts, J. (1983) Faults and other shears in bedded Pleistocene deposits on the Wirral, United Kingdom. *Boreas*, **12**, 137–44.
- Pitts, M. (1979) Hides and antlers: a new look at the gatherer-hunter site at Star Carr, North Yorkshire, England. *World Archaeology*, **11**, 32–42.
- Plant, J. (1866) On the existence of a sea beach on the limestone moors near Buxton. *Transactions of the Manchester Geological* Society, 5, 272.
- Plater, A.J. and Shennan, I. (1992) Evidence of Holocene sea-level change from the Northumberland coast, eastern England. *Proceedings of the Geologists' Association*, 103, 201–16.
- Plater, A.J., Huddart, D., Innes, J.B., Pye, K., Smith, A.J. and Tooley, M.J. (1993). Coastal and sea-level changes. In *The Sand Dunes of the Sefton Coast: proceedings of the Sefton Coast Research Seminar*, 31 May 1991, Liverpool (eds D. Atkinson and J. Houston), National Museums and Galleries on Merseyside with Sefton Metropolitan Council,

Liverpool, pp. 23-34.

- Plater, A.J., Horton, B.P., Haworth, E.Y. *et al.* (2000a) Holocene tidal levels and sedimentation rates using a diatom-based palaeoenvironmental reconstruction: the Tees estuary, northeastern England. *The Holocene*, **10**, 441–52.
- Plater, A.J., Ridgway, J., Rayner, B. et al. (2000b) Sediment provenance and flux in the Tees estuary: the record from the Late Devensian to the present. In Holocene Land-Ocean Interaction and Environmental Change around the North Sea (eds I. Shennan and J. Andrews), Geological Society of London Special Publication, No. 166, Geological Society of London, London, pp. 171–95.
- Plater, A.J., Long, A.J., Huddart, D., Gonzalez, S. and Tooley, M.J. (2000c) The land of the Mersey basin: sea-level changes. In Ecology and Landscape Development: a History of the Mersey Basin: proceedings of a conference beld at Merseyside Maritime museum Liverpool, 5-6 July 1996 (ed. E.F. Greenwood), Liverpool University Press, Liverpool, pp. 13-20.
- Pocock, R.W., Whitehead, T.H., Wedd, C.D. and Robertson, T. (1938) Shrewsbury District including the Hanwood Coalfield, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series, HMSO, London, 297 pp.
- Poole, E.G. and Whiteman, A.J. (1961) The glacial drifts of the southern part of the Shropshire-Cheshire basin. Quarterly Journal of the Geological Society of London, 117, 91-130.
- Poore, M.E.D. and Walker, D. (1959) Wybunbury Moss, Cheshire. *Memoirs and Proceedings of* the Manchester Literary and Philosophy Society, 101, 72–95.
- Porter, S.C. (1989) Some geological implications of average Quaternary glacial conditions. *Quaternary Research*, **32**, 245–61.
- Potter, C. (1876) Observations on the geology and archaeology of the Cheshire Shore. *Transactions of the Historical Society of Lancashire and Cheshire*, 4, 121–42.
- Potts, A.S. (1971) Fossil cryonival features in central Wales. Geografiska Annaler, 53A, 39–51.
- Pounder, E. (1989) Classic Landforms of the Northern Dales, Classic Landform Guides, No. 10, The Geographical Association, Sheffield, 48 pp.
- Powell, R. (1981) A model for sedimentation by

tidewater glaciers. Annals of Glaciology, 2, 129-34.

- Powell, R.D. and Molnia, B.F. (1989) Glacimarine sedimentary processes, facies and morphology of the south-southeast Alaska shelf and fjords. *Marine Geology*, **85**, 359–90.
- Powell R.D., Dawber, M., McInnes, J.N. and Pyne, A.R. (1996) Observations of the grounding-line area at a floating glacier terminus. *Annals of Glaciology*, 22, 217–23.
- Preece, R.C. (2001) Molluscan evidence for differentiation of interglacials within the 'Cromerian Complex'. *Quaternary Science Reviews*, **20**, 1643–56.
- Preece, R.C. and Robinson, J.E. (1984) Late Devensian and Flandrian environmental history of the Ancholme Valley, Lincolnshire: molluscan and ostracod evidence. *Journal of Biogeography*, 11, 319–52.
- Prell, W.L., Imbrie, J., Martinson, B.G., Morley, J.J., Pisias, N.G., Shackleton, N.J. and Steeter, H.F. (1986) Graphic correlation of oxygen isotope stratigraphy – application to the late Quaternary. *Paleoceanography*, 1, 137–62.
- Prentice, J.E. (1951) The Carboniferous Limestone of the Manifold Valley region, North Staffordshire. *Quarterly Journal of the Geological Society of London*, **106**, 171–209.
- Prentice, J.E. (1952) Notes on 'The Carboniferous Limestone of the Manifold Valley region, North Staffordshire'. *Quarterly Journal of the Geological Society of London*, 107, 335.
- Prestwich, J. (1861) On the occurrence of Cyrena fluminalis, together with marine shells of recent species, in beds of sand and gravel over beds of boulder clay near Hull. *Quarterly Journal of the Geological Society of London*, 17, 446–56.
- Price, T.D. (1982) Willow tales and dog smoke. Quarterly Review of Archaeology, 3, 4–7.
- Proctor, H.G. (1965) Mankind. In *The Natural History of Upper Teesdale* (ed. D.H. Valentine), Northumberland and Durham Naturalists Trust, Newcastle-upon-Tyne, pp. 5–11.
- Proctor, H.G. (1976) Mankind. In *The Natural History of Upper Teesdale* (ed. M.E. Bradshaw), rev. edn, Durham Conservation Trust Ltd, Darlington, pp. 7–12.
- Proctor, M.C.F. (1974) The vegetation of the Malham Tarn fens. *Field Studies*, 4, 1–38.
- Proctor, M.C.F. (1995) Hydrochemistry of the

raised bog and fens at Malham Tarn National Nature Reserve, Yorkshire, UK. In *Hydrogeology and Hydrochemistry of British Wetlands*, (eds J.M.R. Hughes and A.L. Heathwaite), John Wiley and Sons Ltd, Chichester, pp. 273–89.

- Pullan, R.A. (1959) Notes on periglacial phenomena: tors. Scottish Geographical Magazine, 75, 51–5.
- Pyatt, F.B., Beaumont, E.H., Buckland, P.C., Lacy, D. and Storey, D.M. (1991a) An examination of the mobilisation of elements from the skin and bone of the bog body Lindow II and a comparison with Lindow III. *Environmental Geochemistry and Health*, **13**, 153–9.
- Pyatt, F.B., Beaumont, E.H., Lacy, D., Magilton, J.R. and Buckland, P.C. (1991b) Non isatis sed vitrum, or the colour of Lindow Man. Oxford Journal of Archaeology, 10, 61–73.
- Pyatt, F.B., Beaumont, E.H., Buckland, P.C., Lacy, D., Magilton, J.R. and Storey, D.M. (1995)
  Mobilisation of elements from the bog bodies
  Lindow II and III, and some observations on
  body painting. In *Bog Bodies. New Discoveries and New Perspectives* (eds R.C.
  Turner and R.G. Scaife), British Museum
  Press, London, pp. 62–73.
- Pye, K. (1990) Physical and human influences on coastal dune development between the Ribble and Mersey estuaries, North-West England. In *Coastal Dunes: Form and Process* (eds K.F. Nordstrom, N.P. Psuty and R.W.G. Carter) *Coastal Morphology and Research*, John Wiley and Sons Ltd, Chichester, pp. 339–59.
- Pye, K. and Neal, A. (1993a) Stratigraphy and age structure of the Sefton dune complex: preliminary results of field drilling investigations. In *The Sand Dunes of the Sefton Coast: proceedings of the Sefton Coast Research Seminar*, 31 May 1991, Liverpool (eds D. Atkinson and J. Houston), National Museums and Galleries on Merseyside with Sefton Metropolitan Council, Liverpool, pp. 41–4.
- Pye, K. and Neal, A. (1993b) Late Holocene dune formation on the Sefton coast, northwest England. In *The Dynamics and Environmental Context of Aeolian Sedimentary Systems* (ed. K. Pye), *Geological Society of London Special Publication*, No. 72, Geological Society of London, London, pp. 201–17.
- Pye, K. and Neal, A. (1994) Coastal dune erosion at Formby Point, north-west England: causes

and mechanisms. Marine Geology, 19, 39-56.

- Pye, K., Stokes, S. and Neal, A. (1995) Revised chronostratigraphy of aeolian sand deposits on the Sefton coast, northwest England, using <sup>14</sup>C and optical dating methods. *Proceedings* of the Geologists' Association, **106**, 281–92.
- Raczkowska, Z. (1995) Nivation in the high Tatras, Poland. *Geografiska Annaler*, 77A, 251–58.
- Radge, G.W. (1939) The glaciation of North Cleveland. Proceedings of the Yorkshire Geological Society, 24, 180-205.
- Radley, J. (1962) Peat erosion on the high moors of Derbyshire and West Yorkshire. *East Midland Geographer*, 3, 40–50.
- Radley, J., Tallis, J.H. and Switsur, V. R. (1974) The excavation of three 'narrow blade' Mesolithic sites in the southern Pennines, England. *Proceedings of the Prebistoric Society*, **40**, 1–20.
- Raistrick, A. (1925) The glaciation of Borrowdale, Cumberland. *Proceedings of the Yorksbire Geological Society*, **20**, 155–81.
- Raistrick, A. (1926) The glaciation of Wensleydale, Swaledale and adjoining parts of the Pennines. *Proceedings of the Yorkshire Geological Society*, 20, 366–410.
- Raistrick, A. (1927) Periodicity in the glacial retreat in west Yorkshire. *Proceedings of the Yorkshire Geological Society*, **21**, 24–9.
- Raistrick, A. (1931a) The glaciation of Wharfedale. Proceedings of the Yorkshire Geological Society, 22, 9-31.
- Raistrick, A. (1931b) The glaciation of Northumberland and Durham. *Proceedings of the Geologists' Association*, 42, 281–91.
- Raistrick, A. (1932) The correlation of glacial retreat stages across the Pennines. *Proceedings of the Yorksbire Geological Society*, 22, 199–214.
- Raistrick, A. (1933) Glacial and Post-Glacial periods in West Yorkshire. *Proceedings of the Geologists' Association*, 44, 263–9.
- Raistrick, A. (1936) Excavations at Sewell's Cave, Settle, West Yorkshire. Proceedings of the University of Durbam Philosophical Society, 9, 191–202.
- Raistrick, A. (1947) Malham and Malham Moor, Dalesman, Clapham, 122 pp
- Raistrick, A. (1971) *Ice Age in Yorksbire*, Dalesman, Clapham.
- Raistrick, A. and Blackburn, K.B. (1932) The Late-glacial and post-glacial periods in the North Pennines, Part III – The post-glacial

peats. Transactions of the Northern Naturalists Union, 1, 79–103.

- Raistrick, A. and Blackburn, K.B. (1938) Linton Mires, Wharfedale. Glacial and Post-glacial history. *Proceedings of the University of Durham Philosophical Society*, **10**, 24.
- Raistrick, A. and Illingworth, J.I. (1949) *The Face* of North-west Yorkshire, Dalesman, Clapham.
- Raistrick, A. and Woodhead, T.W. (1930) Plant remains in post-glacial gravels near Leeds. *The Naturalist*, 39–44.
- Ramsay, A.C. (1872) *The Physical Geology and Geography of Great Britain*, 3rd edn, Stanford, London, 349 pp.
- Ramsay, A.C. (1846) On the Denudation of South Wales and the Adjacent Counties of England. *Memoir of the Geological Survey of Great Britain and of the Museum of Practical Geology*, 1, 297–335.
- Ramsay, A.C. (1872) On the river courses of England and Wales. *Journal of the Geological Society of England and Wales*, **28**, 148–60.
- Ramsbottom, W.H.C. (1973) Transgressions and regressions in the Dinantian: a new synthesis of British Dinantian stratigraphy. *Proceedings* of the Yorkshire Geological Society, **39**, 567–607.
- Ramsbottom, W.H.C. (1977) Major cycles of transgression and regression (mesothems) in the Namurian. *Proceedings of the Yorksbire Geological Society*, **41**, 261–91.
- Rapp, A. (1984) Nivation hollows and glacial cirques in Soderasen, Scania, South Sweden. *Geografiska Annaler*, 66A, 11–28.
- Ratcliffe, D.A. (1960) The Mountain Flora of Lakeland. *Proceedings of the Botanical Society of the British Isles*, 4, 1–25.
- Ratcliffe, D.A. (1978) The plant communities of Upper Teesdale, In Upper Teesdale: the Area and its Natural History (ed. A.R. Clapham), Collins, London, pp. 64–87.
- Rea, B., Whalley, W.B., Evans, D.J.A., Gordon, J.E. and McDougall, D.A. (1998) Plateau icefields: geomorphology and dynamics. *Quaternary Proceedings*, 6, 35–54.
- Reade, T.M. (1871) The geology and physics of the post-glacial period, as shown in the deposits and organic remains in Lancashire and Cheshire. *Proceedings of the Liverpool Geological Society*, 2, 36–88.
- Reade, T.M. (1878a) The trees of the post-glacial forest beds in the neighbourhood of Liverpool. *Transactions of the Historical Society of Lancashire and Cheshire*, 6, 27–8.

- Reade, T.M. (1878b) Some further notes on the submarine forests of the Alt Mouth. *Proceedings of the Liverpool Geological Society*, **3**, 362–9.
- Reade, T.M. (1883a) On a section of the Formby and Leasowe Marine beds and Superior peat beds, disclosed by the cuttings for the outlet sewer at Hightown. *Proceedings of the Liverpool Geological Society*, 4, 269.
- Reade, T.M. (1883b) The drift beds of North West England and North Wales. *Quarterly Journal* of the Geological Society of London, 39, 82–132.
- Reade, T.M. (1908) Post-glacial beds at great Crosby as disclosed by the new outfall sewer. *Proceedings of the Liverpool Geological Society*, 10, 217–36.
- Reed, C. (1901) The Geological History of the Rivers of East Yorkshire, C.J. Clay and Sons, London, 103 pp.
- Rees, J.G., Ridgway, J., Ellis, S., Knox, O'B., Newsham, R.W. and Parkes, A. (2000) Holocene sediment storage in the Humber estuary. In Holocene Land-Ocean Interaction and Environmental Change around the North Sea (eds I. Shennan and J.E. Andrews), Geological Society of London Special Publication, No. 166, Geological Society of London, London, pp. 119–43.
- Reid, C. (1885) The Geology of Holderness, and the Adjoining Parts of Yorkshire and Lincolnshire, Memoir (District) of the Geological Survey of Great Britain, HMSO, London, 177 pp.
- Reid, C. (1913) *Submerged Forests*, Cambridge University Press, Cambridge, 129 pp.
- Reid, E.M. (1919) Preliminary description of the plant remains. In On a deposit of interglacial loess and some transported preglacial freshwater clays on the Durham coast (C.T. Trechmann). *Quarterly Journal of the Geological Society of London*, 75, 197–200.
- Reid, E.M. (1920) On two preglacial floras from Castle Eden (County Durham). Quarterly Journal of the Geological Society of London, 76, 104–44.
- Reid, P.C. and Downie, C. (1973) The age of the Bridlington Crag. *Proceedings of the Yorkshire Geological Society*, **39**, 315–18.
- Rendell, H. (1992) A comparison of TL age estimates from different mineral fractions of sand. *Quaternary Science Reviews*, 11, 79–83.
- Rendell, H., Worsley, P., Green, F. and Parks, D.

(1991) Thermoluminescence dating of the Chelford Interstadial. *Earth and Planetary Science Letters*, **103**, 182–9.

- Reynolds, C.S. (1971) The ecology of the planktonic blue-green algae in the north Shropshire meres. *Field Studies*, **3**, 409–32.
- Reynolds, C.S. (1973a) The phytoplankton of Crose Mere, Shropshire. British Phycological Journal, 8, 153-62.
- Reynolds, C.S. (1973b) Phytoplankton periodicity of some north Shropshire meres. *British Phycological Journal*, **8**, 301–20.
- Reynolds, C.S. (1979) The limnology of the eutrophic meres of the Shropshire–Cheshire plain. *Field Studies*, **5**, 93–173.
- Reynolds, C.S. and Reynolds, J.B. (1985) The atypical seasonality of phytoplankton in Crose Mere, 1972 an independent test of the hypothesis that variability in the physical-environment regulates community dynamics and structure. *British Phycological Journal*, 20, 227–42.
- Richards, K.S. (1981) Evidence of Flandrian valley alluviation in Staindale, North York Moors. *Earth Surface Processes and Landforms*, 6, 183–6.
- Richards, K.S., Peters, N.R., Robertson-Rintoul, M.S.E. and Switsur, V.R. (1987) Recent valley sediments in the North York Moors: evidence and interpretation. In *International Geomorphology: proceedings of the First International Conference on Geomorphology* (ed. V. Gardiner), John Wiley and Sons Ltd, Chichester, pp. 869–83.
- Richards, M. (1993) *Hadrian's Wall, Vol. 1: The Wall Walk, Cicerone Guide,* Cicerone, Milnthorpe, 206 pp.
- Ridd, M.F., Walker, D.B. and Jones, J.M. (1970) A deep borehole at Harton on the margin of the Northumberland trough. *Proceedings of the Yorkshire Geological Society*, **338**, 75–103.
- Riley, D.N. (1966) An early Bronze Age cairn on Harland Edge, Beeley Moor, Derbyshire. *Derbyshire Archaeological Journal*, **86**, 31–53.
- Ringrose, P. (1988) Palaeoseismic (?) liquefaction event in late Quaternary sediment at Glen Roy, Scotland. *Terra Nova*, 1, 57–62.
- Roberts, B.K., Turner, J. and Ward, P.F. (1973) Recent forest history and land-use in Weardale, northern England. In *Quaternary Plant Ecology: the 14th Symposium of the British Ecological Society*, University of Cambridge, 28–30 March 1972 (eds H.J.B.

Birks and R.G. West), Blackwell Scientific Publications, Oxford, pp. 207–21.

- Roberts, G., Gonzalez, S. and Huddart, D. (1996) Intertidal Holocene footprints and their archaeological significance. *Antiquity*, **70**, 647–51.
- Robinson, D.A. and Williams, R.B.G. (1976) Aspects of the geomorphology of the sandstone cliffs of the central Weald. *Proceedings* of the Geologists' Association, **87**, 93–9.
- Robinson, J.E. (1972) Quaternary Ostracoda from East Yorkshire and north Lincolnshire. *Quaternary Newsletter*, 7, 1–2.
- Robson, D.A. (1981) The Geology of Northeast England, Natural History Society of Northumbria Special Publication, The Natural History Society of Northumbria, Newcastle-upon-Tyne, 113 pp.
- Rodwell, J.S. (1991a) British Plant Communities, Vol. 1, Woodlands and Scrub, Cambridge University Press, Cambridge.
- Rodwell, J.S. (1991b) British Plant Communities, Vol. 2, Mires and Heaths, Cambridge University Press, Cambridge.
- Rodwell, J.S. (1992) British Plant Communities, Vol. 3, Grasslands and Montane Communities, Cambridge University Press, Cambridge.
- Rodwell, J.S. (1995) British Plant Communities, Vol. 4, Aquatic Communities, Swamps and Tall-berb Fens, Cambridge University Press, Cambridge.
- Roe, D.A. (1981) *The Lower and Middle Palaeolithic Periods in Britain*, Routledge and Kegan Paul, London, 324 pp.
- Roe, H. M. (1995) The Cudmore Grove channel site (TM 067144). In *The Quaternary of the Lower Reaches of the Thames: field guide* (eds D.R. Bridgland, P. Allen, B.A. Haggart), *Quaternary Research Association Field Guides*, Quaternary Research Association, Durham, pp. 258–69.
- Rose, J. (1974) Small scale variability of some sedimentary properties of lodgement and slumped till. *Proceedings of the Geologists' Association*, 85, 223–37.
- Rose, J. (1975) Raised beach gravels and ice wedge casts at Old Kilpatrick, near Glasgow. Scottish Journal of Geology, 11, 15–21.
- Rose, J. (1980) Landform development around Kisdon, upper Swaledale, Yorkshire. Proceedings of the Yorkshire Geological Society, 43, 201–19.
- Rose, J. (1985) The Dimlington Stadial/Dimlington Chronozone: a proposal for naming the

main glacial episode of the Late Devensian in Britain. *Boreas*, 14, 225–30.

- Rose, J. (1987) Status of the Wolstonian glaciation in the British Quaternary. *Quaternary Newletter*, 53, 1–9.
- Rose, J. (1989a) Stadial type sections in the British Quaternary. In *Quaternary Type* Sections: Imagination or Reality (eds J. Rose and C. Schluchter), A.A. Balkema Publishers, Rotterdam, pp. 45–67.
- Rose, J. (1989b) Tracing the Baginton-Lillington Sands and Gravels from the West Midlands to East Anglia. In West Midlands: field guide (ed. D.H. Keen), Quaternary Research Association Field Guides, Quaternary Research Association, Cambridge, pp. 102–10.
- Rose, J. (1991) Stratigraphical basis of the Wolstonian glaciation and the retention of the term Wolstonian as a chronostratigraphic stage name – a discussion. In *Central East Anglia and the Fen Basin: field guide* (eds S.G. Lewis, C.A. Whiteman and D.R. Bridgland), *Quaternary Research Association Field Guides*, Quaternary Research Association, London, pp. 15–20.
- Rose, J. and Allen, P. (1977) Middle Pleistocene stratigraphy in south-east Suffolk. *Journal of the Geological Society, London*, **133**, 85–102.
- Rose, J. and Boardman, J. (1983) River activity in relation to short-term climatic deterioration. *Quaternary Studies in Poland*, 4, 189–98.
- Rose, J. and Letzer, J.M. (1977) Superimposed drumlins. *Journal of Glaciology*, **18**, 471-80.
- Rose, J., Sturdy, R.G., Allen, P. et al. (1978) Middle Pleistocene sediments and palaeosols near Chelmsford, Essex. Proceedings of the Geologists' Association, 89, 91–6.
- Rose, J. and Mitchell, W.A. (1989) Quaternary geology of upper Swaledale and the adjoining regions: field meeting report. *Mercian Geologist*, **11**, 275–83.
- Rose, J., Boardman, J., Kemp, R.A. and Whiteman, C.A. (1985a) Palaesols and the interpretation of the British Quaternary stratigraphy. In *Geomorphology and Soils* (eds K.S. Richards, R.R. Arnett and S.Ellis), Allen and Unwin, London, pp. 348–75.
- Rose, J., Allen, P., Kemp, R.A., Whiteman, C.A. and Owen, N. (1985b) The early Anglian Barham Soil of eastern England. In *Soils and Quaternary Landscape Evolution* (ed. J. Boardman), John Wiley and Sons Ltd, Chichester, pp. 197–229.
- Rose, W.C.C. and Dunham, K.C. (1977) Geology

and Hematite deposits of South Cumbria, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (58 and southern part of sheet 48), HMSO, London, 170 pp.

- Ross, A. (1967) Pagan Celtic Britain: studies in iconography and tradition, Routledge and Kegan Paul, London, 433 pp.
- Ross, A. (1986) Lindow Man and the Celtic tradition. In *Lindow Man. The Body in the Bog* (eds I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 162–9.
- Ross, A. and Robins, D. (1989) The Life and Death of a Druid Prince: the Story of an Archaeological Sensation, Guild Publishing, London, 176 pp.
- Round, F.E. (1961) The diatoms of a core from Esthwaite Water. *New Phytologist*, 60, 43–59.
- Rowe, P.J. and Atkinson, T.C. (1985) Uranium-thorium dating results from Robin Hood's Cave. In *Peak District and Northern Dukeries: field guide* (eds D.J. Briggs, D.D. Gilbertson and R.D.S. Jenkinson), *Quaternary Research Association Field Guide*, Quaternary Research Association, Cambridge, pp. 200–7.
- Rowell, A.J. and Turner, J.S. (1952) Corrie-glaciation in the upper Eden valley, Westmorland. *Liverpool and Manchester Geological Journal*, 1, 200–7.
- Rowell, T.K. and Turner, J. (1985) Litho-, humicand pollen stratigraphy at Quick Moss, Northumberland. *Journal of Ecology*, 73, 11–25.
- Rowlands, P.H. and Shotton, F.W. (1971) Pleistocene deposits of Church Stretton (Shropshire) and its neighbourhood. *Journal* of the Geological Society, London, 127, 599–622.
- Rowley-Conwy, P. (1995) Mesolithic settlement patterns: new zooarchaeological evidence from the Vale of Pickering, Yorkshire. In University of Durham and University of Newcastle upon Tyne Archaeological Reports, 1994, pp. 1–6.
- Ruddiman, W.F. and Raymo, M.E. (1988) Northern hemisphere climate regimes during the past three Ma: possible tectonic connections. In *The Past Three Million Years; Evolution of Climatic Variability in the North Atlantic Region proceedings of a Royal Society discussion meeting beld on 25 and 26 February 1987* (eds N.J. Shackleton, R.G. West

and D.Q. Bowen.), The Royal Society of London, London, pp. 1–20.

- Ruddiman, W.F., Sanceta, C.D. and McIntyre, A. (1977) Glacial/interglacial response rate of subpolar North Atlantic waters to climatic change: the record in oceanic sediments. *Philosophical Transactions of the Royal Society of London*, **B280**, 119–42.
- Ruddiman, W.J.F., Shackleton, N.J. and McIntyre, A. (1986) North Atlantic sea-surface temperatures for the last 1.1 Million years. In North Atlantic Palaeoceanography (eds C.P. Summerhayes and N.J. Shackleton), Geological Society of London Special Publication, No. 21, Blackwell Scientific Publications, Oxford, pp. 155–73.
- Ruhe, R.V. (1956) Geomorphic surfaces and the nature of soils. *Soil Science*, 82, 441–55.
- Russell, A.J. (1995) Late Devensian meltwater movement and storage within the Ochil Hills. *Scottish Journal of Geology*, **31**, 65–78.
- Rust, B.R. (1972) Structure and process in a braided river. *Sedimentology*, 18, 221–45.
- Rust, B.R. (1975) Fabric and structure in glaciofluvial gravels. In *Glaciofluvial and Glaciolacustrine Sedimentation* (eds A.V. Jopling and B.C. McDonald), *Society of Economic Paleontologists and Mineralogists Special Publication*, No. 23, Society of Economic Paleontologists and Mineralogists, Tulsa, pp. 238–48.
- Said, M. (1969) The Pleistocene geomorphology of the Burbage basin. Unpublished PhD thesis, Sheffield University.
- Sambrook Smith, G.H. and Glasser, N.F. (1998) Late Devensian ice sheet characteristics: a palaeohydraulic approach. *Geological Journal*, 33, 149–58.
- Saunders, G.E. (1968) A fabric analysis of the ground moraine deposits of the Lleyn Peninsula of southwest Caernarvonshire. *Geological Journal*, 6, 105–18.
- Savigear, R.A.G. (1952) Some observations on slope development in South Wales. *Transactions of the Institute of British Geographers*, 18, 31–51.
- Scaife, R.G. (1986) Pollen in human palaeofaeces; and a preliminary investigation of the stomach and gut contents of Lindow Man. In *Lindow Man. The Body in the Bog* (eds I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 126–35.
- Scaife, R.G. (1995) Pollen analysis of the Lindow III food residue. In *Bog Bodies. New*

Discoveries and New Perspectives (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 83–7.

- Schadla-Hall, R.T. (1987a) Early man in the eastern Vale of Pickering. In *East Yorksbire: field* guide (ed. S. Ellis), *Quaternary Research* Association Field Guide, Quaternary Research Association, Cambridge, pp. 22–30.
- Schadla-Hall, R.T. (1987b) Recent investigations of the early Mesolithic landscape and settlement in the Vale of Pickering, North Yorkshire. In *Mesolithic Northwest Europe: Recent Trends* (eds P. Rowley-Conwy, M. Zvelebil and H.P. Blankholm), *Recent Trends Series*, Vol. 2, Department of Archaeology and Prehistory, University of Sheffield, Sheffield, pp. 46–54.
- Schadla-Hall, R.T. (1988) The early post glacial in eastern Yorkshire. In Archaeology in Eastern Yorkshire: Essays in bonour of T.C.M. Brewster (ed. T.G. Manby), Department of Archaeology and Prehistory, University of Sheffield, Sheffield, pp. 25–34.
- Schadla-Hall, R.T. (1989) The Vale of Pickering in the Early Mesolithic in context. In *The Mesolithic in Europe: papers presented at the Third International Symposium*, Edinburgh, 1985 (ed. C. Bonsall), John Donald, Edinburgh, pp. 218–224.
- Schadla-Hall, R.T. and Cloutman, E.W. (1985)
  'One cannot dig at random in a peat bog'. The eastern Vale of Pickering and the archaeology of a buried landscape. In Archaeology of the Ploughsoil: studies in the collection and interpretation of field survey data (eds C.C. Haselgrove, M. Millett and I.M. Smith), Department of Archaeology and Prehistory, University of Sheffield, Sheffield, pp. 77–86.
- Schadla-Hall, R.T. and Lane, P. (in press) *The early Mesolithic in the Vale of Pickering*, McDonald Institute Monographs, McDonald Institute for Archaeological Research, Cambridge.
- Schreve, D.C. (1997) Mammalian biostratigraphy in the later Middle Pleistocene in Britain. Unpublished PhD thesis, University of London.
- Schreve, D.C. (1999) Bielsbeck Farm, North Cliffe. In *The Quaternary of North-East England: field guide* (eds D.R. Bridgland, B.P. Horton and J.B. Innes), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 176–9.
- Schreve, D.C. (2001) Differentiation of the British late Middle Pleistocene interglacials:

the evidence from mammalian biostratigraphy. *Quaternary Science Reviews*, 20, 1693–1705.

- Schreve, D.C. and Bridgland, D. (in press) Mammalian remains from North Cliffe, Mott's Field (South Cliffe) and Bielsbeck Farm, east Yorkshire. In *Change and Continuity within* the Prehistoric Landscape of the Foulness Valley, East Yorkshire (eds P. Halkon et al.), East Riding Archaeologist.
- Scott, J., Smith, J.H. and Winterbottom, D. (1973) *Glossop: Dale, Manor and Borougb*, Glossop and District Historical Society, Glossop, Derbyshire, 108 pp.
- Scourse, J.D. (1987) Periglacial sediments and landforms in the Isles of Scilly and West Cornwall. In *Periglacial Processes and Landforms in Britain and Ireland* (ed. J. Boardman), Cambridge University Press, Cambridge, pp. 225–36.
- Seddon, M.B. and Holyoak, D.T. (1985) Evidence of sustained regional permafrost during deposition of fossiliferous Late Pleistocene sediments at Stanton Harcourt (Oxfordshire, England). *Proceedings of the Geologists' Association*, 96, 53–71.
- Selby, M.J. (1972) Antarctic tors. Zeitschrift für Geomorphologie, 13, 73–86.
- Sernander, R. (1908) On the evidence of postglacial changes of climate furnished by the peat mosses of northern Europe. *Geologiska Föreningens i Stockholm Förhandlingar*, 30, 467–78.
- Sewell, J.T. (1904) Notes on the 'overflow channel' in Newton Dale between Lake Wheeldale and Lake Pickering. *Proceedings of the Yorkshire Geological Society*, **15**, 443–6.
- Shackleton, N.J. and Opdyke, N.D. (1973) Oxygen isotope and palaeomagnetic stratigraphy of equatorial Pacific core V28–238L. Oxygen isotope temperatures and ice volumes on 10<sup>5</sup> and 10<sup>6</sup> year scale. *Quaternary Research*, 3, 39–55.
- Shackleton, N.J. and Opdyke, N.D. (1976)
  Oxygen isotope and palaeomagnetic stratigraphy of Pacific core V28–239, Late Miocene to Late Holocene. In *Investigation of late Quaternary Paleoceanography and Paleoclimatology* (eds. R.M. Cline and J.D. Hays), *Geological Society of America Memoir*, No. 145, Geological Society of America, Boulder, pp. 449–64.
- Shackleton, N.J., Backman, J., Zimmerman, H. et al. (1984) Oxygen isotope calibration of the

onset of icerafting and history of glaciation in the North Atlantic region. *Nature*, **307**, 620–3.

- Shackleton, N.J., Imbrie, J. and Pisias, N.G. (1988) The evolution of oceanic oxygen-isotope variability in the North Atlantic over the past three million years. *Philosophical Transactions of the Royal Society of London*, **B318**, 679–88.
- Shackleton, N.J., Berger, A. and Peltier, W.R. (1990) An alternative astronomical calibration of the Lower Pleistocene timescale based on ODP Site 677. *Philosophical Transactions of the Royal Society of Edinburgh, Earth Sciences*, 81, 251–61.
- Shakesby, R.A. (1977) The Lennoxtown erratic train, central Scotland. Unpublished PhD thesis, University of Edinburgh.
- Sharp, C. (1816) A History of Hartlepool, G. Andrews, Durham.
- Sharpe, D.R. (1988) Late glacial landforms of Wollaston Peninsula, Victoria Island, NWT: product of ice-marginal retreat, surge, and mass stagnation. *Canadian Journal of Earth Sciences*, 25, 262–79.
- Shaw, J. (1972a) Sedimentation in the ice-contact environment, with examples from Shropshire (England). *Sedimentology*, **18**, 23–62.
- Shaw, J. (1972b) The Irish Sea Glaciation of north Shropshire – some environmental reconstructions. *Field Studies*, 4, 603–31.
- Shaw, J. (1982) Melt-out till in the Edmonton area, Alberta. *Canadian Journal of Earth Sciences*, 19, 1548–69.
- Shaw, J. (1983) Drumlin formation related to inverted meltwater erosional marks. *Journal* of *Glaciology*, 29, 461–79.
- Shaw, J. (1987) Glacial sedimentary processes and environmental reconstruction based on lithofacies. *Sedimentology*, **34**, 103–16.
- Shaw, J. (1989) Drumlins, subglacial meltwater floods and ocean responses. *Geology*, **17**, 853–6.
- Shaw, J. and Kvill, D. (1984) A glaciofluvial origin for drumlins of Livingstone lake area, Saskatchewan. *Canadian Journal of Earth Sciences*, **21**, 1442–59.
- Shaw, J. and Sharpe, D.R. (1987) Drumlin formation by subglacial meltwater erosion. *Canadian Journal of Earth Sciences*, 24, 2316–22.
- Shaw, J., Kvill, D. and Rains, B. (1989) Drumlins and catastrophic subglacial floods. *Sedimentary Geology*, **62**, 177–202.

- Sheldrick, C., Lowe, J.J. and Reynier, M.J. (1997) Palaeolithic barbed point from Gransmoor, East Yorkshire, England. *Proceedings of the Prehistoric Society*, 63, 359–70.
- Shennan, I. (1982) Interpretation of Flandrian sea-level data from the Fenland. *Proceedings* of the Geologists' Association, 93, 53–63.
- Shennan, I. (1986a) Flandrian sea-level changes in the Fenland. I: the geographical setting and evidence of relative sea-level changes. *Journal* of *Quaternary Science*, **1**, 119–54.
- Shennan, I. (1986b) Flandrian sea-level changes in the Fenland II: tendencies of sea-level movement, altitudinal changes and local and regional factors. *Journal of Quaternary Science*, 1, 155–79.
- Shennan, I. (1989) Holocene crustal movements and sea-level changes in Great Britain. Journal of Quaternary Science, 4, 77–89.
- Shennan, I. (1992) Late Quaternary sea-level changes and crustal movements in Eastern England and Eastern Scotland: an assessment of models of coastal evolution. *Quaternary International* **15**/**16**, 161–73.
- Shennan, I., Tooley, M.J., Davis, M.J. and Haggart, B.A. (1983) The analysis and interpretation of Holocene sea-level data. *Nature*, 302, 404–6.
- Shennan, I., Horton, B.P., Innes, J.B. et al. (2000a) Late Quaternary sea-level changes, crustal movements and coastal evolution in Northumberland. Journal of Quaternary Science, 15, 215–37.
- Shennan, I., Lambeck, K., Horton, B.P. et al. (2000b) Holocene isostasy and relative sealevel changes on the east coast of England. In Holocene Land-Ocean Interaction and Environmental Change around the North Sea (eds I. Shennan and J. Andrews), Geological Society of London Special Publication, No. 166, Geological Society of London, London, pp. 275–98.
- Sheppard, J.A. (1956) The Draining of the Marshlands of East Yorkshire. Unpublished PhD thesis, University of Hull.
- Sheppard, J.A. (1957) The Medieval meres of Holderness. *Transactions of the Institute of British Geographers*, 23, 75–86.
- Sheppard, T. (1895) On another section in the so-called inter-glacial gravels of Holderness. *Proceedings of the Yorkshire Geological Society*, 13, 1–14.
- Sheppard, T. (1912) The Lost Towns of the Yorkshire Coast, A. Brown and Sons, London,

328 pp.

- Sheppard, T. and Stather, J.W. (1907) Note on a new section in the glacial drifts of Holderness. *Proceedings of the Yorkshire Geological Society*, 16, 171–6.
- Shimwell, D.W. (1968) The phytosociology of calcareous grasslands in the British Isles. Unpublished PhD thesis, University of Durham.
- Shimwell, D.W. (1974) Sheep grazing intensity in Edale, 1692–1747 and its effect on the blanket peat erosion. *Derbyshire Archaeological Journal*, 94, 35–40.
- Shimwell, D.W. (1981) Footpath erosion. In Peak District Moorland Erosion Study: Phase I Report (eds J. Phillips, D. Yalden and J. Tallis), Peak Park Joint Planning Board, Bakewell, pp. 160–70.
- Shimwell, D.W. (1985) The distribution and origins of the lowland mosslands. In *The Geomorphology of North-West England* (ed. R.H. Johnson), Manchester University Press, Manchester, pp. 299–312.
- Shirley, J. (1958) The Carboniferous Limestone of the Monyash–Wirksworth area, Derbyshire. Quarterly Journal of the Geological Society of London, 114, 411–30.
- Shoemaker, E.M. (1991) On the formation of large subglacial lakes. *Canadian Journal of Earth Sciences*, 28, 1975–81.
- Shoemaker, E.M. (1992a) Subglacial floods and the origin of low-relief ice-sheet lobes. *Journal of Glaciology*, **38**, 105–12.
- Shoemaker, E.M. (1992b) Water sheet outburst floods from the Laurentide Ice Sheet. *Canadian Journal of Earth Sciences*, 29, 1250–64.
- Shoemaker, E.M. (1995) On the meltwater genesis of drumlins. *Boreas*, 24, 3–10.
- Shoemaker, E.M. (1999) Subglacial water-sheet floods, drumlins and ice-sheet lobes. *Journal* of *Glaciology*, **45**, 201–13.
- Shone, W. (1878) On the glacial deposits of west Cheshire, together with lists of the fauna found in the drift of Cheshire and adjoining counties. *Quarterly Journal of the Geological Society of London*, **34**, 383–97.
- Shotton, F.W. (1977) The Devensian Stage: its development, limits and substages. *Philosophical Transactions of the Royal Society of London*, **B280**, 107–18.
- Shotton, F.W. (1981) Major contributions of North-East England to the advancement of Quaternary Studies. In *The Quaternary in*

Britain (eds J.Neale and J.Flenley), Pergamon Press, Oxford, pp. 137–45.

- Shotton, F.W. (1986) Glaciations in the United Kingdom. Quaternary Science Reviews, 5, 293–7.
- Shotton, F.W. and West, R.G. (1969) Stratigraphical table of the British Quaternary. *Proceedings of the Geological Society of London*, **1656**, 155-7.
- Shotton, F.W. and Williams, R.E.G. (1971) Birmingham University radiocarbon dates V. *Radiocarbon*, **15**, 2.
- Shotton, F. W. Blundell, D. J., and Williams, R. E. G. (1970) Birmingham University radiocarbon dates IV. *Radiocarbon*, **12**, 385.
- Shotton, F.W., Goudie, A.S., Briggs, D.J. and Osmaston, H.A. (1980) Cromerian interglacial deposits at Sugworth, near Oxford, England, and their relation to the Plateau Drift of the Cotswolds and the terrace sequence of the Upper and Middle Thames. *Philosophical Transactions of the Royal Society of London*, B289, 55–86.
- Sikes, S.K. (1971) The Natural History of the African Elephant, The World Naturalist, Weidenfeld and Nicolson, London, 397 pp.
- Simmons, I.G. (1969a) The infill of glacial meltwater channels on the North York Moors. *Naturalist*, **910**, 93–6.
- Simmons, I.G. (1969b) Pollen diagrams from the North York Moors. *New Phytologist*, **68**, 807–27.
- Simmons, I.G. and Cundill, P.R. (1974a) Late Quaternary vegetational history of the North York Moors. I. Pollen analyses of blanket peats. *Journal of Biogeography*, **1**, 159–69.
- Simmons, I.G. and Cundill, P.R. (1974b) Late Quaternary vegetational history of the North York Moors. II. Pollen analyses of landslip bogs. *Journal of Biogeography*, **1**, 253–61.
- Simmons, I.G. and Innes, J.B. (1981) Tree remains in a North York Moors peat profile. *Nature*, 294, 76–8.
- Simmons, I.G. and Innes, J.B. (1987) Mid-Holocene adaptations and later Mesolithic forest disturbance in northern England. *Journal of Archaeological Science*, 14, 385–403.
- Simmons, I.G. and Innes, J.B. (1988a) Late Quaternary vegetational history of the North York Moors. VIII. Correlation of Flandrian II litho- and pollen stratigraphy at North Gill, Glaisdale Moor. *Journal of Biogeography*, **15**, 249–72.

- Simmons, I.G. and Innes, J.B. (1988b) Late Quaternary vegetational history of the North York Moors. X. Investigations on East Bilsdale Moor. *Journal of Biogeography*, **15**, 299–324.
- Simmons, I.G. and Innes, J.B. (1996a) Prehistoric charcoal in peat profiles at North Gill. *Journal of Archaeological Science*, 23, 193–7.
- Simmons, I.G. and Innes, J.B. (1996b) Disturbance phases in the Mid-Holocene vegetation at North Gill, North York Moors: form and process. *Journal of Archaeological Science*, 23, 183–91.
- Simmons, I.G., Atherden, M.A., Cundill, P.R. and Jones, R.L. (1975). Inorganic layers in soligenous mires of the North Yorkshire Moors. *Journal of Biogeography*, 2, 49–56.
- Simmons, I.G., Atherden, M.A., Cloutman, E.W., Cundill, P.R., Innes, J.B. and Jones, R.L. (1993)
  Prehistoric environments. In Prebistoric and Roman Archaeology of North-East Yorksbire (ed. D.A. Spratt), Council for British Archaeology Research Report, 87; British Archaeological Reports British Series, 104, Council for British Archaeology, London, pp. 15-50.
- Simpson, I.M. (1959) The Pleistocene succession in the Stockport and South Manchester area. *Quarterly Journal of the Geological Society of London*, **115**, 107–15.
- Simpson, I.M. and West, R.G. (1958) On the stratigraphy of a Late Pleistocene organic deposit at Chelford, Cheshire. *New Phytologist*, 57, 239–50.
- Sinka K.J. and Atkinson T.C. (1999) A mutual climatic range method for reconstructing palaeoclimate from plant remains. *Journal of the Geological Society, London*, **156**, 381–96.
- Sinker, C.A. (1960) The vegetation of the Malham Tarn area. Proceedings of the Leeds Philosophical and Literary Society (Science), 8, 139-75.
- Sinker, C.A. (1962) The north Shropshire meres and mosses: a background for ecologists. *Field Studies*, 1, 101–138.
- Sissons, J.B. (1958a) Supposed ice-dammed lakes in Britain with particular reference to the Eddleston valley, southern Scotland. *Geografiska Annaler*, 40, 159–87.
- Sissons, J.B. (1958b) Sub-glacial stream erosion in Southern Northumberland. Scottish Geographical Magazine, 74, 163-74.
- Sissons, J.B. (1960a) Erosion surfaces, cyclic slopes and drainage systems in Southern

Scotland and Northern England. *Transactions* of the Institute of British Geographers, 28, 23–38.

- Sissons, J.B. (1960b) Some aspects of glacial drainage channels in Britain, Part I. Scottish Geographical Magazine, 76, 131–46.
- Sissons, J.B. (1961) Some aspects of glacial drainage channels in Britain, Part II. Scottish Geographical Magazine, 77, 15–36.
- Sissons, J.B. (1964) The glacial period. In *The* British Isles: a Systematic Geography (eds J.W. Watson and J.B. Sissons), Nelson, Edinburgh, pp. 131–49.
- Sissons, J.B. (1974) The Quaternary in Scotland: a review. Scottish Journal of Geology, 10, 311-37.
- Sissons, J.B. (1977) Former ice-dammed lakes in Glen Moriston, Inverness-shire and their significance in upland Britain. *Transactions of the Institute of British Geographers*, 2, 224-42.
- Sissons, J.B. (1978) The parallel roads of Glen Roy and adjacent glens, Scotland. *Boreas*, 7, 229–44.
- Sissons, J.B. (1979a) Catastrophic lake drainage in Glen Spean and the Great Glen, Scotland. *Journal of the Geological Society, London*, 136, 215–24.
- Sissons, J.B. (1979b) Palaeoclimatic inferences from former glaciers in Scotland and the Lake District. *Nature*, **278**, 518–21.
- Sissons, J.B. (1980) The Loch Lomond Advance in the Lake District, northern England. *Transactions of the Royal Society of Edinburgb*, 71, 13–27.
- Sissons, J.B. (1981) The last Scottish ice-sheet: facts and speculative discussion. *Boreas*, **10**, 1–17.
- Sissons, J.B. (1982) A former ice-dammed lake and associated glacier limits in the Achnasheen area, central Ross-shire. *Transactions of the Institute of British Geographers*, 7, 98–116.
- Sissons, J.B. (1983) Shorelines and isostasy in Scotland. In:Shorelines and Isostasy (eds D.E. Smith and A.G. Dawson), Institute of British Geographers, Special Publication, No. 16, Academic Press, pp. 209–25.
- Skertchly, S.B.J. (1877) *The Geology of the Fenland*, Memoir (District) of the Geological Survey of Great Britain, England and Wales, HMSO, London, 335 pp.
- Skipsey, E. (1994) The last 200 million years in Cumbria. Proceedings of the Cumberland

Geological Society, 5, [1992-3], 449-55.

- Slater, G. (1929) The Dawpool section of the Dee estuary, Cheshire. Proceedings of the Liverpool Geological Society, 15, 134–43.
- Skog, G. and Regnell, J. (1995) Precision calendar-year dating of the elm decline in a *Sphagnum*-peat bog in southern Sweden. *Radiocarbon*, 37, 197–202.
- Smailes, A.E. (1960) Northern England, Regions of the British Isles, Nelson, London, 324 pp.
- Small, R.J. (1962) A short note on the origin of Devil's Dyke near Brighton. Proceedings of the Geologists' Association, 73, 187–92.
- Small, R.J. (1965) The role of spring sapping in the formation of Chalk escarpment valleys. Southampton Research Series in Geography, 1, 3–29.
- Smith, A.G. (1958a) Two lacustrine deposits in the south of the English Lake District. New Phytologist, 57, 363–86.
- Smith, A.G. (1958b) Post-glacial deposits in south Yorkshire and north Lincolnshire. New Phytologist, 57, 19–49.
- Smith, A.G. (1958c) The mires of south-western Westmorland: stratigraphy and pollen analysis. New Phytologist, 58, 105–27.
- Smith, A.G. (1970) The influence of mesolithic and neolithic man on British vegetation: a discussion. In *Studies in the Vegetational History of the British Isles* (eds D. Walker and R.G. West), Cambridge University Press, Cambridge, pp. 81–96.
- Smith, A.G. and Pilcher, J.R. (1973) Radiocarbon dates and vegetational history of the British Isles. *New Phytologist*, **72**, 903–14.
- Smith, A.J. (1959) Structures in the stratified late-glacial clays of Windermere, England. Journal of Sedimentary Petrology, 29, 447-53.
- Smith, A.J. (1982) A Guide to the Sefton Coast Data Base. Unpublished Report, Sefton Metropolitan Borough Council.
- Smith, B. (1912) The glaciation of the Black Combe district. Quarterly Journal of the Geological Society of London, 68, 402–48.
- Smith, B. (1932) The glacial lakes of Eskdale, Miterdale and Wasdale, Cumberland and the retreat of the ice during the main glaciation. Quarterly Journal of the Geological Society of London, 88, 57–83.
- Smith, B. (1985) A palaeoecological study of raised mires in the Humberhead Levels. Unpublished PhD thesis, University of Wales.
- Smith, D.B. (1965) In Summary of Progress of

the Geological Survey for 1964, Geological Survey of Great Britain, HMSO, London, p. 58.

- Smith, D.B. (1966) In Summary of Progress of the Geological Survey for 1965, Geological Survey of Great Britain, HMSO, London, p. 62.
- Smith, D.B. (1981) The Quaternary geology of the Sunderland district, north east England. In *The Quaternary in Britain* (eds J. Neale and J. Flenley), Pergamon Press, Oxford, pp. 146–67.
- Smith, D.B. (1994) Geology of the Country around Sunderland, Memoir (Sheet) of the British Geological Survey (England and Wales) (No. 21), HMSO for the British Geological Survey, London, 161 pp.
- Smith, D.B. (1995) Permian and Triassic. In Robson's Geology of North-East England, 2nd edn (ed. G.A.L. Johnson). *Transactions of the Natural History Society of Northumbria*, 56, 283–95.
- Smith, D.B. and Francis, E.A. (1967) Geology of the Country between Durham and West Hartlepool, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (27), HMSO, London, 354 pp.
- Smith, D.B., Beaumont, P., Gaunt, G.D., Francis, E.A. and Penny, L.F. (1973) North-east England. In A Correlation of Quaternary Deposits in the British Isles (eds G.F. Mitchell, L.F. Penny, F.W. Shotton and R.G. West), Geological Society of London Special Report, No. 4, Scottish Academic Press, Edinburgh, pp. 22–8.
- Smith, E.G., Rhys, G.H. and Eden, R.A. (1967) Geology of the Country around Chesterfield, Matlock and Mansfield, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (112) HMSO, London, 430 pp.
- Smith, E.G., Rhys, G.H. and Goosens, R.F. (1973) Geology of the Country around East Retford, Worksop and Gainsborough, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (101), HMSO, London, 348 pp.

Smith, M.D. (1988) About Horwich, Chorley.

- Smith, R.A. (1911) Lake-dwellings in Holderness. Archaeologia, 62, 593–610.
- Smith, R.A. (1967) The deglaciation of southwest Cumberland: a reappraisal of some features in the Eskdale and Bootle areas. *Proceedings of the Cumberland Geological* Society, 2, 76–83.

Smith, R.F. and Boardman, J. (1989) The use of

soil information in the assessment of the incidence and magnitude of historical flood events in upland Britain. In Floods: Hydrological, Sedimentological and Geomorphological Implications (eds K. Beven and P. Carling), British Geomorphological Research Group. Symposia Series, John Wiley and Sons Ltd, Chichester, pp. 185-97.

- Smith, R.F. and Boardman, J. (1994) Soils in Mosedale. In *Cumbria: field guide* (eds J. Boardman and J. Walden), *Quaternary Research Association Field Guide*, Quaternary Research Association, Oxford, pp. 173–7.
- Smith, R.T (1986) Aspects of the soil and vegetation history of the Craven District of North Yorkshire. In Archaeology in the Pennines: Studies in Honour of Arthur Raistrick (eds T.G. Manby and P. Turnbull), British Archaeological Reports British Series, 158, British Archaeological Reports, Oxford, pp. 3–28.
- Smith, W. (1821) New Geological Atlas of England and Wales: Part IV, Geological Map of Yorkshire, Cary, London.
- Smithson, P.A. (1985) The present climate of the Northern Pennines. In Field Guide to the Periglacial Landforms of Northern England (ed. J. Boardman), Quaternary Research Association, Cambridge, pp. 1–3.
- Smythe, J.A. (1912) The glacial geology of Northumberland. Transactions of the Natural History Society of Northumberland, 4, 86-116.
- Sparks, B.W. (1962) Post-glacial mollusca from Hawes Water, illustrating some difficulties of interpretation. *Journal of Conchology*, **25**, 78–82.
- Sparks, B.W., Williams, R.B.G. and Bell, F.G. (1972) Presumed ground-ice depressions in East Anglia. *Proceedings of the Royal Society of London*, A327, 329–43.
- Spencer, H.E.P. and Melville, R.V. (1974) The Pleistocene mammalian fauna of Dove Holes, Derbyshire. *Bulletin of the Geological Survey* of Great Britain, 48, 43–53.
- Spratt, D.A. (1993) Prebistoric and Roman archaeology of Northeast Yorkshire, Council for British Archaeology Research Report, 87; British Archaeological Reports British Series, 104, Council for British Archaeology, London, 188 pp.
- Spratt, D.A. and Simmons, I.G. (1976) Prehistoric activity and environment on the

North York Moors. *Journal of Archaeological Science*, **3**, 193–210.

- Squires, R. (1978) Conservation in upper Teesdale: contributions from the palaeoecological record. *Transactions of the Institute of British Geographers, New Series*, 3, 129–50.
- Squires, R.H. (1970) A contribution to the vegetational history of Upper Teesdale. Unpublished PhD thesis, University of Durham.
- Squires, R.H. (1971) Flandrian history of the Teesdale rarities. *Nature*, 229, 43–4.
- Stallibrass, S. (1995) Low Hauxley, Northumberland: an Assessment of the Animal Bones, Durham Environmental Archaeology Report, 5/95.
- Statham, D.C. (1989) Modern times. In The North York Moors: Landscape Heritage (eds D.A. Spratt and B.J.D. Harrison), David and Charles Publishers, London, pp. 199–222.
- Statham, I. (1976) A scree slope rockfall model. *Earth Surface Processes*, 1, 43–62.
- Stather, J.W. (1905) Investigation of the fossiliferous drift deposits at Kirmington, Lincolnshire, and at various localities in the East Riding of Yorkshire. *Report of the British Association* for the Advancement of Science, 1904, 272–4.
- Stather, J.W. (1907) Investigation of the fossiliferous drift deposits at Kirmington, Lincolnshire, and at various localities in the East Riding of Yorkshire. *Reports of the British Association* for the Advancement of Science, 1906, 313–14.
- Stather, J.W. (1910) The Bielsbeck fossiliferous beds. Transactions of the Hull Geological Society, 6, 103–9.
- Stather, J.W. (1922) On a peculiar displacement in the Millepore Oolite near South Cave. *Proceedings of the Yorkshire Geological Society*, 19, 395–400.
- Stead, I.M. (1986) Excavation and examination.
  In Lindow Man. The Body in the Bog (eds I.M. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 14–16.
- Stead, I.M. and Turner, R.C. (1985) Lindow man. Antiquity, 59, 25–9.
- Stead, I.M., Bourke, J.B. and Brothwell, D. (eds) (1986) *Lindow Man. The Body in the Bog*, British Museum Publications, London.
- Stephens, N. (1990) Natural Landscapes of Britain from the Air, Cambridge University Press, Cambridge, 288 pp.
- Stevens, G. (1964) Intermittent springs.

# *Transactions of the Cave Research Group*, 7, 3–9.

- Stevens, J.H. and Atkinson, K. (1970) Soils and their capability. In *Durbam County and City* with Teesside (ed. J.C. Dewdney), British Association, Durham, pp. 46–57.
- Stevenson, I.P. and Gaunt, G.D. (1971) Geology of the Country around Chapel-en-le-Frith, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (99), HMSO, London, 444 pp.
- Stoneman, R.E. (1993) Holocene palaeoclimates from peat stratigraphy: extending and refining the model. Unpublished PhD thesis, University of Southampton.
- Stoney, R.E. (1988) Environmental change and coastal change in South-West Lancashire. Unpublished BSc dissertation, University of Durham.
- Storetvedt, K.M., Abranches, M.C., Petersen, N., Hummervoll, R. Deutsch, E.R. and Murphy, G.S. (1992) Structure of remnant magnetization and magnetic mineralogy of the Cheviot lavas (Lower Devonian), northeast England. *Physics of the Earth and Planetary Interiors*, 72, 21–37.
- Strahan, A. (1886) On the glaciation of south Lancashire, Cheshire and the Welsh border. Quarterly Journal of the Geological Society of London, 42, 369–80.
- Strahan, A. and De Rance, C.E. (1890) Geology of Flint, Mold and Ruthin (Quarter-sheet 79SE), Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – Old Series, HMSO, London, 242 pp.
- Stratton, L.W. (1956) The Mollusca of the Malham area. Journal of Conchology, 24, 111-38.
- Straw, A. (1968a) Late Pleistocene glacial erosion along the Niagra Escarpment of southern Ontario. Bulletin of the Geological Society of America, 79, 889–910.
- Straw, A. (1968b) A Pleistocene diversion of drainage in North Derbyshire. *East Midland Geographer*, 4, 275–80.
- Straw, A. (1969) Pleistocene events in Lincolnshire: a survey and revised nomenclature. Transactions of the Lincolnshire Naturalists' Union, 17, 21–4.
- Straw, A. (1979a) The geomorphological significance of the Wolstonian glaciation of eastern England. Transactions of the Institute of British Geographers, New Series, 4, 540–9.
- Straw, A. (1979b) Eastern England. In Eastern
and Central England (eds A. Straw and K.M. Clayton), *Geomorphology of the British Isles*, Methuen, London, pp. 1–139.

- Straw, A. (1979c) An Early Devensian glaciation in eastern England. *Quaternary Newsletter*, 28, 18–24.
- Straw, A. (1983) Pre-Devensian glaciation of Lincolnshire (eastern England) and adjacent areas. *Quaternary Science Reviews*, 2, 239–60.
- Straw, A. and Clayton, K.M. (eds) (1979) Eastern and Central England, Geomorphology of the British Isles, Methuen, London, 247 pp.
- Stuart, A.J. (1976) The History of the Mammal Fauna during the Ipswichian/Late Interglacial in England. *Philosophical Transactions of the Royal Society of London*, **B276**, 221–50.
- Stuart, A.J. (1982) *Pleistocene Vertebrates in the British Isles*, Longmans and Co., London, 212 pp.
- Stuart, A.J. and Lister, A.M. (2001) The mammalian faunas of Pakefield/Kessingland and Corton, Suffolk, UK: evidence for a new temperate episode in the British early Middle Pleistocene. *Quaternary Science Reviews*, 20, 1677–92.

Sturlodottir, S.A. and Turner, J. (1985) The elm decline at Pawlaw Mire: an anthropogenic interpretation. *New Phytologist*, 99, 323–9.

- Sturm, M. and Matter, A. (1978) Turbidites and varves in lake Brienz (Switzerland): deposition of clastic detritus by density currents. In Modern and Ancient Lake Sediments (eds A. Matter and M.E. Tucker), Special Publication of the International Association of Sedimentologists, No. 2, Blackwell Scientific Publications, Oxford, pp. 145–68.
- Sugden, D.E. (1968) The selectivity of glacial erosion in the Cairngorm Mountains, Scotland. *Transactions of the Institute of British Geographers*, **45**, 79–92.
- Sugden, D.E. (1989) Modification of old land surfaces by ice sheets. Zeitschrift für Geomorphologie, Neue Folge Supplement Band, 72, 163–72.
- Sugden, D.E. and Watts, S.H. (1977) Tors, felsenmeer, and glaciation in Northern Cumberland Peninsula, Baffin Island. *Canadian Journal of Earth Sciences*, 14, 2817–23.
- Sugden, D.E., Glasser, N.F. and Clapperton, C.M. (1992) Evolution of large roches moutonnées. *Geografiska Annaler*, 74A, 253–64.
- Suggate, R.P. and West, R.G. (1959) On the extent of the Last Glaciation in eastern

England. Proceedings of the Royal Society of London, B150, 263–83.

- Sumbler, M.G. (1983a) A new look at the type Wolstonian glacial deposits of Central England. *Proceedings of the Geologists'* Association, 94, 23-31.
- Sumbler, M.G. (1983b) The type Wolstonian sequence – some further comments. *Quaternary Newsletter*, 40, 36–9.
- Summerfield, M.A. (1991) Global Geomorphology: an Introduction to the Study of Landforms, Longman Scientific and Technical, Harlow, 537 pp.
- Sutcliffe, A.J. (1976) The British Glacial-Interglacial sequence. *Quaternary Newsletter*, 18, 1–7.
- Sutcliffe, A.J., Lord, T.C., Harmon, R.S., Ivanovich, M, Rae, A. and Hess, J.W. (1985)
  Wolverine in Northern England at about 83,000 yr BP: Faunal evidence for climatic change during Isotope Stage 5. *Quaternary Research*, 24, 73–86.
- Sweeting, M.M. (1950) Erosion cycles and limestone caverns in the Ingleborough district. *Geographical Journal*, 115, 63–78.
- Sweeting, M.M. (1966) The weathering of limestones. In *Essays in Geomorphology* (ed. G.H. Dury), Heinemann, London, pp. 177–210.
- Sweeting, M.M. (1972) Karst Landforms, Macmillan, London, 362 pp.
- Sweeting, M.M. (1974) Karst geomorphology in North West England. In *The Limestones and Caves of North-West England* (ed. A.C. Waltham), David and Charles, Newton Abbot, pp. 46–78.
- Switsur, V.R. and West, R.G. (1975) University of Cambridge Natural Radiocarbon Measurements XIII. *Radiocarbon*, 17, 35–51.
- Synge, F.M. (1964) The glacial succession in west Caernarvonshire. *Proceedings of the Geologists' Association*, **75**, 431–44.
- Szafer, W. (1946) The Pliocene flora of Kroscienko in Poland. Rozprawy Wydzialu matematyczno-przyrodniczego, 72, 1–162 (English Summary).
- Tallantire, P.A. (1976) *Trapa natans* in the British Flandrian. *Nature*, **261**, 347.
- Tallantire, P.A. (1992) The alder [*Alnus glutinosa* (L.) Gaertn.] problem in the British Isles: a third approach to its palaeohistory. *New Phytologist*, **122**, 717–31.
- Tallis, J. H. (1964a) Studies on southern Pennine peats I. The general pollen record. *Journal of Ecology*, 52, 323–31.

- Tallis, J. H. (1964b) Studies on southern Pennine peats II. The pattern of erosion, *Journal of Ecology*, 52, 333–44.
- Tallis, J.H. (1964c) Studies on southern Pennine peats III. The behaviour of *Sphagnum*. *Journal of Ecology*, **52**, 345–53.
- Tallis, J.H. (1964d) The pre-peat vegetation of the southern Pennines. *New Phytologist*, 63, 363–73.
- Tallis, J. (1965) Studies on southern Pennine peats IV. Evidence of recent erosion. *Journal* of Ecology, 53, 509–20.
- Tallis, J.H. (1973a) Studies on southern Pennine peats V. Direct observations on peat erosion and peat hydrology at Featherbed Moss, Derbyshire. *Journal of Ecology*, 61, 1–22.
- Tallis, J.H. (1973b) The terrestrialisation of lake basins in North Cheshire, with special reference to the development of a 'Schwingmoor' structure. *Journal of Ecology*, **61**, 537–67.
- Tallis, J.H. (1975) Tree remains in southern Pennine blanket peats. *Nature*, **256**, 482–4.
- Tallis, J.H. (1981a) Rates of erosion. In Peak District Moorland Erosion Study: Phase I Report (eds J. Phillips, D. Yalden and J. Tallis), Peak Park Joint Planning Board, Bakewell, pp. 74–83.
- Tallis, J.H. (1981b) Uncontrolled fires. In Peak District Moorland Erosion Study: Phase I Report (eds J. Phillips, D. Yalden and J. Tallis), Peak Park Joint Planning Board, Bakewell, pp 176–82.
- Tallis, J.H. (1985a) Mass movements and erosion of a southern Pennine blanket peat. *Journal* of Ecology, 73, 283–315.
- Tallis, J.H. (1985b) Erosion of blanket peat in the southern Pennines: new light on an old problem. In *The Geomorphology of North-West England* (ed. R.H. Johnson), Manchester University Press, Manchester, pp. 313–26.
- Tallis, J.H. (1987) Fire and flood at Holme Moss: erosion processes in an upland blanket mire. *Journal of Ecology*, **75**, 1099–129.
- Tallis, J.H. (1991) Forest and moorland in the south Pennine upland in the mid-Flandrian period. III. The spread of moorland local, regional and national. *Journal of Ecology*, 79, 401–15.
- Tallis, J.H. (1995) Climate and erosion signals in British blanket peats: the significance of *Racomitrium lanuginosum* remains. *Journal* of Ecology, 83, 1021–30.
- Tallis, J.H. and Johnson, R.H. (1980) The dating of landslides in Longdendale, north

Derbyshire, using pollen-analytical techniques. In *Timescales in Geomorphology* (eds R.A. Cullingford, D.A. Davidson and J. Lewin), John Wiley and Sons Ltd, Chichester, pp. 189–205.

- Tallis, J.H. and Livett, E.A. (1994) Pool and hummock patterning in a southern Pennine blanket mire I. Stratigraphic profiles for the last 2800 years. *Journal of Ecology*, 82, 775–88.
- Tallis, J.H. and McGuire, J. (1972) Central Rossendale: the evolution of an upland vegetation. I. The clearance of woodland. *Journal* of Ecology, 60, 721–37.
- Tallis, J.H. and Switsur, V.R. (1973) Studies in southern Pennine peats VI. A radiocarbondated pollen diagram from Featherbed Moss, Derbyshire. *Journal of Ecology*, 61, 743–51.
- Tallis, J.H. and Switsur, V.R. (1983) Forest and moorland in the south Pennine uplands in the mid-Flandrian period. I. Macrofossil evidence of the former forest cover. *Journal of Ecology*, 71, 585–600.
- Tallis, J.H. and Switsur, V.R. (1990) Forest and moorland in the south Pennine uplands in the mid-Flandrian period. II. The hillslope forests. *Journal of Ecology*, **78**, 857–83.
- Tallis, J.H. and Yalden, D. (1984) *Moorland Restoration Project: Phase 2 Report*, Peak Park Joint Planning Board, Bakewell.
- Tarbet, M.A. (1973) Geotechnical properties and sedimentation characteristics of tills in south east Northumberland. Unpublished PhD thesis, University of Newcastle-upon-Tyne.
- Tauber, H. (1965) Differential pollen dispersal and the interpretation of pollen diagrams. *Danmarks Geologiske Undersøgelse*, *II*, **89**, 1–69.
- Taylor, B.J. (1958) Cemented shear planes in the Pleistocene Middle Sands of Lancashire and Cheshire. *Proceedings of the Yorkshire Geological Society*, **31**, 359–66.
- Taylor, B.J., Burgess, I.C., Land, D.H., Mills, D.A.C., Smith, D.B. and Warren, P.T. (1971)
  Quaternary. In Northern England, 4th edn (eds B.J. Taylor, I.C. Burgess, D.H. Land, D.A.C Mills, D.B. Smith and P.T. Warren)
  British Regional Geology, No. 7, HMSO, London, pp. 83–90.
- Taylor, D. (1995) New pollen data from the Keyingham valley, southern Holderness. In Wetland Heritage of Holderness: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 121–7.

- Taylor, J.J., Innes, J.B. and Jones, M.D.H. (1994) Locating prehistoric wetland sites by an integrated palaeoenvironmental/geophysical survey strategy at Little Hawes Water, Lancashire. In Whither Environmental Archaeology? (eds R. Luff and P. Rowly-Conwy), Oxbow Monograph, No. 38, Oxbow Books, Oxford, pp. 13–23.
- Taylor, M.P. and Macklin, M.G. (1998) Holocene alluvial sedimentation of the River Swale at Catterick, North Yorkshire. In *The Quaternary* of the Eastern Yorkshire Dales: field guide: *The Holocene Alluvial Record* (eds A.J. Howard and M.G. Macklin), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 83–7.
- Taylor, M.P., Macklin, M.G. and Hudson-Edwards, K. (2000) River sedimentation and fluvial response to Holocene environmental change in the Yorkshire Ouse Basin, northern England. *The Holocene*, **10**, 201–12.
- Te Punga, M.T. (1956) Altiplanation terraces in Southern England. *Biuletyn Peryglacjalny*, 4, 331–8.
- Te Punga, M.T. (1957) Periglaciation in southern England. *Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap*, 74, 400–12.
- Teasdale, D. and Hughes, D. (1999) The glacial history of north-east England. In The Quaternary of North-East England: field guide (eds D.R. Bridgland, B.P. Horton and J.B. Innes), Quaternary Research Association Field Guide, Quaternary Research Association, London, pp. 10–17.
- Tegerdine, G.D., Campbell, S.D.G. and Woodcock, N.H. (1981) Transcurrent faulting and pre-Carboniferous Anglesey. *Nature*, London, **293**, 760–62.
- Temple, P.H. (1965) Some aspects of cirque distribution in the west-central Lake District, northern England. *Geografiska Annaler*, 47A, 185–93.
- Thew, N.M. and Woodall, D. (1984) Late Devensian molluscan palaeoecology of Holderness. In Late Quaternary Environments and Man in Holderness (ed. D.D. Gilbertson), British Archaeological Reports British Series, 134, British Archaeological Reports, Oxford, pp. 109–57.
- Thistlewood, L. and Whyte, M.A. (1993) A palaeomagnetic and mineral magnetic study of the Speeton Shell Bed, North Yorkshire. *Proceedings of the Yorkshire Geological*

Society, 49, 325-34.

- Thom, B.G. (1974) Coastal erosion in eastern Australia. Search, 5, 198–209.
- Thom, B.G. (1984) Transgressive and regressive stratigraphies of coastal sand barriers in southeast Australia. *Marine Geology*, 56, 137–58.
- Thom, B.G., Polach, H.A. and Bowman, G.M. (1978) Holocene Age Structure of Coastal Sand Barriers in New South Wales, Department of Geography, University of New South Wales, Duntroon.
- Thomas, G.N. (2001) Late Middle Pleistocene pollen biostratigraphy in Britain: pitfalls and possibilities in the separation of interglacial sequences. *Quaternary Science Reviews*, 20, 1621–30.
- Thomas, G.S.P. (1971) Isle of Man, Easter 1971: field guide, Quaternary Research Association, Quaternary Research Association, London, 130 pp.
- Thomas, G.S.P. (1985a) The Late Devensian glaciation along the border of north-east Wales. *Geological Journal*, **20**, 319–40.
- Thomas, G.S.P. (1985b) The Quaternary of the northern Irish Sea Basin. In *The Geomorph*ology of North-West England (ed. R.H. Johnson), Manchester University Press, Manchester, pp. 143–58.
- Thomas, G.S.P. (1989) The Late Devensian glaciation along the western margin of the Cheshire–Shropshire Basin. Journal of Quaternary Science, 4, 167–81.
- Thomas, G.S.P. (1999) Northern England. In A Revised Correlation of Quaternary Deposits in the British Isles (ed. D.Q. Bowen), Geological Society of London Special Report, No. 23, Geological Society of London, Bath, pp. 91–8.
- Thomas, G.S.P. and Dackombe, R.V. (1991). The glacial deposits of the Isle of Man. In *Glacial Deposits in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), A.A. Balkema Publishers, Rotterdam, pp. 333–44.
- Thomas, G.S.P. and Montague, E. (1997) The morphology, stratigraphy and sedimentology of the Carstairs Esker, Scotland, U.K. *Quaternary Science Reviews*, 16, 661–674.
- Thomas, G.S.P., Chester, D.K. and Crimes, P. (1998) The Late Devensian glaciation of the eastern Lleyn Peninsula, North Wales: evidence for terrestrial depositional environments. *Journal of Quaternary Science*, 13, 255–270.

## References

- Thomas, G.S.P., Huddart, D. and Bennett, M.R. (in press) The Newbigging esker system, Lanarkshire, Southern Scotland: a model for tunnel, subaqueous fan and supraglacial esker formation. *Journal of Quaternary Science*.
- Thomas, K.D. (1989) Vegetation of the British chalklands in the Flandrian period: a response to Bush. *Journal of Archaeological Science*, **16**, 549–53.
- Thomas, M.F. (1978) Denudation in the tropics and the interpretation of the tropical legacy in higher latitudes – a view of the British experience. In *Geomorphology, Present Problems* and Future Prospects (eds C. Embleton, D. Brunsden and D.K.C. Jones), Oxford University Press, Oxford, pp. 185–202.
- Thompson, D. and Worsley, P. (1966) A Late Pleistocene molluscan fauna from the drifts of the Cheshire Plain. *Geological Journal*, 5, 197–207.
- Thompson, D.B. and Worsley, P. (1967) Periods of ventifact formation in the Permo-Triassic and Quaternary of the North East Cheshire basin. *Mercian Geologist*, **2**, 279–98.
- Thompson, R. (1975) Long period European geomagnetic secular variation confirmed. Geophysical Journal of the Royal Astronomical Society, 43, 847–59.
- Thompson, R. and Oldfield, F. (1986) *Environmental Magnetism*, Allen and Unwin, London, 227 pp.
- Thorn, C.E. (1976) Quantitative evaluation of nivation in the Colarado Front Range. *Geological Society of America Bulletin*, 87, 1169–78.
- Thorn, C.E. (1988) Nivation: a geomorphic chimera. In Advances in Periglacial Geomorphology (ed. M.J. Clark), John Wiley and Sons Ltd, Chichester, pp. 3–31.
- Thorn, C.E. and Hall, K. (1980) Nivation: an arctic-alpine comparison and reappraisal. *Journal of Glaciology*, **25**, 109–24.
- Thornber, N. (1959) Pennine Underground, Dalesman, Clapham, 208 pp.
- Thorne, M.C. (1996) Quaternary Evolution of the Sellafield Area, Cumbria. *Nirex Science Report*, SAC/96/006.
- Thorne, M.C., Merritt, J.W., Wingfield, R.T. R, Tooley, M.J. and Clayton, K.M. (1997) Quaternary Evolution of the Sellafield Area, Cumbria. *Nirex Science Report*, SA/97/002.
- Thorpe, R.S. and McDonald, R. (1985) Geochemical evidence for the emplacement of the Whin Sill complex of northern England.

Geological Magazine, 122, 389-96.

- Tiddeman, R.H. (1872) On the evidence for the ice sheet in north Lancashire, and adjacent parts of Yorkshire and Westmoreland. *Journal of the Geological Society, London,* 28, 471–91.
- Tiddeman, R.H. (1889) On concurrent faulting and deposition in Carboniferous times in Craven, Yorkshire, with a note on Carboniferous reefs. *Report of the British Association for the Advancement of Science*, **1888**, pp. 600–3.
- Tiddeman, R.H. (1891) Physical history of the Carboniferous rocks in upper Airedale. Proceedings of the Yorkshire Geological Society, 11, 482–92.
- Tinkler, K.J. (1966) Slope profiles and scree in the Eglwyseg Valley, North Wales. *Geographical Journal*, **132**, 379–85.
- Tinsley, H.M. (1975) The former woodland of the Nidderdale Moors and the role of early man in its decline. *Journal of Ecology*, 63, 1–26.
- Tinsley H.M. (1976) Cultural influences on Pennine vegetation with particular reference to north Yorkshire. *Transactions of the Institute of British Geographers, New Series*, 1, 310–22
- Tinsley, H.M. and Smith R.T. (1973) Ecological investigations at a Romano-British earthwork in the Yorkshire Pennines. *Yorkshire Archaeological Journal*, 46, 23–33.
- Tippett, J.M. and Kamp, P.J.J. (1995) Geomorphic evolution of the Southern Alps, New Zealand. *Earth Surface Processes and Landforms*, 20, 177–92.
- Tipping, R.M. (1991a) The climatostratigraphic subdivision of the Devensian Lateglacial: evidence from a pollen site near Oban, western Scotland. *Journal of Biogeography*, 18, 89–101.
- Tipping, R.M. (1991b) Climatic change in Scotland during the Devensian Late Glacial: the palynological record. In *The Late Glacial in north-west Europe: Human Adaptation and Environmental Change at the end of the Pleistocene* (eds N. Barton, A.J. Roberts and D.A. Roe), *Council of British Archaeology Research Report*, 77, Council for British Archaeology, London, pp. 7–21.
- Tipping, R.M. (1992) The determination of cause in the generation of major prehistoric valley fills in the Cheviot Hills, Anglo-Scottish Border. In *Alluvial Archaeology in Britain:*

proceedings of a conference sponsored by the RMC Group plc, 3–5 January 1991, British Museum (eds S. Needham and M.G. Macklin), Oxbow Monograph, No. 27, Oxbow Press, Oxford, pp. 111–21.

- Tipping, R.M. (1994a) Fluvial chronology and valley floor evolution of the upper Bowmont Valley, Borders Region, Scotland. *Earth Surface Processes and Landforms*, 19, 641–57.
- Tipping, R.M. (1994b) Williamson's Moss: palynological evidence for the Mesolithic-Neolithic transition. In *Cumbria: field guide* (eds J. Boardman and J. Walden), *Quaternary Research Association Field Guide*, Quaternary Research Association, Oxford, pp. 104–27.
- Tipping, R. (1995) Holocene evolution of a lowland Scottish landscape: Kirkpatrick Fleming.
  I. Peat- and pollen-stratigraphic evidence for raised moss development and climate change. *The Holocene*, 5, 69–81.
- Tipping, R.M. (1996) The Neolithic landscapes of the Cheviot Hills and hinterland: palaeoenvironmental evidence. In Neolithic Studies in No-Man's Land: papers on the Neolithic of Northern England from the Trent to the Tweed (ed. P. Frodsham), Northern Archaeology Special Edition, 13/14, Northumberland Archaeological Group, Northumberland, pp. 17–33.
- Tooley, M.J. (1969) Sea-level changes and the development of Coastal Plant Communities during the Flandrian in Lancashire and adjacent areas. Unpublished PhD thesis, University of Lancaster.
- Tooley, M.J. (1970) The peat beds of the southwest Lancashire coast. *Nature in Lancashire*, 1, 19–26.
- Tooley, M.J. (1974) Sea-level changes during the last 9000 years in north-west England. *Geographical Journal*, **140**, 18–42.
- Tooley, M.J. (1976) Flandrian sea-level changes in west Lancashire and their implications for the 'Hillhouse Coastline'. *Geological Journal*, **11**, 37–52.
- Tooley, M.J. (1977) The Quaternary history of north-west England and the Isle of Man. In The Isle of Man, Lancashire coast and Lake District (ed. M.J. Tooley), International Union for Quaternary Research Guidebook for Excursion, A4, International Union for Quaternary Research, Birmingham, pp. 5–7.
- Tooley, M.J. (1978a) Sea-Level Changes: North-West England during the Flandrian Stage,

Clarendon Press, Oxford, 176 pp.

- Tooley, M.J. (1978b) The history of Hartlepool Bay. International Journal of Nautical Archaeology and Underwater Exploration, 7, 71–87.
- Tooley, M.J. (1980) Theories of coastal change in North-West England. In Archaeology and Coastal Change: being the papers presented at meetings in London and Manchester on 27th October and 5th November (ed. F.H. Thompson), Society of Antiquaries of London Occasional Papers, New Series, No. 1, Society of Antiquaries of London, London, pp. 74–86.
- Tooley, M.J. (1982) Sea-level changes in northern England. *Proceedings of the Geologists' Association*, 93, 43–51.
- Tooley, M.J. (1984) Raised and buried beaches in the Durbam coast, Institute of British Geographers, Excursion to the Durham coast, Department of Geography, University of Durham.
- Tooley, M.J. (1985) Sea-level changes and coastal morphology in north-west England. In *The Geomorphology of North-West England* (ed. R.H. Johnson), Manchester University Press, Manchester, pp. 94–121.
- Tooley, M.J. (1990) The chronology of coastal dune development in the United Kingdom. *Catena, Supplement*, 18, 81–8.
- Tooley, M.J. (1992) Recent sea-level changes. In Saltmarsbes: Morphodynamics, Conservation and Engineering Significance, (eds J.R.L Allen and K. Pye), Cambridge University Press, Cambridge, pp. 19–40.
- Tooley, M.J. and Kear, B. (1977) Mere Sands Wood (Shirdley Hill Sand). In *The Isle of Man*, *Lancasbire Coast and Lake District* (ed. M.J. Tooley), *international Union for Quaternary Research Guidebook for Excursion*, A4, International Union for Quaternary Research, Birmingham, pp. 9–10.
- Tooley, M.J., Rackham, D.J. and Simmons, I.G. (1982) A red deer (*Cervus elaphus* L.) skeleton from Seamer Carrs, Cleveland, England: provenance of the skeleton and palaeoecology of the site. *Journal of Archaeological Science*, 6, 365–76.
- Travis, C.B. (1913) Geological notes on recent dock excavations at Liverpool and Birkenhead. *Proceedings of the Liverpool Geological Society*, 24, 267–75.
- Travis, C.B. (1926) The peat and forest bed of the south-west Lancashire coast. *Proceedings* of the Liverpool Geological Society, 14,

263-77.

- Travis, C.B. (1929) The peat and forest beds of Leasowe, Cheshire. *Proceedings of the Liverpool Geological Society*, **15**, 157–78.
- Travis, W.G. (1909) On plant remains in peat in the Shirdley Hill Sand at Aintree, South Lancashire. *Transactions Liverpool Botanical Society*, **1**, 47–52.
- Trechmann, C.T. (1915) The Scandinavian Drift of the Durham coast and the general glaciology of south-east Durham. *Quarterly Journal* of the Geological Society of London, 71, 53–82.
- Trechmann, C.T. (1919) On a deposit of interglacial loess and some transported preglacial freshwater clays on the Durham coast. *Quarterly Journal of the Geological Society of London*, 75, 173–203.
- Trechmann, C.T. (1931) The Scandinavian Drift or Basement Clay on the Durham coast. *Proceedings of the Geologists' Association*, 42, 292–4.
- Trechmann, C.T. (1936) Mesolithic flints from the submerged forest at West Hartlepool. *Proceedings of the Prehistoric Society*, **11**, 161–8.
- Trechmann, C.T. (1947) The submerged forest beds of the Durham coast. *Proceedings of the Yorkshire Geological Society*, **27**, 23–32.
- Trechmann, C.T. (1952) On the Pleistocene of East Durham. *Proceedings of the Yorkshire Geological Society*, 28, 164–79.
- Troels-Smith, J. (1955) Karakterisering af løse jordarter. Danmarks Geologiske Undersøgelse, 4, 3 (10), 73 pp.
- Trotter, F.M. (1922) Report from the Cumberland District. Summary of Progress of the Geological Survey of Great Britain and the Museum of Practical Geology (1921), 46-8.
- Trotter, F.M. (1929) Glaciation of the eastern Edenside, the Alston Block and the Carlisle Plain. Quarterly Journal of the Geological Society of London, 88, 549–607.
- Trotter, F.M. and Hollingworth, S.E. (1932) The glacial sequence in the North of England. *Geological Magazine*, 69, 374–80.
- Trotter, F.M., Hollingworth, S.E., Eastwood, T. and Rose, W.C.C. (1937) *Gosforth District: explanation of map 37*, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series, HMSO, London, 140 pp.

Trudgill, S. (1985) Limestone Geomorphology,

Longman, London.

- Tufnell, L. (1966) Some little-studied British landforms. Proceedings of the Cumberland Geological Society, 2, 50–6.
- Tufnell, L. (1969) The range of periglacial phenomena in Northern England. Biuletyn Peryglacjalny, 19, 291–32.
- Tufnell, L. (1971) Erosion by snow patches in the northern Pennines. *Weather*, 26, 492–8.
- Tufnell, L. (1972) Ploughing blocks with special reference to northwest England. *Biuletyn Peryglacjalny*, 21, 237–70.
- Tufnell, L. (1975) Hummocky microrelief in the Moor House area of the northern Pennines. *Biuletyn Peryglacjalny*, 24, 353–68
- Tufnell, L. (1976) Ploughing block movements on the Moor House Reserve (England), 1965–1975. Biuletyn Peryglacjalny, 26, 311–17.
- Tufnell, L. (1978) Studies of periglacial phenomena on the Moor House National Nature Reserve and surrounding areas. Unpublished PhD thesis, University of Newcastle upon Tyne.
- Tufnell, L. (1985) Periglacial landforms in the Cross Fell-Knock Fell area of the northern Pennines. In *Field Guide to the Periglacial Landforms of Northern England* (ed. J. Boardman), Quaternary Research Association, Cambridge, pp. 4–14.
- Turner, C. (1975) The correlation and duration of Middle Pleistocene interglacial periods in northwest Europe. In After the Australopithecines: Stratigraphy, Ecology and Culture Change in the Middle Pleistocene (eds K.W. Butzer and G.L. Isaac) World Anthropology, Mouton, The Hague, pp. 259–308.
- Turner, G.M. and Thompson, R. (1981) Lake sediment record of the geomagnetic secular variation in Britain during Holocene times. *Geophysical Journal of the Royal Astronomical Society*, 65, 703–25.
- Turner, J. (1962) The *Tilia* decline: an anthropogenic interpretation. *New Phytologist*, 61, 328–41.
- Turner, J. (1964) The anthropogenic factor in vegetational history. 1. Tregaron and Whixall Mosses. New Phytologist, 64, 328–41.
- Turner, J. (1965) A contribution to the history of forest clearance. Proceedings of the Royal Society of London, B161, 343–52.
- Turner, J. (1970) Vegetational history. In Durham County and City with Teesside (ed. J. Dewdney), British Association for the

Advancement of Science, Durham, pp. 123–33.

- Turner, J. (1978) History of Vegetation and Flora. In *Upper Teesdale: the Area and its Natural History* (ed. A.R. Clapham), Collins, London, pp. 88–101.
- Turner, J. (1979) The environment of north-east England during Roman times as shown by pollen analysis. *Journal of Archaeological Science*, 6, 285–90.
- Turner, J. (1984) Pollen diagrams from Cross Fell and their implications for former tree-lines. In: Lake Sediments and Environmental History (eds E.Y. Haworth and J.W.G. Lund), Leicester University Press, Leicester, pp. 317–57.
- Turner, J. and Hodgson, J. (1979) Studies in the vegetational history of the northern Pennines.
  I. Variations in the composition of the early Flandrian forests. *Journal of Ecology*, 67, 629–46.
- Turner, J. and Hodgson, J. (1981) Studies in the vegetational history of the northern Pennines.II. An atypical diagram from Pow Hill, Co. Durham. *Journal of Ecology*, 69, 171–88.
- Turner, J. and Hodgson, J. (1983) Studies in the vegetational history of the northern Pennines.
  III. Variations in the composition of the mid-Flandrian forests. *Journal of Ecology*, 71, 95–118.
- Turner, J. and Kershaw, A.P. (1973) A Late- and Post-Glacial pollen diagram from Cranberry Bog, near Beamish, County Durham. *New Phytologist*, 72, 915–28.
- Turner, J., Hewetson, V.P., Hibbert, F.A., Lowry, K.H. and Chambers, C. (1973) The history of the vegetation and flora of Widdybank Fell and the Cow Green reservoir basin, Upper Teesdale. *Philosophical Transactions of the Royal Society of London*, **B265**, 327–40.
- Turner, J.S. (1936) The structural significance of the Rossendale Anticline. *Transactions of the Leeds Geological Association*, 5, 157–60.
- Turner, R.C. (1986) Discovery and excavation of the Lindow Bodies. In *Lindow Man. The Body in the Bog* (eds I.M. Stead, J.B. Bourke, J.B. and D. Brothwell), British Museum Publications, London, pp. 10–13.
- Turner, R.C. (1988) A Cumbrian bog body from Scaleby. Transactions of the Cumberland and Westmorland Antiquarian and Archaeological Society, 88, 1–7.
- Turner, R.C. (1989) Another Cumbrian bog body from Seascale. *Transactions of the*

Cumberland and Westmorland Antiquarian and Archaeological Society, 89, 21–3.

- Turner, R.C. (1995a) Discoveries and excavations at Lindow Moss 1983–8. In Bog Bodies. New Discoveries and New Perspectives (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 10–18.
- Turner, R.C. (1995b) Recent research into British bog bodies. In *Bog Bodies. New Discoveries* and New Perspectives (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 108–22.
- Turner, R.C. (1995c) The Lindow man phenomenon: ancient and modern. In Bog Bodies. New Discoveries and New Perspectives (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 188–204.
- Turner, R.C. (1995d) Gazeteer of bog bodies in the British Isles, 1. Britain. In Bog Bodies. New Discoveries and New Perspectives (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 205–20.
- Turner, R.C. and Penney, S. (1996) Bog bodies. The discoveries at Whixall Moss. In Fenn's and Whixall Mosses (eds A. Berry, F. Gale, J.L. Daniels and B. Allmark), Clywd County Council, Mold, pp. 41–6.
- Turner, R.C. and Scaife, R.G. (1995) Bog Bodies. New Discoveries and New Perspectives, British Museum Press, London.
- Turner, R.C., Rhodes, M. and Wild, J.P. (1991) The Roman body found on Grewelthorpe Moor in 1850: a reappraisal. *Britannia*, 22, 191–201.
- Twidale, C.R. (1957). Glacier overflow channels in north Lincolnshire. *Transactions of the Institute of British Geographers*, 22, 47–54.
- Twigger, S.N. (1988) Late Holocene palaeoecology and environmental archaeology of six lowland lakes and bogs in North Shropshire. Unpublished PhD thesis, University of Southampton.
- Twigger, S.N. and Haslam, C.J. (1991) Environmental change in Shropshire during the last 13,000 years. *Field Studies*, 7, 743–58.
- Valentin, H. (1954) Der Landverlust in Holderness, Ostengland, von 1852 bis 1952. *Die Erde*, 6, 296–315.
- Valentin, H. (1957) Glazialmorphologische Untersuchungen in Ostengland. Abhandlungen Geographische Institut der Freien Universitat Berlin, 4, 1–86.
- Valentine, D.H. (1965) The Natural History of Upper Teesdale, Northumberland and

Durham Naturalists Trust, Newcastle-upon-Tyne.

- Van de Noort, R. and Davies, P. (1993) Wetland Heritage. An Archaeological Assessment of the Humber Wetlands, Humber Wetlands Project, University of Hull, Hull, 181 pp.
- Van de Noort R. and Ellis S. (1995a) Wetland Heritage of Holderness: an Archaeological Survey, Humber Wetlands Project, University of Hull, Hull, 387 pp.
- Van de Noort, R. and Ellis, S. (1995b) Recommendations. In Wetland Heritage of Holderness: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 361–4.
- Van de Noort, R. and Ellis, S. (1997) Wetland Heritage of the Humberbead Levels: an Archaeological Survey, Humber Wetlands Project, University of Hull, Hull, 508 pp.
- Van de Noort, R. and Ellis, S. (1999) Wetland Heritage of the Vale of York: an Archaeological Survey, Humber Wetland Project, University of Hull, Hull, 331 pp.
- Van de Noort, R., Ellis, S., Taylor. M, and Weir D. (1995) Preservation of archaeological sites. In Wetland Heritage of Holderness: an Archaeological Survey (eds R. Van de Noort and S. Ellis), Humber Wetlands Project, University of Hull, Hull, pp. 341–56.
- Van der Meer, J.J.M. (1987) Micromorphology of glacial sediments as a tool in distinguishing genetic varieties of till. In *INQUA Till Symposium*, Finland, 1985 (eds R. Kujansuu and M. Saarnisto), *Geological Survey of Finland Special Paper*, No. 3, Geologian Tutkimuskeskus, Espoo, pp. 77–89.
- Van der Meer, J.J.M. (1993) Microscopic evidence of subglacial deformation. *Quaternary Science Reviews*, 12, 553–87.
- Van der Sanden, W.A.B. (1995) Bog bodies on the Continent: the developments since 1965, with special reference to the Netherlands. In Bog Bodies. New Discoveries and New Perspectives (eds R.C. Turner and R.G. Scaife), British Museum Press, London, pp. 146–67.
- Vanstone, S.D. (1998) Late Dinantian palaeokarst of England and Wales: implications for exposure surface development. *Sedimentology*, **45**, 19–37.
- Varley, W.J. (1964) *Cheshire Before the Romans*, Cheshire Community Council, Chester, 109 pp.
- Varley, W.J. (1968) Barmston and the Holderness crannogs. *East Riding Archaeologist*, 1,

11-26.

- Versey, H.C. (1938a) The Tertiary history of East Yorkshire. *Proceedings of the Yorkshire Geological Society*, 23, 302–14.
- Versey, H.C. (1938b) The Speeton pre-glacial shell bed. *The Naturalist, Hull*, 227--9.
- Versey, H.C. (1948) Geology and Scenery of the Countryside round Leeds and Bradford, Murby, London, 94 pp.
- Vincent, P. (1969) The glacial history and deposits of a selected part of the Alston Block. Unpublished PhD thesis, University of Durham.
- Vincent, P. (1985) Quaternary geomorphology of the southern Lake District and Morecambe Bay area. In *The Geomorphology of North-West England* (ed. R.H. Johnson), Manchester University Press, Manchester, pp. 158–77.
- Vincent, P. (1996) Palaeokarst, pits and problems. Proceedings of the Cumberland Geological Society, 6(1), 134-6.
- Vincent, P.J. (1995) Limestone pavements in the British Isles: a review. *Geographical Journal*, 161, 265–74.
- Wager, L.R. (1931) Jointing in the Great Scar Limestone of Craven and its relation to the tectonics of the area. Quarterly Journal of the Geological Society of London, 87, 392–424.
- Walden, J. (1994) Late Devensian sedimentary environments in the Irish Sea Basin: glacioterrestrial or glaciomarine? In *Cumbria: field* guide (eds J. Boardman and J. Walden), Quaternary Research Association Field Guide, Quaternary Research Association, Oxford, pp. 15–18.
- Walden, J., Dackombe, R.V. and McGraw, J. (1994) Clast lithological and mineral magnetic analysis of diamicts from the Cumberland coastal exposures. In *Cumbria: field guide* (eds J. Boardman and J. Walden), *Quaternary Research Association Field Guide*, Quaternary Research Association, Oxford, pp. 75–85.
- Walder, J. and Hallet, B. (1985) A theoretical model of the fracture of rock during freezing. Bulletin of the Geological Society of America, 96, 336–46.
- Walder, J. and Hallet, B. (1986) The physical basis of frost weathering: toward a more fundamental and unified perspective. *Arctic and Alpine Research*, **18**, 27–32.
- Walker, D. (1955a) Late-glacial deposits at Lunds, Yorkshire. New Phytologist, 54, 343–9.
- Walker D. (1955b) Studies in the Post-glacial history of British vegetation. Skelsmerg Tarn and

Kentmere, Westmorland. *New Phytologist*, 54, 222–54.

- Walker, D. (1956) A Late glacial deposit at St. Bees, Cumberland. Quarterly Journal of the Geological Society of London, 112, 93–101.
- Walker, D. (1965) The Post-glacial period in the Langdale Fells, English Lake District. New Phytologist, 64, 488–510.
- Walker, D. (1966a) The glaciation of the Langdale Fells. *Geological Journal*, 5, 208–15.
- Walker, D. (1966b) The Late Quaternary history of the Cumberland Lowland. *Philosophical Transactions of the Royal Society of London*, B251, 1–120.
- Walker, D. (1970). Direction and rate of some Post-glacial hydroseres. In *Studies in the Vegetational History of the British Isles* (eds D.Walker and R.G. West), Cambridge University Press, Cambridge, pp. 117–39.
- Walker, D. and Walker, P.M. (1961) Stratigraphic evidence of regeneration in some Irish bogs. *Journal of Ecology*, 49, 169–85.
- Walker, D. and Godwin, H. (1954) Lake stratigraphy, pollen analysis and vegetation history. In *Excavations at Star Carr: an early Mesolithic site at Seamer near Scarborough* (ed. J.D. Clark), Cambridge University Press, Cambridge, pp. 25–68.
- Walker, M.J.C. (1995) Climatic changes in Europe during the last glacial/interglacial transition. *Quaternary International*, 28, 63-76.
- Walker, M.J.C. and Harkness, D.D. (1990) Radiocarbon dating the Devensian Lateglacial in Britain: new evidence from Llanilid, South Wales. *Journal of Quaternary Science*, 5, 135-44.
- Walker, M.J.C., Coope, G.R. and Lowe, J.J. (1993) The Devensian (Weichselian) Lateglacial palaeoenvironmental record from Gransmoor, East Yorkshire, England. *Quaternary Science Reviews*, 12, 659–80.
- Walker, M.J.C., Bohncke, S.J.P., Coope, G.R., O'Connell, M., Usinger, H. and Verbruggen, C. (1994) The Devensian/Weichselian Late Glacial in northwest Europe (Ireland, Britain, north Belgium, the Netherlands, northwest Germany). Journal of Quaternary Science, 9, 109–18.
- Waller, M.P. and Hamilton, S. (2000) Vegetation history of the English chalklands: a mid-Holocene pollen sequence from the Caburn, East Sussex. *Journal of Quaternary Science*, 15, 253–72.

- Walsh, P.T. and Brown, E.H. (1971) Solution subsidence outliers containing probable Tertiary sediment in N.E.Wales. *Journal of Geology*, 7, 299–320.
- Walsh, P.T., Boulter, M.C., Ijataba, M. and Urbani, D.M. (1972) The preservation of the Neogene Brassington Formation of the southern Pennines and its bearing on the evolution of Upland Britain. *Journal of the Geological Society, London*, **128**, 519–59.
- Waltham, A.C. (1974) The geology of the southern Askrigg Block. In *Limestones and Caves of North-West England* (ed. A.C. Waltham), David and Charles, Newton Abbot, pp. 25–45.
- Waltham, A.C. (1990) Geomorphic evolution of the Ingleborough karst. Transactions of the British Cave Research Association, 17, 9–18.
- Waltham, A.C and Tillotson, A.C. (1989) The Geomorphology of Ingleborough: Documentation and Assessment of the Surface and Underground Geomorphology of Ingleborough SSSI, Nature Conservancy Council, Peterborough.
- Waltham, A.C., Simms, M.J., Farrant, A.R. and Goldie, H.S. (1997) *Karst and Caves of Great Britain*, Geological Conservation Review Series, No. 12, Chapman and Hall, London, 358 pp.
- Waltham, T. (1987) Karst and Caves in the Yorkshire Dales National Park, Yorkshire Dales National Park Committee/British Cave Research Association, Guisborough.
- Warburton, J. (1985) Contemporary patterned ground (sorted stripes) in the Lake District. In *Field Guide to the Periglacial landforms of Northern England* (ed. J. Boardman), Quaternary Research Association, Cambridge, pp. 54–62.
- Warburton, J. (1997) Patterned ground in the Lake District. In *Geomorphology of the Lake District: a Field Guide* (ed. J. Boardman), Environmental Change Unit for the British Geomorphological Research Group, Oxford, pp. 107–19.
- Warburton, J. and Caine, N. (1999) Sorted patterned ground in the English Lake District. *Permafrost and Periglacial Processes*, 10, 193–7.
- Ward, C. (1873) The glaciation of the northern part of the Lake District. *Quarterly Journal of* the Geological Society of London, 29, 422–41.
- Ward, J.C. (1870) On the denudation of the Lake District. *Geological Magazine*, 7, 14–17.
- Ward, J.C. (1876) The Geology of the Northern

Part of the English Lake District – quartersheet 101SE, Memoir (District) of the Geological Survey of Great Britain, HMSO, London, 132 pp.

- Ward, S.D. and Evans, D.F. (1976) Conservation assessment of British limestone pavements based on floristic criteria. *Biological Conservation*, 9, 217–33.
- Warren, W.P. and Ashley, G.M. (1994) Origins of the ice-contact stratified ridges (eskers) of Ireland. *Journal of Sedimentary Petrology*, A64, 433–49.
- Warwick, G.T. (1964) Dry valleys of the Southern Pennines. *Erdkunde*, **18** (2), 116–23.
- Washburn, A.L. (1956) Classification of patterned ground and review of suggested origins. Bulletin of the Geological Society of America, 67, 823-65.
- Washburn, A.L. (1973) Periglacial Processes and Environments, Edward Arnold, London, 320 pp.
- Washburn, A.L. (1979) Geocryology: a Survey of Periglacial Processes and Environments, Edward Arnold, London, 406 pp.
- Waters, R.S. (1954) Pseudobedding in the Dartmoor granite. *Transactions of the Royal Society of Cornwall*, **18**, 456–62.
- Waters, R.S. (1962) Altiplanation terraces and slope development in West Spitsbergen and South-West England. *Biuletyn Peryglacjalny*, 11, 89–101.
- Waters, R.S. and Johnson, R.H. (1958) The terraces of the Derbyshire Derwent. *East Midland Geographer*, 2, 3–15.
- Watson, E. (1965) Grèzes litées on éboulis ordonnées tardiglaciares dans la région d'Aberystwyth. Bulletin Association de Geographes Francaise, 338, 16–25.
- Watson, E. (1966) Two nivation cirques near Aberystwyth, Wales. *Biuletyn Peryglacjalny*, 15, 79–101.
- Watson, E. (1971) Remnants of pingos in Wales and the Isle of Man. *Geological Journal*, 7, 381–92.
- Watson, E. (1972) Pingos of Cardiganshire and the latest ice limit. *Nature*, **238**, 343–4.
- Watson, E. (1977) The periglacial environment of Great Britain during the Devensian. *Philosophical Transactions of the Royal Society of London*, **B280**, 183–98.
- Watson, E.A. (1970) The Cardigan Bay area. In The Glaciations of Wales and adjoining regions (ed. C.A. Lewis), Geographies for Advanced Study, Longmans and Co., London,

pp. 125-45.

- Watt, A.S. (1971) Rare species in Breckland: their management and survival. *Journal of Applied Ecology*, 8, 593–609.
- Watt, A.S., Perrin, R.M.S. and West, R.G. (1966) Patterned ground in Breckland: structure and composition. *Journal of Ecology*, 54, 239–58.
- Watts, S.H. (1981) Bedrock weathering features in a portion of eastern high arctic Canada: their nature and significance. *Annals of Glaciology*, 2, 170–5.
- Watts, W.A. (1959) Pollen spectra from the interglacial deposits at Kirmington, Lincolnshire. *Proceedings of the Yorkshire Geological Society*, **32**, 145–52.
- Watts, W.A. (1970) Criteria for identification of Late Glacial climatic oscillations, with special reference to the Bølling Oscillation. American Quaternary Association 1st Meeting (Abstracts), pp. 144–5.
- Watts, W.A. (1980) Regional variation in the response of vegetation to Late-glacial climatic events in Europe. In Studies in the Lateglacial of North-West Europe: including papers presented at a symposium of the Quaternary Research Association beld at University College London, January 1979 (eds J.J. Lowe, J.M. Gray and J.E. Robinson), Pergamon Press, London, pp.1–21.
- Webb, P.C. and Brown, G.C. (1984) Lake District Granites: heat production and related geochemistry: British Geological Survey, Investigations of the Geothermal Potential of the UK, Geothermal Energy Research Programme, Energy Resources, WJ/GE/84/14.
- Wells, C., Huckerby, E. and Hall, V. (1997) Midand late-Holocene vegetation history and tephra studies at Fenton Cottage, Lancashire, UK. Vegetation History and Archaeobotany, 6, 153–66.
- Wells, C.E., Hodgkinson, D. and Huckerby, E. (2000) Evidence for the possible role of beaver (*Castor fiber*) in the prehistoric ontogenesis of a mire in northwest England, UK. *The Holocene*, **10**, 503–8.
- West, I.E. (1986) Forensic aspects of Lindow Man. In *Lindow Man. The Body in the Bog* (eds I.E. Stead, J.B. Bourke and D. Brothwell), British Museum Publications, London, pp. 77–80.
- West, R.G. (1956) The Quaternary deposits at Hoxne, Suffolk. *Philosophical Transactions of the Royal Society of London*, B239, 265–356.
  West, R.G. (1957) Interglacial deposits at

Bobbitshole, Ipswich. *Philosophical Transactions of the Royal Society of London*, **B241**, 1–31.

- West, R.G. (1963) Problems of the British Quaternary. Proceedings of the Geologists' Association, 74,147-86.
- West, R.G. (1968) Pleistocene Geology and Biology: with Especial Reference to the British Isles, Longmans and Co., London, 377 pp.
- West, R.G. (1969) A note on pollen analyses from the Speeton Shell Bed. *Proceedings of the Geologists' Association*, **80**, 217–218.
- West, R.G. (1970) Pollen zones in the Pleistocene of Great Britain and their correlation. *New Phytologist*, **69**, 1179–83.
- West, R.G. (1972) Relative land-sea level changes in south-eastern England during the Pleistocene. *Philosophical Transactions of the Royal Society of London*, 272A, 87-98.
- West, R.G. (1977) Pleistocene Geology and Biology: with Especial Reference to the British Isles, 2nd edn, Longmans and Co., London, 440 pp.
- West, R.G. (1980) Pleistocene forest history in East Anglia. New Phytologist, 85, 571-622.
- West, R.G. and Wilson, D.G. (1966) Cromer Forest Bed Series. *Nature*, 209, 497-8.
- Wheeler, A. (1978) Why are there no fish remains at Star Carr? Journal of Archaeological Science, 5, 85–9.
- White, G.W. (1971) Thickness of Wisconsinan tills in Grand River and Killbuck lobes, north-eastern Ohio and north-western Pennsylvania. In *Till: a Symposium* (ed. R.P. Goldthwait), Ohio State University Press, Columbus, pp. 402.
- Whitehead, T.H., Dixon, E.E.L., Pocock, R.W., Robertson, T. and Cantrill, T.C. (1927) The Country between Stafford and Market Drayton, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (139), HMSO, London, 128 pp.
- Whitehead, T.H., Robertson, T., R.W. and Dixon,
  E.E.L. (1928) The country between
  Wolverhampton and Oakengates, Memoir (Sheet) of the Geological Survey of Great
  Britain (England and Wales) New Series (153), HMSO, London, 244 pp.
- Whiteman, C.A. (1981) Drumlins around Appleby-in-Westmorland, Cumbria. In *Eastern Cumbria Field Meeting: 15–18 May 1981* (ed. J. Boardman), *Quaternary Research Association Field Guide*, Quaternary Research Association, London, pp. 107–13.

- Whiteman, C.A. (1990) Early and Middle Pleistocene stratigraphy and soils in central Essex, England. Unpublished PhD thesis, University of London.
- Whiteman, C.A. (1992) The palaeogeography and correlation of pre-Anglian-Glaciation terraces of the River Thames in Essex and the London Basin. *Proceedings of the Geologists' Association*, **103**, 37–56.
- Whiteman, C.A. and Rose, J. (1992) Thames River sediments of the British Early and Middle Pleistocene. *Quaternary Science Reviews*, **11**, 363–75.
- Whittard, W.F. (1931) The geology of the Ordovician and Valentian rocks of the Shelve country, Shropshire. *Proceedings of the Geologists' Association*, 42, 322–39.
- Williams, P.W. (1966) Limestone pavements with special reference to western Ireland. *Transactions of the Institute of British Geographers*, 40, 155–72.
- Williams, R.B.G. (1964) Fossil patterned ground in eastern England. *Biuletyn Peryglacjalyny*, 14, 337–49.
- Williams, R.B.G. (1975) The British climate during the last glaciation: an interpretation based on periglacial phenomena. In *Ice Ages Ancient* and Modern: proceedings of the 21st Inter-University Geological Congress held at the University of Birmingham, 2–4 January, 1974 (eds A.E. Wright and F. Moseley), Geological Journal Special Issue, No. 6, Seel House Press, Liverpool, pp. 95–120.
- Williams, C.T. (1985) Mesolithic Exploitation Patterns in the Central Pennines: a Palynological Study of Soyland Moor, British Archaeological Reports British Series, 139, British Archaeological Reports, Oxford, 175 pp.
- Williams, P.F. and Rust, B.R. (1969) The sedimentology of a braided river. Journal of Sedimentary Petrology, 39, 649–79.
- Williamson, I.A. (1952) A glacial overflow channel near Burnley, north-east Lancashire. Proceedings of the Yorkshire Geological Society, 28, 228–9.
- Wills, L.J. (1924) The development of the Severn valley in the neighbourhood of Ironbridge and Bridgnorth. *Quarterly Journal of the Geological Society of London*, 80, 274–314.
- Wills, L.J. (1929) *The Physiographical Evolution* of Britain, Edward Arnold, London, 376 pp.
- Wilson, P. (1977) The Rosthwaite moraines. Proceedings of the Cumberland Geological

Society, 3, 239-49.

- Wilson, P. (1979) Experimental investigation of etch pit formation on quartz sand grains. *Geological Magazine*, **116**, 477–482
- Wilson, P. (1980) Surface textures of regolith quartz from the Southern Pennines. *Geological Journal*, **15**, 113–29.
- Wilson, P. (1985) The Mere Sands of Lancashire – a forgotten Flandrian deposit. *Quaternary Newsletter*, 45, 23–6.
- Wilson, P. and Clark, R. (1995) Landforms associated with a Loch Lomond Stadial glacier at Cronkley Scar, Teesdale, northern Pennines. Proceedings of the Yorkshire Geological Society, 50, 277–83.
- Wilson, P., Bateman, R.M. and Catt, J.A. (1981) Petrography, origin and environment of deposition of the Shirdley Hill Sand of South Lancashire, England. *Proceedings of the Geologists' Association*, **92**, 211–29.
- Wilson, S.J. (1991) The correlation of the Speeton Shell Bed, Filey Bay, Yorkshire, to an oxygen isotope stage. *Proceedings of the Yorkshire Geological Society*, **48**, 223–6.
- Wilson, V. (1948) East Yorkshire and Lincolnshire, British Regional Geology, HMSO, London, 94 pp.
- Wiltshire, P.E.J. and Edwards, K.J. (1993) Mesolithic, early Neolithic, and later prehistoric impacts on vegetation at a riverine site in Derbyshire, England. In *Climate Change and Human Impact on the Landscape* (ed. F.M. Chambers), Chapman and Hall, London, pp. 157–68.
- Wimble, G, Wells, C. and Hodgkinson, D. (2000) Human impact on mid- and late Holocene vegetation in Cumbria, UK. Vegetation History and Archaeobotany, 9, 17–30.
- Winch, N.J., Thornhill, J. and Waugh, R. (1805) The Botanist's Guide through the Counties of Northumberland and Durham, S. Hodgson, Newcastle-upon-Tyne.
- Wingfield, R.T.R., Merritt, J.W. and Eaton, G.P. (1997) A summary of the correlation and nature of onshore and offshore Quaternary sediments of the Sellafield area. *Nirex Science Report*, SA/97/003.
- Winograd, I.J., Coplen, T.B., Landwehr, J.M. et al. (1992) Continuous 500,000-year climate record from vein calcite in Devils Hole, Nevada. Science, 258, 255–60.
- Wintle, A.G. and Catt, J.A. (1985) Thermoluminescence dating of Dimlington Stadial deposits in eastern England. *Boreas*, 14,

231-4.

- Woillard, G.M. (1978) Grand Pile peat bog: a continuous pollen record of the last 140,000 years. Quaternary Research, 9, 1–21.
- Woillard, G.M. and Mook, W.G. (1982) Carbon-14 dates at Grand Pile: correlation of land and sea chronologies. *Science*, **215**, 159–161.
- Wood, B.L. (1969) Periglacial tor topography in southern New Zealand. New Zealand Journal of Geology and Geophysics, 12, 361–75.
- Wood, S.V. and Rome, J.L. (1868) On the glacial and postglacial structure of Lincolnshire and south-east Yorkshire. *Quarterly Journal of the Geological Society of London*, 24, 146–84.
- Woolacott, D. (1920) On an exposure of sands and gravels containing marine shells at Easington, Co. Durham. Geological Magazine, 57, 307-11.
- Woolacott, D. (1921) The interglacial problem and the glacial and postglacial sequence in Northumberland and Durham. *Geological Magazine*, 58, 21–32, 60–69.
- Woolacott, D. (1922) On the 60-ft raised beach at Easington, Co.Durham. *Geological Magazine*, 59, 64–74.
- Wooldridge, S.W. and Linton, D.L. (1939) Structure, Surface and Drainage in South East England, Institute of British Geographers Publication, No 10, G. Philip, London, 124 pp.
- Worsley, P. (1966) Some Weichselian fossil frost wedges from east Cheshire. Mercian Geologist, 1, 357–65.
- Worsley, P. (1967a) Problems in naming the Pleistocene deposits of the north-east Cheshire Plain. *Mercian Geologist*, 2, 51–5.
- Worsley, P. (1967b) Some aspects of the Quaternary evolution of the Cheshire Plain and adjacent areas. Unpublished PhD thesis, University of Manchester.
- Worsley, P. (1970) The Cheshire–Shropshire lowlands. In *The Glaciations of Wales and Adjoining Regions* (ed. C.A. Lewis), *Geographies for Advanced Study*, Longmans and Co., London, pp. 83–106.
- Worsley, P. (1975) An appraisal of the glacial Lake Lapworth concept. In *Environment, Man and Economic Change: Essays presented to S.H. Beaver* (eds A.D.M. Phillips and B.J. Turton), Longmans and Co., London, pp. 98–118.
- Worsley, P. (1977) The Cheshire-Shropshire Plain. In Wales and the Cheshire-Shropshire Lowland (ed. D.Q. Bowen), International Union for Quaternary Research Guidebook

for Excursion, A8/C8, International Union for Quaternary Research, Birmingham, pp. 53– 64.

- Worsley, P. (1978) Chelford. In Field Handbook: Annual Field Meeting 1978 of the Quaternary Research Association (eds E.A. Francis, H. Davies, E. Derbyshire, M.P. Lee and P. Worsley), Quaternary Research Association, Keele, pp. 29–36.
- Worsley, P. (1980) Problems in radiocarbon dating the Chelford Interstadial of England. In *Timescales in Geomorphology* (eds R.A. Cullingford, D.A. Davidson and J. Lewin), John Wiley and Sons Ltd, Chichester, pp. 289–304.
- Worsley, P. (1985) Pleistocene history of the Cheshire–Shropshire plain. In *The Geomorph*ology of North-West England (ed. R.H. Johnson), Manchester University Press, Manchester, pp. 201–21.
- Worsley, P. (1991a) Possible early Devensian glacial deposits in the British Isles. In *Glacial Deposits in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), Balkema, Rotterdam, pp. 47–51.
- Worsley, P. (1991b) Glacial deposits of the low-lands between the Mersey and Severn rivers.
  In *Glacial Deposits in Great Britain and Ireland* (eds J. Ehlers, P.L. Gibbard and J. Rose), Balkema, Rotterdam, pp. 203–11.
- Worsley, P. (1992) A pre-Devensian mammoth tooth from Arclid, Cheshire. *Proceedings of the Geologists' Association*, **103**, 75–7.
- Worsley, P., Coope, G.R., Good, T.R., Holyoak, D.T. and Robinson, J.E. (1983) A Pleistocene succession from beneath Chelford Sands at Oakwood Quarry, Chelford, Cheshire. *Geological Journal*, 18, 307–24.
- Wray, D.A. and Cope, F.W. (1948) *The Geology of Southport and Formby*, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series, HMSO, London, 54 pp.
- Wright, C.W. and Wright, E.V. (1933) Some notes on the Holocene deposits at North Ferriby. *Naturalist*, **920**, 210–12.
- Wright, J.K. (1968) The stratigraphy of the Callovian rocks between Newtondale and the Scarborough coast, Yorkshire. *Proceedings of the Geologists' Association*, 79, 363–99.
- Wright, J.K (1977) The Cornbrash Formation (Callovian) in North Yorkshire and Cleveland. Proceedings of the Yorkshire Geological Society, 41, 325–46.

- Wright, J.K. (1978). The Callovian succession (excluding Cornbrash) in the western and northern parts of the Yorkshire Basin. *Proceedings of the Geologists' Association*, 89, 239-61.
- Wright, T. (1860) On the subdivisions of the Inferior Oolite of southern England compared with the equivalent beds of that formation on the Yorkshire coast. *Quarterly Journal of the Geological Society of London*, **15**, 1–48.
- Wright, V.P. (1982) The recognition and interpretation of palaeokarsts: two examples from the Lower Carboniferous of South Wales. *Journal* of Sedimentary Petrology, **52**, 83–94.
- Wright, W.B. (1914) The Quaternary Ice Age, Macmillan, London, 464 pp.
- Wright, W.B., Sherlock, R.L., Wray, D.A. and Tonks, L.H. (1927) *The Geology of the Rosendale Anticline*, Memoir (Sheet) of the Geological Survey of Great Britain (England and Wales) – New Series (76), HMSO, London, 182 pp.
- Wymer, J. (1981) The Palaeolithic. In The Environment in British Prehistory (eds I.G. Simmons and M.J. Tooley), Duckworth, London, pp. 49–81.
- Wymer, J.J. (1985) *The Palaeolithic Sites of East* Anglia, Geo Books, Norwich, 440 pp.
- Yates, E.M. (1956) The Keele surface and the Upper Trent drainage. *East Midland Geographer*, 1, 10–22.
- Yates, E.M. and Moseley, F. (1958) Glacial lakes and spillways in the vicinity of Madeley, North Staffordshire. *Journal of the Geological Society, London*, **113**, 409–28.
- Yates, E.M. and Moseley, F. (1967) A contribution to the glacial geomorphology of the Cheshire Plain. *Transactions of the Institute of British Geographers*, 42, 107–25.
- Yorke, C. (1961) The Pocket Deposits of Derbyshire, Private Publication, Birkenhead, 86 pp.
- Young, A. (1961) Characteristic and limiting slope angles. Zeitschrift für Geomorphologie, 5, 126–31.
- Younger, P.L. and McHugh, M. (1995) Peat development, sand cones and palaeohydrogeology of a spring-fed mire in East Yorkshire, UK. *The Holocene*, **5**, 59–67.
- Zagwijn, W.H. (1974) The Pliocene-Pleistocene boundary in western and southern Europe. *Boreas*, **3**, 75-97.
- Zalesiewicz, J.A. and Gibbard, P.L. (1988) The Pliocene to early Middle Pleistocene of East Anglia: an overview. In *Pliocene–Middle*

## References

Pleistocene of East Anglia: field guide (eds PL.Gibbard and J.A. Zalasiewicz), *Quaternary Research Association Field Guide*, Quaternary Research Association, Cambridge, pp. 1–31.

Zeuner, F.E. (1959) *The Pleistocene Period: its climate, chronology and faunal successions,* Hutchinson, London, 447 pp.

Zong, Y. (1993) Flandrian sea-level changes and

impacts of projected sea-level rise on the coastal lowlands of Morecambe Bay and the Thames Estuary, UK. Unpublished PhD thesis, University of Durham.

Zong, Y. and Tooley, M.J. (1996) Holocene sealevel changes and crustal movements in Morecambe Bay, northwest England. *Journal* of *Quaternary Science*, **11**, 43–58.

Destances Saya). Glass description of sectors and second and

and the second sec

# Glossary

This glossary provides brief explanations of the technical terms used in the introductions to the chapters and in the 'conclusions' sections of the site reports. These explanations are not rigorous scientific definitions but are intended to help the general reader. Detailed stratigraphical terms are omitted as they are given context within the tables and figures. Words in **bold** type indicate an internal reference to another glossary entry.

- Abbevillian: an archaeological term referring to a period of European culture during which crude hand axes first appeared. Part of the **Palaeolithic** division of the **Stone Age**, it precedes the **Acheulian** period.
- Ablation: the disappearance of snow and ice by melting and evaporation from the surface of a glacier, controlled mainly by air temperature but also affected by sunshine, rainfall, humidity and wind speed.
- Abrasion: the wearing away of rocks or sediments by an agent of transportation charged with a load of already eroded material, which acts as a tool for grinding, cutting, scratching and polishing. Abrasion by water and ice produces rounded forms and abrasion by ice produces striations.
- Absolute age: the actual age, as opposed to the relative age, of a formation, rock or fossil, usually given in 'years before present' actually meaning years before AD 1950.
- Absolute dating: a method of determining the absolute age of formation of a rock or mineral; includes techniques such as radiometric dating, electron spin resonance, thermoluminescence and palaeomagnetic techniques.
- Accelerator mass spectrometry (AMS) <sup>14</sup>C dating: a method of dating whereby <sup>14</sup>C atoms are separated by their differences in

mass rather than by their radioactivity. The technique uses much smaller samples than the conventional  $^{14}$ C technique.

- Acheulian: an archaeological term referring to a period of European culture noted for the manufacture of the hand axe and the cleaver. Part of the lower Palaeolithic division, it follows the Abbevillian period, and precedes the Mousterian period.
- Aegelsee oscillation: a short-lived, low-amplitude climatic oscillation, leading to colder and drier conditions, which has been identified on the Swiss Plateau and in the UK, and dated to approximately 13 000 years BP, towards the end of the last glacial period (the Devensian Stage).
- Aeolian: descriptive of sediments transported and deposited by the wind.
- Age: a geological time unit (cf. chronostratigraphy), usually taken to be the smallest standard division of geological time, of shorter duration than an epoch.
- Aggradation: the building upwards of a river valley or floodplain by accumulation of fluvial deposits; can also be applied to material deposited by other agencies, such as wind or sea.
- Allerød Interstadial: a term used primarily in Europe to describe a short-lived climatic amelioration, or interstadial event, which

occurred approximately 11 000 years BP, towards the end of the last glacial period (the **Devensian Stage**), following the **Older Dryas** and prior to the **Younger Dryas**.

- Allochthonous: descriptive of a rock which formed somewhere other than its current position and was subsequently transported.
- Alluvial: a term applied to the environments, action, and products of rivers or streams. Alluvial deposits are composed of clastic material deposited in the river floodplain.
- Alluvium: sediment deposited by rivers.
- Alluvial fan: a cone-shaped deposit made up of water-laid deposits, and also some material transported by mud flows.
- Alluviation: the process of the accumulation of material deposited by river water, usually located along the river valley and tending to be predominantly fine silt or sand.
- Alpine orogeny: a period of mountain building resulting from the collision of the European and African plates that took place during the late Tertiary Period.
- Amino acids: a group of organic compounds found within plant and animal tissues.
- Amorphous: lacking a definite form or structure; non-crystalline.
- Anastomosing: descriptive of a system which branches or contains a network; for example the channel pattern of a braided stream, or the veins on a leaf which form a netlike pattern.
- Andesite: a fine-grained volcanic or shallowlevel intrusive rock intermediate in composition between a basalt and rhyolite.

Anaerobic: literally 'without air' or oxygen.

- **Angiosperm**: a major division of the plant kingdom; a flowering plant which has seeds that develop in an ovary.
- Anglian Stage: a British chronostratigraphical division (stage; see chronostratigraphy); a cold (glacial) stage of the middle Pleistocene Epoch, equivalent to oxygen isotope stage 12, and occurring from about 300 000 to 250 000 years BP. It follows the Cromerian Stage and precedes the Hoxnian Stage.
- Annelid: any worm-like invertebrate of the phylum Annelida, typically with a segmented body and a distinct head and appendages. Usually only preserved as a **trace fossil** due to the lack of a skeleton.
- Aragonite: a form of calcium carbonate commonly found in the shells of invertebrates. It is less stable than calcite and more soluble in

cold water than in warm. It is often replaced by other minerals, such as calcite, in fossils.

- Arboreal: associated with, or living in, trees. Arenaceous: descriptive of clastic sediments made up of sand-sized particles.
- Arenig Epoch: a geological time division (epoch; cf. chronostratigraphy); the second epoch of the Ordovician Period.
- Arête: a narrow mountain crest or sharp-edged rocky ridge, often present above the snowline in rugged mountains. It is formed by glaciers and is the result of the backward growth of the walls of adjoining cirques.
- ARM (anhysteretic remanent magnetization): the remanence produced in a sample by subjecting it to an increasing and decreasing alternating magnetic field superimposed upon a steady direct-current magnetic field.
- Atlantic period: a term primarily used in Europe to describe an interval of the Holocene Epoch that extends from about 7500 until 4500 years BP. It follows the Boreal period and precedes the Sub-Boreal period, and is characterized by a climate generally warmer and wetter than that of the present day.

Augite: a pyroxene (ferromagnesian) mineral.

- Aurochs: a form of wild ox that is now extinct.
- Authigenic: a mineral formed in place in a sediment or rock either by replacing or displacing an earlier mineral.
- Autochthonous: descriptive of a rock formed in its current position.
- Autogenic: descriptive of an ecological succession resulting from factors originating within the natural community and altering the habitat.
- **Basalt**: a fine-grained, usually dark coloured, crystalline basic **igneous rock**, formed by a volcanic eruption, and therefore usually in the form of a lava or **dyke**. It has a silica content of less than 53 wt% and consists largely of plagioclase feldspar and ferromagnesian minerals.
- Batholith: a large, irregular mass of intrusive igneous rock emplaced deep in the Earth's crust.
- **Baventian Stage:** a British chronostratigraphical division (stage; see chronostratigraphy); a cold (glacial) stage of the early Pleistocene Epoch, which ended about 1.6 million years ago. It follows the Antian Stage and precedes the Bramertonian Stage.

- **Bedform**: a small- or large-scale landform, formed by the deformation of the bed of a river, a sand dune, or the seabed, by current flow over a mobile sediment bed. Examples include ripples, large dunes, horizontal sheetflow and antidunes.
- Bedding plane: a planar feature in sedimentary rocks representing an original surface of deposition. Conspicuous bedding planes may indicate a short interruption in, or change in character of, sediment deposition.
- **Bedrock**: the rock, usually solid, underlying soil and other unconsolidated surficial material.
- **Beestonian Stage**: a British chronostratigraphical division (stage; cf. chronostratigraphy); a cold (glacial) stage of the early Pleistocene Epoch, which ended about 400 000 years BP. It follows the Pastonian Stage and precedes the Cromerian Stage.
- **Bioclastic**: consisting of **clasts** of **biogenic** origin, e.g. broken shell or bone debris.
- **Biogenic**: descriptive of sediments that have been produced by animals, for example coral reefs.
- **Biostratigraphy:** the stratigraphical subdivision and correlation of sedimentary rocks based on their fossil content.
- **Biota**: the **flora** and **fauna** of a particular place; the faunal and floral assemblage of a bed or other **stratigraphical** unit.
- **Bioturbation:** the physical disturbance of unconsolidated **sediment**, such as by burrowing and feeding, caused by the organisms living on or in it. These disturbances are often preserved as **trace fossils** in ancient **sediments**.
- **Biozone:** a stratigraphically restricted unit of sedimentary rocks defined by its fossil content, most usefully by species of narrowly defined temporal range but wide spatial range and named after abundant or characteristic species.
- **Blanket bog**: an acid peat formed by high rainfall and the rapid leaching of bases, which blankets the topography in upland regions with a typically cool, wet, oceanic climate.
- **Blockfield**: found on high mountain slopes above the treeline and in polar regions, composed of a thin accumulation of large and usually angular blocks over solid **bedrock**, formed by frost shattering.
- **Blockslope:** Angular blocks on a slope formed by frost shattering, see also **blockfield**.

- **Bog**: ground that is waterlogged and spongy. It consists mainly of mosses and contains acidic decaying vegetation that may develop into **peat**.
- Bølling–Allerød Interstadial complex: a term used primarily in Europe to define the time during which the Bølling and Allerød interstadial events occurred. These two interstadial events were separated by the colder Older Dryas. The complex spans from approximately 13 000 until 11 000 years BP and is considered to be equivalent to the Windermere Interstadial in Britain.
- **Bølling Interstadial**: a term used primarily in Europe to describe a short-lived climatic amelioration, or **interstadial** event, which occurred approximately 12 500 years BP, towards the end of the last glacial period (the **Devensian Stage**), prior to the **Older Dryas**.
- Boreal period: a term used primarily in Europe to describe an interval of the Holocene Epoch that extends from about 9000 to 7500 years BP. It follows the Pre-Boreal period and precedes the Atlantic period, and was characterized by cold winters, warm summers and a growth of boreal forests.
- **Boreal**: referring to the north or a cold climate. **Boulder**: a sedimentary particle with a diameter of more than 256 mm.
- BP: before present (see Absolute dating).
- **Brackish**: waters with salinities intermediate between fresh and marine waters.
- **Braided channel**: a stream or river channel that branches frequently and rejoins after separation by bars.
- **Braided river (braided stream)**: a stream or river that divides into an interlacing network of several small branching and rejoining shallow channels, separated by bars or islands.
- **Bramertonian Stage**: a British chronostratigraphical division (stage; see chronostratigraphy); a short-lived temperate (interglacial) stage of the early **Pleistocene Epoch**, which began about 1.6 million years ago. It follows the **Baventian Stage**.
- Breccia: a sedimentary rock consisting of angular pebbles (cf. conglomerate).
- **Bronze Age:** an archaeological cultural division, designated in the **Three-Age System** as following the **Stone Age** and preceding the **Iron Age**, and characterized by a shift from the use of stone tools to the use of bronze. The timing of this division varies from region to region, but is considered to have occurred

in Europe about 5000 years BP.

- **Brown Earth Soil**: a type of soil typically found in deciduous woodlands, where organic matter is rapidly formed by the abundant leaf litter and soil fauna.
- **Bryophyte**: a group of plants that include mosses and liverworts.
- Cainozoic Era: a geological time division (era; cf. chronostratigraphy); the youngest era, spanning from approximately 65 million years ago to the present, and consisting of the Tertiary and Quaternary periods.
- **Calcareous**: containing large quantities of calcium carbonate (CaCO<sub>3</sub>).
- Calcification: the process of increasing the proportion of calcium carbonate in a rock or fossil.
- **Calcite**: calcium carbonate (CaCO<sub>3</sub>), the dominant component of **limestones**.
- **Calcrete**: a 'fossil soil' (**palaeosol**) rich in calcium carbonate, indicative of arid or semi-arid environments.
- **Calving**: the process by which a mass or block of ice breaks off of a glacier or ice sheet, usually in the sea.
- **Carboniferous Period**: a geological time division (**period**; cf. **chronostratigraphy**); ranging from about 362 to 290 million years ago, it precedes the **Permian Period**.
- Carbon isotope analysis: see isotope analysis.
- **Carr**: a water-logged ecosystem (mire) containing scrub vegetation, found on high productivity (mineral-rich nutrients) peat, dominated by alder and willow.
- **Catchment:** a term often synonymous with drainage basin; the area that collects the water flowing to a particular river. See **watershed**.
- Chalk: a poorly lithified, porous white limestone. Stratigraphically, *the Chalk* (a proper noun with a capital letter) is used synonymously with the Upper Cretaceous Series, which formed during the Late Cretaceous Epoch.
- **Charcoal**: the carbonized remains of plant tissue burnt at very high temperatures, in which some internal structure of the plant may be still preserved.
- Charophyte: a single-celled planktonic plantlike organism.
- Chelford Interstadial: a term used in Britain to describe a short-lived climatic amelioration or

interstadial event, which occurred from about 65 000 and 59 000 years BP, towards the beginning of the last glacial period, the Devensian Stage.

- **Chironomid**: any member of the chironomidae family of the order Diptera. Includes over 200 species of midges, bloodworms and gnats.
- **Chert**: cryptocrystalline silica (SiO<sub>2</sub>) which may be of organic or inorganic origin, occurring as layers or **nodules** in **sedimentary rocks** (mainly **limestones**).
- Chronostratigraphy: the correlation and subdivision of rock units on the basis of relative age – a hierarchy of sequential units to which the layers of sedimentary rocks are allocated, through the study and interpretation of their stratigraphy. The hierarchy of principal chronostratigraphical units is erathem, system, series and stage, which are related, respectively, to the geological time units of era, period, epoch and age. Rocks of the Jurassic System (a chronostratigraphical unit) were laid down in the Jurassic Period (a geological time unit).
- Chronozone: a fine division of geological time based on some recognizable feature preserved in contemporaneous sedimentary strata.
- Cirque: an overdeepened, steep-walled, hollow in a mountain caused by glacial and periglacial erosion; = corrie (Scotland); = cwm (Wales).
- Clast (adj. clastic): a sedimentary particle, a fragment of a pre-existing rock or fossil (bio-clast).
- Clay: very fine-grained sediment, less than 0.004 mm in size.
- Climax community: an assemblage of species representing the usual long-term or permanent inhabitants of an area.
- **Coal:** a combustible rock containing primarily carbonaceous material formed from the compaction and hardening of plant remains.
- **Coal Measures**: a stratigraphical term used for the sequence of rocks occurring in the upper part of the **Carboniferous System**, which were typically coal-bearing.
- **Cobble:** a piece of rock with a diameter of between 64 and 256 mm. Generally rounded or subrounded in shape.
- Col: the highest point on a divide between two valleys.
- **Coleopteron**: an insect of the order Coleoptera, for example beetles or weevils.

- **Collapse breccia**: a **breccia** formed by the collapse of rock that is overlying an opening.
- **Colluvium** (adj: **colluvial**): any loose, mixed mass of soil or rock fragments deposited by runoff or slow downslope creep, usually found at the base of gentle slopes or hillsides.
- **Columnar joints**: parallel columns which are hexagonal in cross-section, formed due to contraction during cooling, which are found mainly in basaltic flows, but also in other **igneous rocks**.

#### Congelifluction: see gelifluction.

- **Conglomerate**: a sedimentary rock consisting of rounded pebbles (cf. breccia).
- **Consolidation**: any process by which loose material becomes a solid and coherent rock.
- **Contemporaneous**: formed or occurring at the same time.
- **Continentality**: a condition of climate or **palaeoclimate** dominated by persistent, dry, descending air. It persistence can give rise to distinctive deposits and landforms, for example **loess**.
- **Convolute lamination** (or **bedding**): a sedimentary structure characterized by marked crumpling or intricate folding of the laminations within a well-defined, undeformed sedimentation unit; thought to form mainly by density contrasts and load deformation in water-saturated sediment.

Coprolite: preserved and fossilized droppings.

- **Coral**: an aquatic invertebrate animal that secretes a calcium carbonate external skeleton. It may live as an individual or in large colonies.
- **Corestone**: a block of **granite**, oval in shape, formed by **weathering** in the same manner as a **tor**, but separated from **bedrock**.
- **Correlation**: the tracing and identification of a **stratigraphical** unit away from its type area by comparing **lithologies** and/or **faunas**.

Corrie: a Scottish term for a cirque.

- **Coversand**: an **aeolian** deposit of fine-grained **sand**, usually mainly **quartz**, deposited by strong winds during **glacial periods**.
- **Creep:** the slow mass-movement of material down relatively steep slopes, mainly under the force of gravity, but also influenced by saturation with water and alternate freezing and thawing.
- **Cretaceous Period**: a geological time division (**period**; see **chronostratigraphy**); ranging from 145.6 to 65 million years ago, it is the

last period of the Mesozoic Era.

Cromerian Stage: a British chronostratigraphical division (stage; cf. chronostratigraphy); a warm (interglacial) stage of the lower-middle Pleistocene Epoch, equivalent to oxygen isotope stages 13 to 21, and ending about 300 000 years BP. It follows the Beestonian Stage and precedes the Anglian Stage.

- Cromerian Complex: a north-west European chronostratigraphical division which forms part of the middle Pleistocene Epoch and appears to be equivalent to the Cromerian, Beestonian and Pastonian stages of Britain. It is believed to have consisted of 5 or 6 glacial-interglacial transitions.
- Cross-bed, cross-lamination, cross-stratification: a series of inclined bedding planes deposited by currents (rivers, wind or coastal). Large-scale features are named 'cross-stratification', smaller-scale features are known as 'cross-bedding'; and 'crosslaminations' are the finest-scale forms.
- **Cryoplanation**: the alteration of a surface by processes associated with frost action, such as frost shattering and **solifluction**.
- **Cryoturbation**: the disturbance and alteration of soil by frost action.
- Cuesta: an asymmetric ridge, with a steep slope on one side, and a shallow slope on the other.
- **Debris flow**: the rapid downslope flow of poorly-sorted debris mixed with water. Also refers to the landform produced by an individual flow.
- Deforming layer (and/or till): a mobile, subglacial, soft deforming or deformable bed or till, composed of a slurry-like saturated debris, formed when the water pressure in the sediment pores increases enough to reduce the resistance between individual grains; in response to the shearing force from the overlying ice, the slurry forms a continuously deforming layer on which the glacier moves. Deformation tills may accumulate by the transport and accumulation of sediment within the deforming layer or by down-cutting and the assimilation of new sediment into the deforming layer. Recognized by characteristics such as tectonic laminations and folding, but when homogenized can be difficult to recognize from other till types.
- **Deglaciation**: the processes whereby glaciers thin and withdraw from an area.

Delta (adj. deltaic): a fan-shaped or irregular

mass of **sediment** deposited where a river enters a lake or the sea.

- **Denudation:** the combined processes of weathering and erosion that wear down landscapes. From the Latin *denudare*, to 'strip bare'.
- **Dessication crack**: a crack formed when wet **sediment** dries out.
- Devensian Stage: a British chronostratigraphical division (stage; see chronostratigraphy); the last cold (glacial) stage, during the late Pleistocene Epoch, equivalent to oxygen isotope stage 2, and occurring from about 120 000 to 10 000 years BP. It follows the Ipswichian Stage and precedes the Flandrian Stage.
- **Devonian Period**: a geological time division (**period**; cf. **chronostratigraphy**); ranging from about 408 to 362 million years ago, it is part of the Palaeozoic Era.
- **Diachronous**: describes an apparently continuous stratum that is a different age in different places.
- Diagenesis (adj. diagenetic): the alteration of the mineralogy and texture of sediments and fossils when they are close to the Earth's surface by chemical and physical processes; the term excludes metamorphic alteration.
- Diamictite: a poorly or non-sorted, noncalcareous, terrigenous sedimentary rock, that contains a wide range of particle sizes.
- Diamicton: a non-lithified diamictite, for example a till.
- **Diatom:** a single-celled, microscopic plant which grows in fresh and marine water. They secrete walls of silica, which may be preserved in **sediments**.
- **Differential weathering: weathering** that occurs at different rates, due to differences in composition and resistance of a rock and/or differences in the intensity of weathering.
- **Dimictic**: descriptive of a lake that has two yearly overturns or periods of circulation.
- **Dimlington stadial**: a term used primarily in Britain to describe the final, short-lived climatic deterioration, or **stadial** event, which occurred between about 26 000 and 13 000 years BP, towards the end of the last glacial period (the **Devensian Stage**). Also referred to as the Dimlington Chronozone and the equivalent to the **Last Glacial Maximum**.
- Dinantian Stage: a chronostratigraphical division (stage; see chronostratigraphy); equivalent to the Lower Carboniferous

Series in Europe and preceding the Namurian Stage.

- **Dinoflagellate:** a single-celled **planktonic** organism related to algae that has two flagella (tails) that are used in movement.
- Dip: the angle between a surface and a horizontal plane.
- **Dissolution**: the natural process of dissolving a solid; specifically in **karst** processes, the dissolving of carbonate rock to create a liquid solution of calcium and bicarbonate ions in water; also known as **solution**.
- **Dolerite:** a medium-grained **igneous** rock that generally occurs in **dykes** and **sills**.
- **Drenthe ice advance**: the second of three ice advances recognized in Scandinavia, which occurred during the northern European glacial **Saalian stage**.
- **Drift**: a term used to characterize all unconsolidated rock debris transported from one place to another.
- **Drumlin:** a low, rounded hill of glacial till, which was moulded into a streamlined shape by glacier ice passing over it. Its long-axis is parallel to the direction of flow of the ice sheet beneath which it formed.
- **Dry valley**: a fluvial valley cut by a **subaerial** stream or river then abandoned and left dry owing to underground drainage; or caused by a glacial meltwater phase of erosion.
- **Dune**: a ridge or mound of sand-size sediment that occurs in several forms, such as barchan, draa and seif, in deserts and coastal locations. On sandy-bedded rivers, dunes are a bedform that can take several forms and sizes, varying from about 10 cm to 40 m.
- **Dune Slack**: a wet hollow in a sand dune system that is gradually filled in with sand and vegetation, formed when wind erosion reaches the water table and erosion is stopped
- **Dyke:** a vertically orientated band of rock. The term is generally applied to **igneous rocks** which have 'intruded' or 'cut through' pre-existing rocks, although sedimentary (Neptunian) forms occur.
- **Edaphic**: descriptive of ecological formations or effects due to the local conditions of the soil or substrate.
- Eemian Stage: a north-west European (Dutch) chronostratigraphical division (stage; see chronostratigraphy); the penultimate warm (interglacial) stage, during the late Pleistocene Epoch, equivalent to oxygen

**isotope stage** 5 and the British **Ipswichian Stage** and occurring from about 130 000 to 120 000 years BP. It follows the **Saalian Stage** and precedes the **Weichselian Stage**.

- Elbe: a term formerly applied in north-western Europe to an early glacial stage of the Pleistocene Epoch. This term has been superseded by the northern European (Dutch) Menapian Stage, which is assumed to be roughly equivalent to the British Beestonian Stage.
- **Electron spin resonance (ESR)**: a measure of the exposure of calcite speleothem to environmental radiation, which can be used to establish the speleothem's age.
- Elsterian Stage (Elster): a north-west European chronostratigraphical division (stage; see chronostratigraphy); a cold (glacial) stage during the middle Pleistocene Epoch, approximately equivalent to the British Anglian Stage. It follows the European Cromerian Complex and precedes the Saalian Stage.
- **Englacial**: contained or carried within a glacier or ice sheet.
- Ephemeral: short-lived, intermittent.
- **Epiphyte** (adj. **epiphytic**): a plant which does not grow in soil, but lives attached to another plant or inanimate object.
- Epoch: a geological time unit (cf. chronostratigraphy), of shorter duration than a period and itself divisible into ages (e.g. the Late Triassic Epoch; the Pleistocene Epoch).
- Era: a major geological time unit (cf. chronostratigraphy); the geological record is divided into five such units; the Archean, Proterozoic, Palaeozoic, Mesozoic and Cainozoic eras. Each is composed of several Periods.
- **Erathem**: a major chronostratigraphical division (cf. chronostratigraphy) which comprises all the rocks formed during an era.
- **Erosion**: the wearing away of the land's surface by mechanical processes such as the flow of water, ice or wind, or chemical processes such as solution.
- **Erosion surface**: a surface shaped by the processes of **erosion**.
- Erratic: a large clast left behind by melting ice and composed of rock not found locally.
- Esker: a sinuous ridge of sand and gravel deposited by a meltwater stream flowing within a tunnel under a glacier or ice sheet.

Estuarine: relating to estuaries, where a river

opens into the sea or lake.

- **Etchplain**: an extensive **erosion surface**, developed by the rapid lowering, during uplift, of a **peneplain** surface kept at or near base level by the removal of a deep, overlying cover of weathered debris.
- **Eurythermal**: descriptive of a marine organism that can tolerate a wide range of temperatures.
- **Eustatic**: concerning world-wide changes in sea level (as distinct from changes when land locally sinks into or rises from the sea). **Eustatic** changes of sea level may be caused by ice-ages or may reflect periods of major tectonic activity.
- **Eutrophic**: a body of water with high levels in plant nutrients, with correspondingly high productivity.
- **Eutrophication**: the process by which water bodies become **eutrophic**; the artificial or natural enrichment of a lake by an influx of nutrients.
- **Exogenic** (also **exogenetic**): descriptive of a process starting at or near the surface of the Earth, for example **weathering** or **erosion**, and of rocks and landforms that owe their origin to these processes.
- **Extraglacial**: descriptive of glacial deposits formed by meltwater outside the limits of the ice, or of areas never covered by ice.
- Facies: the total characteristics of a rock or sediment, including the rock or sediment type, sedimentary structures (for example bedding), and fossils. Together these features indicate a characteristic environment of deposition.
- Fan: a low-lying accumulation of sediment with a roughly triangular outline. See alluvial fan.
- Fault: a fracture within a rock along that there has been displacement due to tectonic deformation (e.g. earthquakes).
- **Fauna**: animals often referring to the characteristic animal assemblage of a region of time period.
- Fen: a high productivity (mineral-rich nutrients) waterlogged ecosystem (mire), with a winter water table at ground level or above, usually dominated by sedge and an accumulation of peat.
- **Fissure**: a fracture surface or crack within a rock along which a clear separation can be seen. Often filled with material, frequently mineralbearing.

- Fjell: a Norwegian term for field; also an English term for a rocky, elevated, barren plateau above the treeline, covered with snow during the winter.
- Flame structure: a structure with an irregular flame-like shape, formed when an unconsolidated layer of sediment is covered by a layer of denser sediment. The dense material pushes down into the underlying sediment, which is squeezed upwards in 'flames'.
- Flandrian Stage: a European chronostratigraphical division (stage; see chronostratigraphy); the most recent warm (interglacial) stage of the Quaternary Period. It is roughly equivalent to the Holocene Epoch and commenced approximately 10 000 years BP.
- Flaser bedding: cross-laminated sandstones that contain mudstone streaks.
- Flocculation: the effect on water of the bunching of clay particles into aggregates called 'floccules'. It takes place when the repulsive charge that normally exists between clay particles is reduced by the electrolytic action of saltwater, allowing particles to stick together if they collide.
- **Floodplain**: the level surface next to a river that is water covered during times of flood.
- Flora: plants often referring to the characteristic plant assemblage of a region of time period.
- Flowstone: a calcium carbonate rock deposited in caves.
- Flow till: a superglacial till, modified and transported by mass flow from a glacier into a proglacial area.
- Fluvial: relating to a river or river system
- Fluvio-aeolian: relating to the combined action of rivers and wind.
- Fold: a flexure in rocks.
- Foliation: the planar arrangement of minerals, or other textural or structural features in rocks.
- Foraminifer: a single-celled marine animal that has a protective external shell, often with an elaborate form. These micro-organisms are usually less than one millimetre in diameter (a few are larger).
- Foreset: a steeply dipping surface of crossbedded strata; also applied to the large-scale cross strata deposited by rivers in glacial lakes as deltas.
- Foreshore: the outer, or lower, seaward-sloping

zone of a shore or beach. Also applied to the area of land in between a body of water and land that is occupied or cultivated.

- Fossil: the preserved remains of animals and plants.
- Fossiliferous: containing abundant fossils.
- **Frost creep**: the downslope movement of soil or sediment in permafrost areas due to freeze-thaw processes.
- Fuhne ice advance: the first of three ice advances recognized in Scandinavia, which occurred during the northern European glacial Saalian stage.
- **Gabbro:** a coarse-grained, often dark-coloured, basic **plutonic igneous** rock that generally forms large intrusions (**batholiths/plutons**).
- Gastropod: a mollusc with a spiral shell; for example a snail.
- **Gelifluction**: the lateral flow of material under **periglacial** conditions, i.e. **solifluction** in an area underlain by frozen ground.
- Gelivation (gelifraction): frost shattering; the mechanical breakup of rocks and soils due to pressures exerted by the freezing of water in cracks, pores or bedding planes.
- Geomorphology: the study of the landforms and the processes that formed them.
- Gerzensee oscillation: a short-lived, low amplitude climatic oscillation, leading to colder and drier conditions, which has been identified on the Swiss Plateau and in the UK, and dated to approximately 12 000 years BP, towards the end of the last glacial period (the Devensian Stage).
- **Gibbsite**: a white monoclinic mineral formed by the **weathering** of **igneous rocks**, and the principal component of bauxite.
- **Glacial**: relating to the activity and presence of glaciers or ice.
- **Glacial advance**: a time interval marked by an advance or expansion of a **glacier**.
- Glacial age: a subdivision of a glacial epoch.
- **Glacial deposit**: a deposit or **drift** transported by **glaciers** or ice bergs, and deposited directly on land or in the sea.
- **Glacial cycle**: a major climatic oscillation of the order of 100 000 years, during which the ice sheets advanced and subsequently retreated and recurrent at fairly regular times.
- Glacial drainage: the system of meltwater streams flowing from a glacier or ice sheet.

Glacial drift: see glacial deposit.

- Glacial epoch: any period of geological time during which the climate was cold in both the northern and southern hemispheres and ice sheets and glaciers covered a larger total area than those of the present day.
- Glacial erosion: the erosion, by, for example grinding, gouging and scratching, by the movement of a glacier with rock fragments within it, and also by meltwater streams.
- Glacial lake: a lake fed primarily by the meltwater of a glacier, and found beyond the margins of the glacier.
- Glacial maximum: the time or position of the greatest advance of a glacier or ice sheet.

Glacial period: a synonym for glacial epoch.

- **Glacial plucking**: a common mechanical weathering process in glaciated areas where glacial ice frozen into cracks in the bedrock plucks rock material from the valley floor.
- **Glacial recession**: a time marked by a decrease in the size and volume of a **glacier**.
- Glacial refuge (or refugia): a restricted, ice-free area in which plants and animals can or could persist during a time of glacial advance or a glacial epoch.
- **Glacial scour:** the eroding action of a **glacier**. This includes both the removal of material, and the processes of **abrasion**, scratching, and polishing of a rock surface, caused by rock fragments within the **glacier**.
- Glacial stage: a major subdivision of a glacial epoch, for example one of the major cycles of growth and disappearance of the Pleistocene ice sheets.
- **Glacial trough**: a deep, steep sided U-shaped valley leading from a **cirque**, carved by a **glacier** that has widened and deepened a preexisting river valley.
- **Glacial valley**: a U-shaped, steep-sided valley influenced by the presence of glaciers and showing signs of glacial erosion.
- Glaciation: a term to describe the formation, movement and recession of glaciers and ice sheets.
- **Glacier**: a large body of ice formed in part on land by the compaction of snow, which moves slowly by **creep** downslope, or outwards in all directions under the influence of gravity.

Glacier advance: see glacial advance.

**Glacier flow:** the slow outward or downward movement of the ice in a glacier under the force of gravity.

Glacier ice: descriptive of any ice that was once

part of a glacier.

Glacier lobe: a large rounded projection from the margin of a glacier or ice sheet.

Glacier outburst flood: a sudden release of meltwater from a glacier or a glacierdammed lake, which may result in flooding; see also jökulhlaup.

Glacier recession: see glacial recession.

- **Glacier surge**: a period of very rapid flow of a glacier, usually lasting no longer than a few years.
- **Glacio-aqueous**: resulting from the combined action of water and ice.
- **Glacio-eustatic**: relating to changes in sea level due to seawater being 'locked up' in ice sheets and vertical movements of the crust due to loading and unloading of the crust by the weight of the **ice sheets**.
- Glacio-fluvial: relating to the meltwater streams that flow from melting glacier ice, and to the deposits and landforms created by such streams, for example outwash plains.
- **Glaciokarst**: a limestone landscape which has been glaciated.
- Glaciogenic: of or relating to glaciers and glaciations.
- **Glacio-isostasy**: crustal movements associated with the addition and removal of **glaciers**.
- Glacio-lacustrine: relating to glacial lakes.
- **Glaciology:** the study of all aspects of **glaciers**, snow and ice.
- **Glaciomarine sediments**: glacially eroded, terrestrially derived **sediments** (**clay**, **silt**, **sand**, and **gravel**) deposited in the marine environment. The sediments may accumulate by ice rafting, as an ice-contact deposit or by **aeolian** transport.
- Glaciotectonic: the deformation of rocks or sediments caused by glacial movement.
- Gley: the product of waterlogged soil conditions, often represented by colour mottling.
- **Gneiss**: a coarse-grained, inhomogeneous metamorphic rock, formed at high temperatures and pressures, characterized by a coarse foliation or layering of light and dark bands, more widely spaced, irregular, or discontinuous than in a schist.

Goethite: a hydrated iron oxide mineral.

- **Graben**: a linear block of crust downthrown between two parallel **faults** to produce a rift or trough.
- **Graded bedding**: beds that show a change in grain size through the bed. Normal graded bedding is a fining upwards sequence. In

reverse graded bedding, the grain size coarsens upwards.

- Granite: a pale-coloured, coarse-grained plutonic igneous rock, commonly occurring as large intrusions but also found in veins.
- **Gravel**: sedimentary particles with a diameter of between 2 and 4 mm.
- **Gravity anomaly**: the difference between the observed value of gravity at a location and a theoretically calculated value.
- Greywacke: a poorly sorted, clastic sedimentary rock composed of fragments of rocks and crystals and sand set in a clay-rich matrix.
- Grike: a fissure in a limestone pavement, formed by dissolutional enlargement of a joint.
- Gritstone: a hard, coarse-grained sedimentary rock.
- **Groundwater recharge:** the recharging of groundwater by water collected above an impermeable material which creates a saturation zone (the upper level of which is the water table).
- **Grus**: the fragmental by-products formed by the granular disintegration of granitic or sand-stone rocks.
- **Gypsum:** a white or colourless calcium suphate mineral ( $CaSO_4.2H_2O$ ) often associated with evaporite deposits.
- Gyttja: a dark mud, pulpy in texture and rich in organic matter. Found in marshes or lakes whose waters are rich in nutrients and oxygen.
- Haematite: an iron oxide  $(Fe_2O_3)$  often used as a source of iron ore.
- Halleflinta: a no-longer used term for a finegrained quartz- and feldspar-rich metavolcanic rock, often rhyolitic.
- Hanging valley: a tributary valley whose floor is higher than the floor of the main valley. Usually the result of glaciation.
- Holocene Epoch: a geological time division (epoch; cf. chronostratigraphy); the most recent global epoch, which began approximately 10 000 years BP. It is roughly equivalent to the European Flandrian Stage.
- Honeycomb weathering: a form of chemical weathering in which numerous pits occur on a rock exposure, causing the surface to look similar to a large honeycomb. It typically occurs in arid or coastal regions, affecting granular rocks such as sandstones and tuffs.

Hoxnian Stage: a British chronostratigraphical division (stage; cf. chronostratigraphy); a warm (interglacial) stage during the middle Pleistocene Epoch, equivalent to oxygen isotope stage 9 and occurring between about 250 000 and 200 000 years BP. It follows the Anglian Stage.

Humic: derived from or referring to humus.

- **Hummocky moraine**: an undulating landscape, formed along an active ice front, or where masses of stagnant ice have melted out in a moraine landscape.
- **Humus**: the dark organic content of a soil, generally so well decomposed that its origin cannot be determined.
- Hydrosere: a sere developed in an aquatic environment.
- Ice Age: a name often applied to the Pleistocene Epoch during which large areas were repeatedly covered by ice sheets and glaciers.
- **Iceberg**: a piece of ice that has been detached from the main body of a glacier or ice sheet into a body of water.
- Ice cap: an area of ice, smaller than an ice sheet, occurring in the polar regions and high mountain areas.
- Ice-contact slope: an irregular scarp against which glacier ice once rested.
- **Ice floe**: an extensive sheet or large fragment of ice, floating freely in water.
- **Ice-rafted**: descriptive of material deposited by the melting of a **glacier** or **ice sheet** which contained it.
- Ice-rafting: the transportation of rock fragments of all shapes and sizes on icebergs and ice floes, and the subsequent deposition in the sea from the melting of the ice.
- Ice sheet: a very large area of ice, such as those covering much of Greenland and Antarctica in the present day. During the **Pleistocene Epoch**, ice sheets covered much of the Northern Hemisphere.
- Ice-wedge: a massive wedge-shaped body of banded ice formed in a **permafrost**, which occurs as a vertical structure and tapers downwards. Formed by seasonal freezing and thawing of ice and **sediment** and the pressures exerted by its resultant expansions and contractions.
- Ice-wedge cast: a sedimentary structure formed by the filling of the space previously occupied by an ice wedge that has melted.

- Ice-wedge polygon: a large polygon formed by the borders of intersecting ice-wedges.
- **Igneous rock**: a rock that has formed from molten rock (magma), either by volcanic activity or intrusive processes. It consists of interlocking crystals, the size of which depends on the rate of cooling of the magma.
- **Ignimbrite**: a rock, typically silica-rich and pumiceous, formed by deposition from a **pyroclastic** flow; may partly or wholly comprise welded tuff.
- Ilfordian Stage: a British chronostratigraphical division (stage; see chronostratigraphy); a warm (interglacial) during the middle Pleistocene Epoch, equivalent to oxygen isotope stage 7 and occurring after about 200 000 years BP. It follows the Hoxnian Stage.
- **Imbrication**: a sedimentary fabric displaying typically elongate fragments that are aligned in a preferred angle to the bedding, usually indicative of the direction of transport.

Interfluve: the area between rivers.

- **Interglacial**: a period of relatively warm climate between two episodes of **glaciation** where ice is in retreat.
- Interstadial: a relatively short period within a major phase of glaciation when ice was not advancing and conditions were comparatively warm, although trees did not migrate back into the country.
- **Intertidal**: littoral; the zone between high- and low-water marks on a shoreline.
- **Involution**: an irregular, contorted, complex sedimentary structure, caused by the formation, growth and melting of ground ice.
- **Ipswichian Stage:** a British chronostratigraphical division (**stage**; see **chronostratigraphy**); a warm (**interglacial**) stage during the middle **Pleistocene Epoch**, approximately equivalent to the north-west European **Eemian Stage**, and occurring between about 135 000 and 115 000 years BP. It follows the **Wolstonian Stage** and precedes the **Devensian Stage**.
- **IRM** (isothermal remanent magnetization): the remanence produced in a sample by the application and subsequent removal of a known magnetic field.
- **Iron Age:** an archaeological cultural division, designated in the **Three-Age System** as following the **Stone Age** and the **Bronze Age**, and characterized by a general shift to the use of iron as the main material for tools. The

timing of this division varies from region to region, but is considered to have occurred in Europe around 3000 years BP.

**Iron pan:** a thin layer of concentrated iron that forms in soils (podsols) and may be preserved in **palaeosols** and other sedimentary sequences.

Isochrones: lines of equal age.

- **Isostasy:** the condition of equilibrium, comparable to buoyancy, of the Earth's crust 'floating' in the aesthenosphere. Crustal loading, for example by ice, water or volcanic flows, leads to isostatic depression, and the crust sinks deeper into the aesthenosphere. The removal of weight leads to isostatic uplift or rebound, and the crust rises.
- **Isotope analysis:** a study of the relative abundances of usually two forms of an element having the same atomic number but different atomic weights, such as <sup>18</sup>O and <sup>16</sup>O. The relative abundances of certain of these isotopes may be related to the climatic conditions, in which they were produced, and therefore they can be used to investigate past environments.
- Joint: a fracture in a rock that exhibits no displacement across it (unlike a fault). May be caused by shrinkage of igneous rocks as they cool in the solid state, or, in sediments, by regional extension or compression of sediment caused by Earth movements.
- Jökulhlaup: an Icelandic phrase for a glacier outburst flood.
- Jurassic Period: a geological time division (period; cf. chronostratigraphy); ranging from about 208 to 145.6 million years ago, it precedes the Cretaceous Period.
- Kame: a mound of stratified sand and gravel originally deposited on top of, or at the margin of, a glacier or ice sheet by meltwaters, and remaining as a topographic feature after the ice has melted.
- Karren: small dissolution features formed on limestone outcrops and on limestone surfaces beneath a soil cover; dominated by channels or runnels, mostly 10–500 mm deep, which are entrenched to leave sharp or rounded intervening ridges; originally a German term but now used throughout international literature.
- Karst: a distinctive terrain created by erosion of a soluble rock, where the topography and

landforms are a consequence of efficient underground drainage; characterized by caves, **sinkholes** and dry valleys and mainly developed on **limestone**.

- Kettlehole: a depression in glacial or glaciofluvial sediments, resulting from the melting of a mass of glacier ice that was buried in sediment.
- Lacustrine: relating to, formed within in, or produced by, lakes.
- Lamina (pl. laminae): the finest layer within a sedimentary rock, typically less than 1 cm thick.
- Larvickite: an alkali-rich syenite
- Last Glacial Maximum: the time of the last great glacier advance, when ice sheets and glaciers reached their maximum thickness and extent. Dated to between 22 000 and 18 000 years BP, and often assumed to be equivalent to the Dimlington Stadial.
- Late-glacial: relating to the time of the end of the last glaciation of the Pleistocene Epoch, part of the Devensian Stage.
- Lateral moraine: a ridge-like moraine, built along on the side margin of a glacier, formed mainly from valley-side rockfall sediment.
- Leach: to dissolve or remove material from a soil or rock.
- **Lead-210 dating** (<sup>210</sup>**Pb dating**): a method of calculating an age by determining the lead content.
- Levee: a broad ridge alongside a river or stream, deposited by floodwaters when they overtop the channel banks.
- Lignite: a brown coal formed from peat under moderate pressure having a low calorific value, typically of Tertiary age
- Limestone: a sedimentary rock composed of calcium carbonate (calcite), often derived from the shells of organisms.
- Limestone pavement: a bare limestone surface produced by solution processes that enlarge joints to produce horizontal flat areas ('clints') and clefts ('grikes'); usually fretted by karren landforms.
- **Limnic**: referring to or relating to a body of fresh water, such as a lake.
- Limnology: the study of the characteristics of all inland waters, such as lakes, wetlands, rivers and bogs.
- Lipid: a class of molecules consisting of fats, oils and waxes that contain fatty acid chains. A

major component of the cells of plants and animals.

- Lithofacies: a facies defined by sedimentary rock type (using, for example, colour, texture and mineral composition).
- **Lithology:** descriptive of the constitution of a **sediment** or a rock, including texture, composition and colour.
- Lithostratigraphy: the determination of the stratigraphical relationships between rocks based on their lithology. Units are named according to their perceived rank in a formal hierarchy, namely Supergroup, Group, Formation, Member and Bed.
- Little Ice Age: a brief cool interval in the Middle Ages (1400 to 1900 AD), during which temperatures were between 1°C and 2°C lower than the present day.
- Little Climatic Optimum: a brief warm and dry interval in the Middle Ages (1100 to 1300 AD), which occurred prior to the Little Ice Age.
- Littoral: 'seashore'; the zone between high- and low-water marks on a shoreline.
- Load structure: a protuberance of sand or coarse clastic material that extends downwards into a finer-grained, softer underlying material such as wet **mud** or **clay**. Produced by downsinking and unequal settling and compaction of the overlying material.
- Loch Lomond Stadial: a term used primarily in Britain to describe a short-lived climatic deterioration, or stadial event, which occurred about 10 500 years BP, towards the end of the last glacial period (the Devensian Stage). It is equivalent to the European Younger Dryas.
- Loess: a fine-grained sediment of windblown silt and clay, largely derived from cold **periglacial** deserts, or from reworking by wind of the fine components of glacial sediments.
- Lodgment till: a glacial deposit laid down underneath an ice sheet or valley glacier. It is usually clay-rich and contains boulders.
- Loss on ignition: a method for estimating the organic and carbonate content in sediments, by burning the material at high temperatures.
- Macrofossil: a fossil that is easily seen by the naked eye.
- Macrophyte: a plant that can be seen by the naked eye, typical of aquatic regions.
- Magnetic mineral analyses: the measurement of the magnetic properties of a material.

Includes **magnetic susceptibility**, declination, inclination, isothermal remanent magnetization (**IRM**) and 'hard' IRM (HIRM).

- Magnetic susceptibility: a measure of the inherent magnetism of a rock, sediment or soil. It is measured by comparing the ratio of induced magnetization to the strength of the magnetic field causing the magnetization. It can be used to investigate the textural, mineralogical and chemical properties of the medium being measured.
- Marine regression: the withdrawal of the sea from large areas of land due to a fall in sea level relative to the land.
- Marine transgression: the encroachment of the sea across large areas of land, due to either a rise in sea level, or subsidence of the land.
- Marker horizon: a distinctive layer or rock in a body of rock that may help to distinguish between lithostratigraphical units.
- Marl: a very fine-grained calcium carbonate-rich mud or clay.
- Mass wasting: the dislodging and transport of soil and sediment due to gravity. Processes include solifluction and rock falls.
- Matrix: the sediment, usually very fine grained, which infills the spaces between larger grains.
- **Meltwater**: water produced by the melting of snow and ice.
- Meltwater plume: a two- or three-dimensional plume-shaped body of water caused by the mixing of the flow entering a lake or the sea from a glaciated basin, with turbulent eddies along the inflow margins. The shape and velocity patterns within the plume are governed by the discharge and velocity of the incoming water, channel shape, suspended sediment concentration and the density differences between the inflow and surrounding waters and the density stratification in the water.
- Mere: a shallow lake, notably formed by flooding of a subsidence depression in the salt karst of Cheshire, or by ice melting to form kettleholes.
- **Mesolithic**: an archaeological term to define the middle division of the **Stone Age**, following the **Palaeolithic** division and preceding the **Neolithic** division. It is characterized by a broad use of food resources and localized populations, and is broadly dated from about 12 000 to 10 000 years BP.

- Mesozoic Era: a geological time division (era; cf. chronostratigraphy); ranging from about 250 to 65 million years ago, it comprises the Triassic, Jurassic and Cretaceous periods.
- Metamorphic rock: a rock that has been altered by the action of heat and/or pressure, without melting.
- Metamorphism: the process of alteration of igneous rocks and sedimentary rocks by increases in pressure and/or temperature within the Earth's crust.
- **Meteoric water**: groundwater of atmospheric origin, which reaches the Earth's surface as precipitation.
- Microfauna: a microscopic animal assemblage. Microfossil: a microscopic fossil.
- **Microgranite**: a type of **granite** with characteristically small crystals.
- Miocene Epoch: a geological time division (epoch; cf. chronostratigraphy); ranging from about 23 to 5.3 million years ago, it is the fourth of the epochs of the Tertiary Period. It follows the Oligocene Epoch and precedes the Pliocene Epoch.
- **Misfit river**: a river, small in size in comparison to the size of the valley in which it is found.
- Mire: a small area of marshy or boggy ground.
- **Mollusc:** a group of invertebrate animals with shells that includes gastropods, bivalves, ammonites and belemnites.
- Monocline: a localized steepening of beds in an otherwise gentle dip sequence.
- Monolith: a fragment of unfractured bedrock generally greater than a few metres in size.
- Moraine: a ridge of unsorted, unstratified glacial till deposited on top of or at the margins of a glacier or ice sheet.
- **Mottled**: descriptive of a **sediment** that has irregular patches of colour.
- Moulin (glacier mill): a vertical shaft in a glacier, formed by the erosion by surface debris and water, when surface streams reach a crevasse and plunge down.
- Mousterian: an archaeological term referring to a period of European culture during which a wide variety of specialized tools, such as spear points, were developed. Part of the Palaeolithic division of the Stone Age, it follows the Acheulian period. Approximate dates suggest it occurred from 70 000 to 30 000 years BP.

Mud: a mixture of silt and clay-sized particles. Mudstone: a very fine-grained rock.

Mutual Climatic Range (MCR) method: a

## Glossary

method of investigating past climatic and environmental change using the climatic ranges for beetle (coleoptera) species found both in the present day and in fossil assemblages. By establishing the climatic ranges of these beetles, climatic conditions are inferred for the past by considering the overlap of the climatic ranges of the species found in a fossil assemblage.

- Namurian Stage: a chronostratigraphical division (stage; cf. chronostratigraphy); equivalent to the early part of the Upper Carboniferous Series in Europe. It follows the Dinantian Stage, and precedes the Westphalian Stage.
- Neogene Period: a geological time division (period; cf. chronostratigraphy); incorporating the Miocene and Pliocene epochs, it is equivalent to the upper Tertiary Period.
- Neolithic: an archaeological term to define the last division of the Stone Age, following the Palaeolithic and Mesolithic divisions. It is characterized by the use of ground and polished tools, the manufacture of pottery and the practice of farming, and is broadly dated to after approximately 10 000 years BP.
- Nivation (snow patch erosion): the work of periglacial processes associated with a snow patch, including frost shattering and gelifluction, which can form characteristic landforms such as nivation hollows, terraces, benches and ledges.
- Nordmarkite: a red, quartz-bearing alkali syenite.
- Nunatak: a mountain peak that projects above surrounding ice sheets and is subjected to intense frost action but is not scoured by glacial erosion.
- Older Dryas: a term used primarily in Europe to describe a short-lived climatic deterioration, characterized by tundra and the expansion, or restricted retreat, of glaciers. It occurred approximately 11 500 years BP, towards the end of the last glacial period (the Devensian Stage), following the Bølling Interstadial and prior to the Allerød Interstadial.
- **Oligotrophic**: lacking in the nutrients required by plants.
- **Ombrogenous**: usually descriptive of a peat that receives all its moisture from precipitation and rain water. It is often highly acidic

and low in plant nutrients, mineral matter and nitrogen.

- **Ombrotrophic:** term meaning 'nourished by rain', which refers to areas exclusively dependent on nutrients derived from precipitation. Usually descriptive of a peat whose nutrient supply is exclusively from rain water, making it very **oligotrophic**. See also **ombrogenous**.
- **Optical Luminescence dating**: a dating technique whereby instead of the luminescence signal being stimulated by the application of heat (thermal luminescence), an optically stimulated luminescence signal is measured while the mineral is exposed to photons of visible or infra-red electromagnetic radiation. Useful for dating sediments which have received a relatively short light exposure at deposition.
- **Organic**: descriptive of **fossil** remains made up of materials such as cellulose, chitin or keratin but often oxidized to carbon.
- **Orogeny:** a process of mountain building during which the rocks and **sediments** of a particular area of a continent are deformed and uplifted to form mountain belts. Although these processes take a long time they can be distinguished as recognizable and discrete phases in Earth history and are named accordingly, for example the **Alpine Orogeny**.
- **Ostracod**: a class of crustaceans with two calcareous valves. Most are less than 1 mm in size.
- Outwash: load-debris and sediment, often stratified, which is removed from a glacier by meltwater streams and deposited in front of the glacier.
- Outwash fan: a fan-shaped accumulation of outwash.
- Outwash plain: a gently sloping, broad sheet of outwash.
- **Overflow channel**: a channel cut by the overflow waters from a lake, particularly a channel draining **meltwater** from a glacially dammed lake.
- Oxygen-isotope analysis: see isotope analysis.
- Oxygen isotope stages (OIS): the subdivision of the Pleistocene Epoch into a series of glacial-interglacial oscillations numbered from the top (the present day, or stage 1) downwards based on oxygen isotope analysis, which has enabled the identification of these glacial/interglacial stages.

Palaeobotany: the study of ancient plants.

- Palaeochannel: an ancient (occurring in geological time) channel.
- Palaeoclimatology: the study of ancient climates.
- Palaeocurrent: a current-direction from an ancient fluvial flow.
- **Palaeoecology**: the study of the relationships between ancient organisms and their environments.
- Palaeoenvironment: an environment older than the recent.
- Palaeokarst: a fossil karst landform assemblage.
- Palaeolithic: an archaeological term to define the first division of the Stone Age, prior to the Mesolithic and Neolithic divisions. It is characterized by the first use of stone tools and is broadly dated from about 2.5 million years ago to 12 000 years BP.
- **Palaeomagnetism**: the study of magnetism, used to consider the intensity and direction (polarity) of the Earth's magnetic field.
- Palaeontology: the study of fossil animals and plants.
- Palaeosol: an ancient or 'fossilized' soil.
- Palaeotemperature: the average temperature at a given place or time in the geological past.
- Palaeozoic Era: a geological time division (era; cf. chronostratigraphy); ranging from about 540 to 245 million years ago, it precedes the Mesozoic Era.

Paludal: referring to or relating to marsh.

- **Paludification**: the formation of peat due to a change in environmental conditions.
- **Palynology**: the study of **fossil** or preserved pollen enabling reconstructions of **palaeo**-environments.
- **Palynomorph**: a small, walled organic body, such as pollen or spores.
- **Palynozone:** 'pollen zone'; a biostratigraphical subdivision characterized by an assemblage of organic-walled **microfossils** such as pollen and spores.
- **Paraglacial**: usually descriptive of a particular phase between **glacial** and **interglacial** conditions, immediately after deglaciation.
- Pastonian Stage: a British chronostratigraphical division (stage; cf. chronostratigraphy); a temperate (interglacial) stage of the early Pleistocene Epoch and occurring about 600 000 years BP. It follows the Baventian Stage and precedes the Beestonian Stage.

Pea-shingle: a clean gravel, the individual par-

ticles of which are similar in size to peas.

- **Peat:** an unconsolidated deposit of semicarbonized plant remains in a water saturated environment, such as a **bog** or **fen**.
- **Pebble**: a fragment of rock with a diameter of between 4 and 64 mm.
- **Pedestal**: a thin neck or column of rock topped by a wider mass, produced by undercutting due to **wind abrasion** or differential **weathering**.
- **Pediment:** a plain of eroded bedrock, occasionally covered by a thin layer of **sediment**, characteristic of **sedimentary basins** in arid and semi-arid areas.
- **Pediplain**: an extensive, thinly covered erosion surface in a desert region, formed by the coalescence of two or more **pediments**.
- **Pedogenesis:** the origin and formation of soils.
- **Peneplain:** a virtually flat and featureless landscape of considerable size, caused by prolonged weathering and erosion, especially mass-wasting and sheetwash.
- **Periglacial:** a zone or environment peripheral to **glaciers**, so that it is very cold but is not covered by ice sheets; it is characterized by the frozen ground known as **permafrost**.
- **Periglacial activity**: in a region adjacent to a **glacier**, processes that occur as a result of either intense frost action, or the presence of permanently frozen ground, or both; now generally applied to frost processes.
- **Perimarine**: descriptive of the sedimentary facies of a lowland area protected by barrier islands, which may consist of fluvial, lagoonal and peat deposits.
- **Period**: a geological time unit (cf. chronostratigraphy); of shorter duration than an era and itself divisible into epochs.
- **Permafrost**: permanently frozen ground within a **periglacial** environment; may extend to more than 100 m deep, but the active layer of the top few metres thaws each summer and then refreezes in winter.
- **Permian Period**: a geological time division (**period**; cf. **chronostratigraphy**); ranging from about 290 until 250 million years ago, it follows the **Carboniferous Period** and precedes the **Triassic Period**.
- Phreatic: relating to the water table; groundwater.
- **Phreatic tube**: a tubular cave passage formed by almost equal dissolution of the walls, ceiling and floor, while full of water within the

phreatic zone; abandoned tubes are common and may be filled with sediment.

- **Phreatic zone**: the saturated zone of the ground, below the **water table**, where all pore spaces, fissures and caves are filled with groundwater.
- **Phytophagous**: descriptive of an organism that feeds on plants.
- **Phytoplankton**: plant forms of **plankton**, for example **diatoms**. They are often microscopic and with limited powers of locomotion, so mainly dispersed by wind and tide.
- **Piedmont**: an area at the base of a mountain or mountain range linking to the lowlands.
- **Piedmont glacier**: a glacier formed where a valley glacier flows onto lowland and expands after travelling through a bedrock trough. Radial crevasses will generally be evident, relating to the spreading of the ice.
- **Pingo:** a large frost mound, caused by extensive ground ice cover.
- **Pioneer:** in ecology, a species or community that establishes itself in a previously barren area and therefore begins a new ecological cycle.
- **Planation**: the process of **erosion** by which the surface undergoing erosion becomes flat or level.
- **Planation surface:** a term used in Britain to describe a fairly flat plain resulting from prolonged **erosion** by rivers, slope processes, marine erosion, or other types of erosional activity.
- **Plankton**: minute aquatic organisms that drift with water movement.
- **Planktonic:** belonging to the plankton, those generally small organisms that drift in water bodies and have limited powers of locomotion.
- **Pleistocene Epoch:** a geological time division (epoch; cf. chronostratigraphy); the first epoch of the Quaternary Period. It is composed of alternations of great cold with stages of relative warmth and sometimes referred to as the 'Ice Age'.
- **Pleniglacial**: the full glacial phase of a palaeoclimatic cycle.
- **Plinthite:** a material consisting of clay and quartz found in a soil that is poor in humus and highly weathered. It often occurs as red mottles in a polygonal pattern.
- **Pliocene Epoch**: a geological time division (epoch; cf. chronostratigraphy); ranging from about 5.3 until 1.6 million years ago, it is

the last division of the Neogene Period, and precedes the Pleistocene Epoch of the Quaternary Period.

- **Ploughing block** (or **boulder**): a boulder located at the downstream end of vegetationcovered furrows, indicating downslope boulder movement at a rate exceeding that of the surrounding soil.
- **Ploughmark**: a curved, flat-bottomed trough of furrow formed as grounded icebergs are dragged over a lake or sea floor by currents.
- **Pluton**: an intrusion of **igneous rock** emplaced at depth in the Earth's crust. Shape, size and composition are variable.
- **Plutonic**: descriptive term for **igneous** bodies that have crystallized at depth and commonly have coarse grain sizes.
- **Pocket valley**: a **valley** with a head enclosed by steep sides at the base of which water emerges from underground from a spring.
- **Podsol** (**Podzol**): a soil where the minerals have been leached from its surface layers into the lower layers.
- **Podsolization**: the process by which a soil becomes more acidic and develops surface layers that are leached of **clay**.
- **Polje**: a large **karstic** depression with a flat floor and sharp breaks of slope to its rock walls.

Pollen zone: see palynozone.

- **Porphyry:** a field term for an **igneous rock** that contains large phenocrysts within a finegrained groundmass of indeterminate composition; usually preceded by a mineral qualifier indicating the type of phenocryst present; e.g. feldspar porphyry.
- **Postglacial**: referring to the time interval since the total disappearance of **glaciers** at middle latitudes.
- **Pre-Boreal period**: a term primarily used in Europe to describe an interval of the **Holocene Epoch** that extends from about 10 000 to 9000 years BP. It follows the **Younger Dryas** and precedes the **Boreal period**, and is characterized by a climate generally colder and wetter than during the boreal period, and birch and pine vegetation.
- **Preglacial**: referring to the time prior to a **glacial** period. Also said of material underlying glacial deposits.
- **Proglacial**: in front of, or just beyond the margin of an advancing or retreating **glacier**. Also

said of features and deposits produced by or derived from glacier ice.

- **Projected profiles**: a cartographic technique involving the drawing of cross-sections to provide a panoramic and pictorial view of the landscape and landforms, enabling the identification of consistent flatter areas. Consists of a complete first cross-section, with parallel sections behind the first only being drawn in so far as they project above the earlier sections.
- **Protalus rampart**: a curved ridge of angular, large blocks of rock derived by single rock falls from a cliff or steep, rocky slope above, which marks the edge of a snowbank.
- **Protozoan** (pl. **protozoa**): any unicellular and microscopic organism of the phylum Protozoa. Includes flagellates, which have plant and animal affinities, and organisms that secrete calcareous or siliceous skeletons (foraminifera, radiolaria).
- **Proxy record**: a climatic record inferred from the types of flora and fauna – or their features – present in a sequence, such as pollen, treerings, diatoms or beetles.
- **Pteridophyte:** a generalized term used for those vascular plants, including ferns, horsetails and club mosses, that reproduce by spores.
- **Pyrite:** a widespread, naturally occurring iron sulphide mineral,  $FeS_2$ , which often results from the biochemical action of bacteria within **anaerobic** environments, and may be oxidized to form corrosive sulphuric acid.

**Pyritize**: to alter to the mineral **pyrite** ( $FeS_2$ ).

- **Pyroclastic**: a term denoting the volcanic origin of fragments such as glass shards, euhedral or fragmented crystals, 'accidental' or 'cognate' lithic blocks, generated as a direct result of explosive volcanic action.
- **Quartz**: a mineral composed entirely of silica. (SiO<sub>2</sub>), the most common mineral in the Earth's crust.
- Quartzite: descriptive of both an arenaceous rock composed primarily of quartz and a metamorphic rock formed from more or less pure quartz sandstones.
- Quaternary Period: a geological time division (period; cf. chronostratigraphy); ranging from about 1.6 million years ago to the present day, it is the latest period of geological time, and the second period of the Cainozoic

Era. It is divided into two epochs, the Pleistocene and the Holocene.

- Racemization age method: a method of dating rocks or minerals using amino acids.
- **Radiocarbon dating**: a method of radiometric dating by measuring amounts of carbon-14 within organic material. The method is based on the assumption that upon removal from the Earth's carbon cycle (for example when an organism dies), carbon-14 production stops, and therefore a closed system is formed and relative abundances of stable and radioactive carbon can be measured.
- **Radiometric age**: the age in years calculated from the decay of radioactive elements.
- Radiometric dating: methods of dating certain rocks or minerals using the relative abundances of radioactive and stable isotopes of certain elements, together with known rates of decay of radioactive elements. Radiocarbon dating can extend back to only 50 000 years, but other elements (potassium, lead, uranium) can be used to obtain dates of the order of tens to thousands of millions of years.
- **Radiometric**: a general term used for those techniques that measure isotopic abundances in whole rocks or component minerals.
- **Rainwash**: the movement of loose material along the ground by rainwater.
- **Raised beach**: a former beach now situated above the level of the present shoreline as a result of Earth movement (uplift), or changes in global sea level or land. See **isostasy** and **eustatic**.
- **Recurrence horizon (Grenzhorizont):** a horizon in a peat bog succession where the differences in peat type and colour may reflect a periodic drying out of the bog surface and recurring growth; i.e. representing a climatic change from drier to wetter conditions.
- **Regolith:** descriptive of the unconsolidated fragmented material covering **bedrock**. It can include both **allochthonous** and **autochthonous** material.
- Relative age: the age of a formation, rock, fossil or event defined relative to other formations, rocks, fossils or events, rather than in years before present.
- **Relict**: descriptive of a geological feature surviving in its earlier form.

Remanent magnetization: the component of a

rock's magnetization that has a fixed direction relative to the rock.

- **Rhyolite**: a fine-grained extrusive **igneous rock** (lava) with the same chemical and mineralogical composition as **granite**.
- **Riparian Wetland**; a wetland close to the bank of a stream or river.
- **Ripple**: a small-scale undulation in **sediment** produced by the movement of air or water over the **sediment** surface.
- **River valley**: a valley or elongate depression formed by a river during its development.
- **Rock flour**: very fine-grained, angular, **silt** and **clay** sized material formed by crushing. Often applied to the fine-grained material formed when stones in a **glacier** erode the underlying rocks.
- Roddon: an East Anglian term for a natural levee built of sediment carried upstream by the tide rather than downstream by a current.
- Ruderal: descriptive of a plant growing on or in rubbish or rubble.
- Saalian Stage (Saale): a north-west European chronostratigraphical division (stage; cf. chronostratigraphy); a cold (glacial) stage during the middle Pleistocene Epoch, equivalent to oxygen isotope stage 10 and the British Wolstonian Stage. It follows the Holsteinian Stage and precedes the Eemian Stage.
- Sand: typically material that is smaller than a granule and larger than silt. It has a grain size of between 0.625 mm and 2 mm.
- Sandbank: a large, often submerged, deposit of sand, especially found near the shore.
- Sand-blasting: a weathering process in which an exposed rock is eroded by a stream of windblown sand. It often leads to ventifacts.
- Sandstone: a sedimentary rock composed of lithified sand grains.
- Sandur (pl. sandar): a widely used Icelandic term generally synonymous with outwash plain.
- Saprolite: a soft, often red or brown, earthy clay rich decomposed rock, formed in place by chemical weathering, and often forming a layer of cover, up to 100 m thick, in humid environments. It is characterized by its retention of some of the structures that were present in the rock from which it was derived.
- Scar: a steep, rocky eminence or cliff where bare rock is prominently exposed.

- **Scarp**: a line of cliffs or a steep clifflike slope rising above the surrounding land that has been produced by faulting or erosion.
- Schist: a coarse-grained metamorphic rock that displays a strong foliation (schistosity) that is often defined by mica alignment.
- **Scour mark**: a mark produced by the scouring and cutting action of water flowing over the underlying sediment surface.
- Scree: see talus.
- Secular variation: slow changes in the orientation of the Earth's magnetic field, measured in years, decades and centuries, which appear to be long term and internal in origin.
- Sediment: loose material derived from the weathering and erosion of pre-existing rocks, biological activity (e.g. shells and organic matter) or chemical precipitation (e.g. evaporites).
- Sedimentary basin: a large-scale depression that acts as a focus for sediment accumulation.
- Sedimentary rock: a rock composed of sediments, deposited by wind, water or ice.
- Sedimentary structure: any structure of a sediment that was formed at the time of deposition; includes bedding, cross bedding, graded bedding, ripples, scour marks and dessication cracks.
- **Sedimentology**: the study of sediments and sedimentary rocks, including their deposition, structure and composition.
- Seismic stratigraphy: the study of stratigraphy and depositional facies through the interpretation of seismic data.
- Sequence: in stratigraphy is used both in a general way to mean a succession of strata, and in a particular technical way to refer to a body of strata bounded below and above by unconformities (a 'sedimentary sequence').
- Sere: a sequence of ecological communities that develop and succeed one another from the **pioneer** to the **climax community**.
- Series: a chronostratigraphical division (see chronostratigraphy); it comprises all the rocks formed during an epoch and can be divided into stages.
- Set: an individual bed of cross-bedded sediment.
- Shale: a fine-grained sedimentary rock composed predominantly of clay, that splits easily into thin layers.
- **Shear structure**: a rock structure caused by shearing.

- Sheet flood: a short-duration flood that spreads over a large area as a broad, thin, continuous film rather than being concentrated in a channel.
- **Sheetwash**: the material transported and deposited by a **sheet flood**.
- **Shingle**: rounded pebbles of various sizes but generally fairly coarse in size.
- **Sill**: a tabular body of **igneous rock**, originally intruded as a sub-horizontal sheet and generally concordant with the bedding or foliation in the country rocks.
- Silt: a fine-grained sediment size range.
- Siltstone: a rock made of silt.
- **Sinkhole**: a funnel or saucer-shaped surface depression produced by the solution of surface **limestone** or the collapse of underground caverns.
- SIRM (saturation isothermal remanent magnetization): the highest amount of magnetic remanence that can be produced in, and retained by, a sample as a result of its emplacement in a strong magnetic field at a given temperature (usually room temperature).
- Slickenslides: parallel scratch marks made on a rock surface by the relative movement of rocks along fault planes.
- **Solifluction**: the slow downslope movement of saturated sediment or soil debris, occurring most commonly in **periglacial** environments (synonymous with **gelifluction**).
- **Sorting**: the distribution of grain sizes. A wellsorted rock will have a narrow range of grain sizes.
- **Speleothem**: a general term for all cave mineral deposits, mostly formed of calcite by precipitation from lime-saturated groundwater.

Spillway: see overflow channel.

- **Spring:** the point where underground water emerges onto the ground surface from any aquifer; the largest springs are mostly the outlets from **limestone** caves.
- **Spur**: a subordinate ridge or rise that projects sharply from the crest or side of a larger elevation feature such as a hill or mountain.
- Stade (stadial): a substage of a glacial stage marked by a glacial readvance.
- Stage: a chronostratigraphical division (see chronostratigraphy); it comprises all the rocks formed during an age, and is usually taken to be the smallest standard division.

Star dune: a sand dune with a complex star-

shaped morphology.

- **Steppe:** a flat, extensive, treeless grassy plain, typically found in the semi-arid mid-latitudes of south-eastern Europe and Asia.
- Stone Age: an archaeological cultural division, designated in the Three-Age System as preceding the Bronze Age and the Iron Age, and characterized by the use of basic stone tools. The timing of this period varies from region to region, but it ended approximately 5000 years BP.
- **Stone polygon**: a form of patterned ground characterized by a polygonal mesh, which has a sorted appearance resulting from a border of stone surrounding finer-grained material.
- **Stone stripes**: a form of patterned ground characterized by downslope trending parallel bands of coarse rock debris alternating with wider bands of finer-grained material.
- Stratum (pl. strata): a bed, or single layer, of a sediment.
- **Stratigraphical unit**: a body of rock defined by its **lithological** features (lithostratigraphical unit) or fossil content (biostratigraphical unit).
- **Stratigraphy**: the study of the temporal and spatial relationships between **strata**.
- Stratotype: a sequence of sedimentary rocks at a particular locality chosen as the standard against which other sequences can be compared. Stratotypes are established for lithostratigraphical and biostratigraphical units, both regionally and internationally. See stratigraphical unit.
- Stream valley: a valley, or elongate depression, carved by a stream.
- **Stria** (pl. **striae**): one of a series of fine furrows or grooves in a pattern of striation caused by ice movement.
- **Strike**: the trend of a geological surface (such as a **bedding plane**) measured at right angles to the direction of maximum slope, or **dip**.
- **Subaerial**: descriptive of processes and conditions, or features and deposits, that exist, operate or were formed, in the open air on or adjacent to the land surface.
- **Subaqueous**: descriptive of processes and conditions, or features and deposits, that exist, operate, or were formed in or under water.
- Sub-Atlantic period: a term primarily used in Europe to describe an interval of the Holocene Epoch covering the last 2500 years. It follows the Sub-Boreal period, and is characterized by a climate that was

generally milder and wetter than that of the present day.

- Sub-Boreal period: a term primarily used in Europe to describe an interval of the Holocene Epoch from about 4500 to 2500 years BP. It follows the Atlantic period and precedes the Sub-Atlantic period, and is characterized by a climate that was generally cooler and drier than that of the present day.
- Subglacial: formed in or by the basal parts of an ice sheet or glacier.
- **Subglacially-engorged esker**: a ridge of sand and gravel covered by **ablation moraine** formed by deposition in a tunnel in a lateral ice margin as meltwater makes its way down beneath ice, running at almost right-angles to the slope topography.
- **Subsidence**: a sinking of a local or regional portion of the Earth's surface with respect to its surroundings accompanied by little or no horizontal displacement.
- Subterranean: formed, or occurring, under the ground.
- Succession: in stratigraphy, a continuous sequence of sedimentary rock or sediment units.
- **Superglacial** (also **supraglacial**): over, or upon the ice; descriptive of the upper surface of an ice sheet or glacier.
- Superglacial deposits: deposits that have accumulated on the ice surface. When the ice disappears they are left on the land surface, frequently forming hummocks of sand, gravel and clay.

Supraglacial: see superglacial.

- **Syenite**: a coarse-grained intermediate **igneous rock** consisting largely of alkali feldspar and various ferromagnesian minerals.
- System: a chronostratigraphical division (see chronostratigraphy); it comprises all the rocks formed during a period, and can be divided into series.
- Talus: an accumulation of rock litter at the foot of a slope, generally with a wide size-range (up to several metres) and ungraded; commonly used to denote debris shed from the high part of a reef slope and transported basinward by gravity ('reef talus', 'talus apron'). Also called scree.
- **Tarn**: a small and deep mountain lake, often occupying an ice-gouged basin. The term is often, however, applied to any small landlocked pool or lake.

- **Telmatic peat**: a general term for peat developed on wet ground.
- **Temperate**: a temperature that is moderate and mild.
- **Tephra**: descriptive of all **pyroclastic** material, irrespective of size, shape or composition, from a volcanic eruption.
- **Tephra-based chronology (tephrochronology):** chronological and correlation studies involving the dating of volcanic ash layers.
- **Terminal moraine**: the end **moraine** of a **glacier** or **ice sheet**, which marks the maximum extent of the ice advance.
- **Terrace**: a landform composed of waterdeposited materials now located at an elevation different from the contemporary **floodplain** or lake level.
- **Terrestrial**: of or relating to the Earth or the Earth's dry land.
- **Tertiary Period**: a geological time division (**period**; cf. **chronostratigraphy**); ranging from 65 to 1.6 million years ago, it is the penultimate geological **period** and is followed by the **Quaternary Period**.
- **Thallus** (pl. **thalli**): a plant-body that has no vascular tissue, and cannot be divided into root, stem and leaf.
- **Thermokarst:** a **karst-like** topographical feature formed in a **permafrost** region due to the melting of ground ice and the resultant settling of the ground.
- Thermoluminescence dating: a method of dating applicable to objects that have once been heated or have been exposed to ultraviolet light from the sun, by measuring the release of light energy from the object.
- Thermophile (adj. thermophilic): an organism that prefers high temperatures.
- Three-Age System: an archaeological term that divides human prehistory into three successive stages (the Stone Age, Bronze Age and Iron Age), based on the main type of material used to make the tools of the period.
- Thufa (pl. thufur): an Icelandic term, meaning 'earth hummock', formed by ground ice segregation.
- Thurnian Stage: a British chronostratigraphical division (stage; see chronostratigraphy); a cold (glacial) stage of the early Pleistocene Epoch. It follows the Ludhamian Stage and precedes the Antian Stage.
- Till: unsorted, non-stratified sediment deposited directly from glacial ice; commonly

known as 'boulder clay' or 'glacial till'.

- **Till fabric analysis**: the analysis of the threedimensional spatial position of particles in a till by measuring the dip and orientation of clasts within the till. This information can be used to determined any preferred particle orientation and the strength of this orientation.
- **Tor:** a mass of rock rising above the surrounding landscape with free-faces on all sides, commonly shaped by frost shattering or exfoliation in past **periglacial** conditions.
- **Trace fossil:** a sedimentary structure produced by biological activity, for example burrows and footprints.

Travertine: see tufa.

- **Triassic Period**: a geological time division (**period**; cf. **chronostratigraphy**); ranging from 245 to 208 million years ago, it is the first period of the **Mesozoic Era**, and is preceded by the **Permian Period**.
- **Tributary**: a stream that joins, or flows into, a larger river or lake.
- **Trimline**: a sharp line determining the limit of the maximum upper level of the margins of a glacier that has receded from the area. Often it coincides with a break in slope.
- **Tripartite**: consisting of three parts, or divided into three sections.
- Trough (cross) bedding: cross-bedding in which the lower bounding surfaces are curved surfaces of erosion, due to local scour and subsequent deposition.
- **Truncation**: the cutting or breaking off of the top of a geological structure or landform.
- **Tufa:** a soft, porous chemical **sedimentary rock** of calcium carbonate, formed by evaporation or precipitated by algae and bacteria. The hard, dense equivalent is **travertine**.
- **Tuff**: cemented and lithified volcanic ash, comprising rock and crystal fragments from an explosive eruption.
- Tundra: a treeless plain typical of arctic and subarctic areas. Often it has a marshy surface, supporting lichens, mosses and low shrubs, and is underlain by dark soils and permafrost.
- **Tunnel valley**: a shallow trench cut by a subglacial stream not loaded with coarse material.
- **Turbidite**: a sedimentary **clastic** deposit that was formed by the settling out of detrital matter from a mass of **sediment** in water, which, being denser than normal water, had

flowed (as a turbidity current) down a submarine slope under the influence of gravity. Often of greywacke composition.

- **Type locality**: the location where the type section (or stratotype) for a stratigraphical unit is located, or where the original type section or fossil was first described.
- **Unconformity**: the surface that separates two sedimentary sequences of different ages; it represents a gap in the geological record when there was **erosion**, and/or tectonism and/or no deposition. There is often an angular discordance between the two sequences.
- **Undermelting**: melting from below floating ice; or in the Carruthers (1948) sense, bottom melting of interbedded ice/sediment layers.
- 'Up and down' channel: a subglacial channel that has a long profile where part of the floor is both up and down in terms of the general meltwater flow direction and is thought to have been eroded by meltwater flowing under hydrostatic pressure.
- Upton Warren Interstadial: a term used in Britain to describe a short-lived climatic amelioration or interstadial event, which occurred sometime between 50 000 and 26 000 years BP during the last glacial period, the Devensian Stage.
- Uranium series dating: a method of absolute dating used most widely on cave deposits from the Quaternary Period, which measures the decay of uranium isotopes.
- Vadose zone: the zone of rock above the water table where groundwater freely flows downwards and cavities are only partially filled with water; also referred to as the unsaturated zone. cf. phreatic.
- Valley: a generally broad, flat area lying between two mountains or stretches of high ground, often containing a river or stream.
- Valley axis: a thalweg; the surface profile along the centre line of the valley.

Valley Bottom: see Valley floor.

- Valley floor: the broad, flat bottom of a valley.
- Valley glacier: a glacier that flows between the sides of a mountain valley along all or part of its length.
- Valley head: the upper part of a valley.
- Valley system: descriptive of a valley and all of its tributaries.
- Varve: a sedimentary layer, or sequence of

### Glossary

layers, which consists of coarser- and finergrained materials deposited within a body of still water within one year. A glacial varve, deposited by **meltwaters** in a **glacial lake** often has a lower coarse-grained summer layer formed by rapid melting of ice in the summer months, and an upper, fine-grained winter layer, formed when glacial **meltwaters** and their deposits are unavailable.

- Varved clay: a clearly laminated sediment consisting of clay-rich varves, deposited in a lake or other still water body. Also the upper, fine-grained, winter layer of a glacial varve.
- Ventifact: any rock or pebble shaped or worn by the sandblasting action of windblown sand, usually under desert conditions.
- Villafranchian Stage: a European chronostratigraphical stage (stage; see chronostratigraphy); a warm (interglacial) stage of late Pliocene-Early Pleistocene times, characterized by mammalian fossils.
- Volcanic rock: an igneous rock formed when a volcano erupts.
- Warthe ice advance: the third of three ice advances recognized in Scandinavia, which occurred during the northern European glacial Saalian Stage.
- Watershed: the boundary delimiting a river drainage basin as the basic hydrological unit.
- Water table: the level within a rock mass below which all voids are filled with groundwater; above it the vadose zone is freely draining, and below it the phreatic zone is totally and permanently saturated.
- Weathering: the breaking down of rocks through the effects of exposure to the weather; the term does not infer any transportation of the weathered rock material.
- Weichselian Stage: a north-west European chronostratigraphical division (stage; see chronostratigraphy); the classical fourth and last glacial stage of the Pleistocene Epoch, equivalent to the British Devensian Stage. It follows the Eemian Stage.

Wetland: an area of low-lying land where satu-

ration with water is the dominant factor in determining the nature of soil development and the types of fauna and flora living in the soil and on its surface. Examples include **bogs**, fens, marshes and swamps.

- Windermere Interstadial: a term used primarily in Britain to describe a short-lived climatic amelioration, or interstadial event, which occurred between 13 000 and 11 000 years BP, towards the end of the last glacial period (the Devensian Stage). It is often considered to be equivalent to the Bølling-Allerød Interstadial complex of north-west Europe.
- Wolstonian Stage: a British chronostratigraphical division (stage; see chronostratigraphy); a cold (glacial) stage at the end of the middle Pleistocene Epoch, equivalent to oxygen isotope stages 6–8, and occurring from about 200 000 to 130 000 years BP. It follows the Hoxnian Stage and precedes the Ipswichian Stage.
- χ magnetic susceptibility: a measure of the degree to which a substance can be magnetized. Its value is roughly proportional to the concentration of ferrimagnetic and paramagnetic minerals within the sample.
- X-ray diffraction analysis: a technique involving the firing of X-rays at a crystalline structure (e.g. a rock) placed in an X-ray camera, some of which are diffracted to create a pattern on the camera film. This pattern is dependent on the make-up of the structure and can therefore by used to 'fingerprint' the sample.
- Younger Dryas: a term used primarily in Europe to describe a short-lived climatic deterioration, characterized by the expansion, or restricted retreat, of glaciers. It occurred approximately 10 500 years BP, towards the end of the last glacial period (the Devensian Stage), following the Allerød Interstadial but preceding the Pre-Boreal period. It is considered to be the equivalent of the British Loch Lomond Stadial.
# Glossary of botanical names

This glossary of botanical names provides the Latin and common names for the botanical species used in the text and in the pollen diagrams.

Acer Sycamore or Common maple Agropyron Couch-grass Alchemilla Lady's mantle Alisma Water plantain Alnus Alder Anagallis Pimpernel, chaffweed Andromeda polifolia Bog Rosemary Anemone Anemone Anthemis Chamomile Apiaceae Carrot family Armeria Thrift Artemisia Mugwort Artemisia norvegica Norwegian mugwort Aster includes Aster Althaea Marsh mallow

Baldellia ranuculoides Lesser water plantain Bellis Daisy Betula Birch Betula nana Dwarf birch Bidens Bur-marigolds Botrychium Moonwort

Callitriche Water-starworts Calluna vulgaris Heather or ling Calystegia Bindweed Campanula Bellflower Caltha Marsh marigold Cannabis Hemp Carduus cirsium Thistle Carex Sedges Carex echinata Star sedge Carex ericetorum Rare spring sedge Carpinus Hornbeam Caryophyllaceae Pink family Castanea Chestnut Centaurea cyanus Cornflower Centaurea nigra Lesser knapweed Chenopodiaceae Goosefoot family Chrysoplenium Golden-saxifrage Circaea Enchanter's nightshade Cirsium Thistle Cladium mariscus Great fen sedge Coryloid Hazel, or Bog myrtle Crataegus Hawthorn Cruciferae Brassica family Cynoglossum Houndstongue Cyperaceae Sedge family Cystopteris Bladder-ferns

Drosera Sundew Dryas octopetala Mountain avens Dryopteris Buckler-ferns

Eleocharis Spike-rushes Elymus Lyme-grass Empetrum Crowberry Epilobium Willow herbs Equisetum Horsetails Endymion-type Bluebell Erica tetralix Cross-leaved heath Erica-type Heaths or Heathers Ericaceae Heather family Eriophorum Cotton-grasses Eriophorum angustifolium Common cottongrass

#### Glossary

Eriophorum vaginatum Hare's tail cotton grass Euonymus Spindle tree

Fabaceae Pea family Fagus Beech Filicales Ferns Filipendula Meadowsweet Frangula Alder buckthorn Fraxinus Ash

Galium-type Bedstraws Genista-type Greenweed or Needle furze Gentiana Gentians Gentiana verna Spring gentian Gentianella Gentians Geranium Cranesbill Geum Avens Glaux maritima Sea milkwort Glyceria Flote-grass or Reed-grass Gramineae Grasses

Hedera Ivy Helianthemum Rockrose Hippophäe Sea buckthorn Hippuris Mare's tail Hordeum Barley Hornungia Hutchinsia Humulus Hop Hydrocotyle Pennyworts Hypericum St John's-worts

*Ilex* Holly *Iris* Yellow flag *Isoetes* Quill-wort

Juncus Rushes Juniperus Juniper

Knautia Field scabious Kobresia simpliciuscula False sedge

Labiatae (Lamiaceae) Deadnettle family Lamium Deadnettles Lastrea Rigid buckler fern Larix Larch Leguminosae or Papilionaceae Pea family Lemna Duckweed Linum catbarticum Purging flax Linum usitatissimum Flax Littorella Shoreweed Lobelia Lobelia Lonicera Honeysuckle Lotus Birdsfoot trefoil Lychnis flos-cuculi Silene flos-cuculi Lycopodium selago Fir clubmoss Lycopus europeus Gypsywort Lysimachia Loosestrifes Lythrum Purple loosestrife

Malva Mallow Matricaria Mayweeds Melampyrum Cow-wheats Mentha Mints Menyanthes trifoliata Bogbean Mercurialis-type includes Dog's mercury Minuartia stricta Teesdale sandwort Molinia caerulea Purple moor-grass Myosotis-type Forget-me-nots Myriophyllum alterniflorum Alternate-flowered Water-milfoil Myriophyllum spicatum Spiked water-milfoil

*Narthecium ossifragum* Bog asphodel *Nuphar* Yellow water-lily *Nymphaea* White water-lily

Oenanthe-type Dropwort Onobrychis-type Sainfoin Ononis-type Restharrow Osmunda Royal fern Oxycoccus (Vaccinium) Bilberries Oxyria-type Mountain sorrel

Peplis Water purslane Phragmites Common reed Picea Spruce Pinus Pine Plantago coronopus Buck's-horn plantain Plantago lanceolata Ribwort plantain Plantago major Great plantain Plantago media Hoary plantain Plantago maritima Sea plantain Polemonium caeruleum Jacob's ladder Polygala amara Dwarf milkwort Polygonum Knotweed and Bistorts Polygonum aviculare Knotgrass Polygonum convolvulus-type Black bindweed Polypodium Polypody Populus Poplar Potamogeton Pondweed Potentilla Cinquefoils Potentilla erecta Tormentil Poterium Salad burnet Prunus Cherry and Blackthorn Pteridium Bracken

Quercus Oak

#### Glossary

Ranunculaceae Buttercup family Ranunculus Buttercups Rhamnus Buckthorn Rhinanthus-type Yellow rattle Rhododendron Rhododendron Rosaceae Rose family Rubus includes Brambles and Raspberry Rubus chamaemorus-type Cloudberry Rumex Sorrels and Docks Rumex acetosa-type Sorrel

Sagittaria Arrowhead Salix Willow Sambucus Elder Sangu isorba Burnets Saussurea alpina Alpine saw-wort Saxifraga aizoides Yellow saxifrage Saxifraga oppositifolia Purple saxifrage Saxifraga stellaris Starry saxifrage Scleranthus-type includes Knawels Scrophulariaceae Figwort family Secale cereale Rye Selaginella selaginoides Lesser clubmoss Senecio Ragworts Serratula Saw-wort Silene-type Campions Sinapsis Mustards Solanum Nightshade Sorbus Mountain ash (Rowan) and White beam Spergula Spurreys Spergula arvensis Com spurrey

Sphagnum Spaghnum moss Stellaria Stitchworts Stellaria-type includes Chickweeds and Stitch worts Succisa Devil's bit scabious

Taxus Yew Taraxacum Dandelions Teucrium Germanders Thalictrum Meadow rue Thelypteris Marsh fern Thymus Thymes Tilia Lime Trapa natans Water chestnut Trichophorum caespitosum Deergrass Triticum sp. Wheat Typha angustifolia Lesser bulrush Typha latifolia Bulrush

*Ulex-*type Furze or Gorse *Ulmus* Elm Umbelliferae Carrot family *Urtica* Nettle

Vaccinium-type Bilberries Vaccinium vitis-idaea Cowberry Valeriana Valerian Viburnum Viburnums Vicia Vetches (Tares) Vicia sativa-type Common vetch Vicia sylvatica Wood vetch Viola rupestris Teesdale violet

## Fossil index

Note: Page numbers in **bold** and *italic* type refer to **tables** and *figures* respectively. Most mammals and some orders of plants can also be found in the General Index, e.g. bilberry; deer; hyaena. For named pollen zones, see the General Index. See also 'pollen assemablages and zones' in the General Index.

Abra alba 573 Acer 44, 282, 390, 482, 544 A. monspessulanum 45 Achillea 423 Achnanthes minutissima 242 A. suchlandtii 240 Acicula fusca 591 Acidota quadrata 262, 409 Acrocladium 471 A. cupidatum 270 A. giganteum 270 Acutifolia 463 Aegopinella nitidula 441 Agabus arcticus 409 A. bipustulatus 142 Agonum consimile 262, 409 Agrostis 344, 347 Alchemilla 515 A. alpina 348 A. wichurae 348 Aleocharinae indet. 142 algae 369, 426-7, 519 Alisma 134, 267, 369, 371, 373, 537, 545, 550 A. sp. 587 Allium schoenoprassum 89 Alnus 44, 55, 63, 136, 138, 214, 222-9, 223-40, 246-50, 251-7, 267-8, 275-7, 279, 309, 353, 355, 358, 365, 367-8, 370, 376, 377-8, 380-1, 384-6, 388, 390, 392,

395-6, 398, 401-2, 406, 408, 410, 412, 414-15, 417, 419-22, 424, 428, 429-32, 434, 435, 438-42, 447-8, 455-7, 459-60, 460-2, 464, 466, 468, 473, 476, 479, 481-2, 489-90, 494, 496, 501-2, 506, 509, 511, 514, 516-17, 528-31, 533, 536-7, 542-4, 546-7, 549, 556, 559-60, 562-3, 568, 573-4, 576, 579, 584-8 A. glutinosa 55, 266, 280-4, 447, 450, 520, 522, 587-8 A. viridis 55 Alra alba 573 Amara alpina 142, 262 A. quenseli 142 A. torrida 409 Amblystegium riparium 437, 441 Ammonia batavus 563 A. beccari 573 A. spp. 570, 573 Anagallis type 502 Anancus arverensis 33 Andromeda polifolia 489 Anemone 550 Anisus 441 A. leucostoma 134, 590-1 Anthemis type 425, 545 Aphodius 142

Apiaceae 451 Aplexa hypnorum 590-1 aquatic taxa 134, 142, 252-5, 402, 422-3, 426-8, 431, 433, 435, 439, 441, 446, 457-9, 462-3, 469, 481-5, 503, 528-31, 541, 561-9, 562, 570-3, 580, 584, 590-3 see also named aquatic taxa Archidiskodon (Elephas) meridionalis 33, 35-6, 51 Arctica islandica 60 Arenaria cilliata 89 Armeria 407, 471, 474, 485, 550, 556, 561 A. 'A' 373 A. maritima 89, 394, 441, 515, 584 A. type 529 Armiger crista 134 Arpedium brachypterum 142, 409, 423 Artemisia 183-4, 214, 218-19, 222-8, 233-9, 243-4, 252-6, 259-60, 265-71, 279-81, 367-8, 370, 373, 378, 382, 387, 389-90, 387-8, 403, 407, 412, 415, 422-3, 425, 430, 433-4, 446, 451, 458, 464, 466, 469, 473-4, 477, 479, 482, 485, 497, 501-2, 514-16, 520, 522, 542-3,

546, 550, 556, 561, 563, 564, 568 A. norvegica 474, 479 Arvicola terrestris 75, 88 A. terrestris cantiera 38 Asplenium viride 348 Aster t 451 A. types 529 Asteraceae 462 Asterinigata mamilla 573 Asterionella 230 A. formosa 240, 242 Atriplex patula 440 Aulacomnium 471, 501 A. androgynum 441 A. palustre 471 Balanus crenatus 68 Baldella ranunculoides 440 Barbula rubella 224 Barnea candida 584 Bathyomphalus 441 Bellis 546 B. type 281, 477 Bembidion elongatum 44 B. fellmanni 262 B. grisvardi 262 B. bumerale 262 B. mckinleyi 262 B. octomaculatum 262 B. quadripustulatus 262 B. sp. (lunatum group) 142 Betula 69, 87, 135, 136-8, 142, 183-7, 214-19, 223-9, 233-41, 241-50, 251-7, 258-64, 266-71, 274-8, 279-84, 357-8, 367-8, 370, 372-6, 377-8, 380-1, 382-6, 388, 390, 392, 395-6, 398, 401-2, 406, 408, 410-12, 414-15, 417, 420-2, 424, 427-8, 429-32, 434-5, 438-42, 446-8, 450, 452-4, 455-60, 460-3, 464, 466-8, 471-4, 476, 479, 481-2, 484, 494, 496, 499, 501-2, 509, 511, 514, 516-17, 520, 522, 528, 530-1, 533, 536-7, 542-4, 546-7, 549, 556, 560, 562-3, 568, 584, 586-8 B. alba 55 B. nana 89, 138, 183-4, 214, 219, 225-7, 236, 241, 245, 252-6, 266-71, 367,

370, 382, 385-6, 392-4, 422, 424, 428, 430-2, 434-5, 438-41, 457, 464, 468, 471, 474, 476, 515 B. cf. nana 422, 432, 434, 457 B. pendula 471 B. pubescens 214, 251, 429, 471, 587-8 B. verrucosa 251 Betula/Corylus/Myrica, 432 Bidens 477, 542 B. type 426, 502, 520, 522 Bison cf. Priscus 75 B. priscus 88 Bledius fuscipes 142 Bolivina spp. 570 Boreaphilus benningianus 262, 409 B. nordenskioeldi 262 Bos primigenius 264-5, 271 Bothrideres contractus 44 Botrychium 245, 253, 267, 269, 369, 373, 387, 389, 426, 439, 475, 478 B. lunaria 283, 441 B. opbioglossum 371 Botryococcus 253, 426 Brachytemnus submuricatus 44 Brassicaceae 451, 520 Bryophytes 219, 245, 264-71, 344, 347, 366-76, 377, 402, 410, 416, 437, 439-41, 518 Buccella frigida 570 Buccinum 78 B. undatum 60 Bulimina spp. 570, 573 Buliminella elegantissima 573 Byrrhidae 133 Byrrbus sp. 142

*Calliergon* spp. 437, 441 *Callitricbe* 397 *Calluna* 133, 232, 235, 244–50, 252, 268, 347, 360, 363, 369, 371, 377–8, 381–3, 385, 387, 389–92, 396, 403, 406, 409, 412, 415, 431, 481–2, 501–2, 506, **511**, 514, 516–18, 519, 521, 542–4, 546–7, 549, 560, 564

C. vulgaris 266, 280-4, 344, 366, 369, 376, 381, 412, 432, 457, 470, 487, 489, 493, 514 C. type 424 Caloneis formosa 536 Caltha 379, 471, 474, 477, 482.545 C. cf. Rhinanthus 546 C. type 503, 543 Calystegia 407, 482 C. cf. soldanella 550 Campanula 373, 425, 442, 483 C. rotundifolia 515 C. type 502 Campanulaceae 245 Camptothecium nitens 270 Campyllium stellatum 270 Candona angulata 592 C. candida 268-9, 592 C. compressa 268-9, 592 C. fabaeformis 592 C. lobipes 592 C. marchica 268-9 C. neglecta 142, 592 C. pratensis 592 C. spp. 134 Canis lupus 88 Cannabis 363-4, 374, 467, 471, 473, 477, 479 C. type 520 Cannibiaceae 281 Cantharis rustica 441 Carabidae 133, 261-3 Cardium 78 C. edule 67-8, 532 Carduus cirsium sp. 385 Carex 224, 232, 251, 265, 268, 270, 366, 420, 440-1, 511-12 C. biconvex 440 C. carta 514 C. echinata 514-15 C. ericetorum 384 C. paniculata 588 C. cf. rostrata 471 C. sp. 471, 587 C. spp. 381, 383, 384-5, 471 C. trigonous 440 Carpinus 44, 55, 63, 69, 378, 396, 410, 412, 432, 457, 476, 514, 516, 546 C. betulus 280

#### Fossil index

C. laxiflora 55 Carvchium minimum 441 C. tridentatum 590-1 Caryophyllaceae 183-4, 219, 226, 233-41, 244, 253, 259-60, 269, 281, 366, 369-70, 373, 379, 387, 389-90, 397, 403, 410, 425, 433, 458, 466, 469, 473-4, 477, 479, 511, 516, 522, 542-3, 550, 559, 561, 564 Centaurea 546, 565 C. cyanus 281, 467, 477, 545, 565, 569 C. nigra 438, 442, 458, 477 C. type 502 Cerambycidae 133 Cerastoderma edule 68, 531, 539, 558, 573, 584 Ceratophyllum demersum 251 Cercyon sp. 142 Cerealia 281-2, 364, 423, 439-42, 458-60, 464, 489, 495-6, 498-9, 520, 525, 528-30, 545-7, 564, 569 Cereals 235, 360-5, 374-6, 379-80, 389-90, 397-8, 421, 423, 428, 433, 435, 462-3, 467-8, 477, 495, 503-4 see also Latin names of cereals Cervus elephus 271 Cervus megaceros (c.f. Megaloceros giganteus) 419 Chamaenerion 244 Chara 224, 251, 385, 422, 427, 447, 471, 517, 527 charophytes 277 Chenopodiaceae 219, 244, 249-50, 266, 281, 283-4, 368, 370, 373, 379, 387, 389-90, 397-8, 422, 425, 433, 458-60, 464, 466, 469, 474, 477, 483, 485, 501-2, 514, 516-17, 520, 529, 533-5, 537-8, 542-3, 545-6, 550, 556, 559, 561, 563-4, 568, 584 Chenopodiaceae type 529 Chenopodium 439 C. album 440 C. type 502 Chironomideae 219, 228, 274, 277, 507

Chlamys opercularis 584 Chrisatella 228 Chrysomelidae 133 Chrysoplenium 389 Cibicides lobatulus 570, 573, 580 Cicuta virosa 251 Cirsium 483, 550 C. palustre 471 C. type 281, 474, 477 Cladium 232, 251, 407, 423, 446-7, 548, 550, 559-60, 563-4.568 C. mariscus 281, 283, 440, 446, 449, 556, 559 Cladocera 228, 236, 507 Cliona sp. 60 Coccinellidae 133 Cocconeis diminuta 240 Coelodonta antiquitatis 88 Coleoptera 132-4, 136-8, 142, 183-7, 215, 219, 226-8, 238-9, 242, 258-64, 409-412, 423, 446, 506-7 see also beetles in the **General Index** Colymbetes dolabratus 262 C. dolabratus/striatus 409 Campanula 483 Compositae 233-41, 249-50, 369, 370, 373, 415, 417, 422, 425, 466, 469, 516, 533-4, 537 Compositae liguliflorae 281 Compositae(Ligulatae) 69, 183-4, 244, 281, 379, 387, 389-90, 397, 564, 568 Compositae(Tubulatae) 379, 387, 389-90, 397, 403, 533-4, 550, 561, 564 Cornaceae 415 Cornus sanguinea 587 Coryloid 235, 248, 277, 406, 410, 412, 424, 522, 585, 587-8 Corylus 45, 69, 184, 214, 223-8, 233, 244, 249-50, 252-6, 267-8, 274-8, 279-84, 344, 357-8, 360, 365, 367-8, 370, 372, 376, 382, 385-6, 377-8, 380, 388, 390, 392, 396, 398, 401-2, 414-15, 417, 419-21, 428, 430-1, 430-2, 435, 438-42,

447, 450, 454, 461, 463, 472-4, 476, 479, 482, 489-90, 496, 501-2, 504, 506-7, 509, 511, 514, 516-17, 520, 528-31, 533, 538, 561-3, 565, 568 C. avellana 45, 279-84, 408, 412, 585, 587 C. avellana type 450, 560, 564, 568 C. type 266, 501-2, 533, 537 Corvlus/Myrica 430-2, 456-7, 459, 464, 462, 466, 468, 542-4, 546-7, 549 Cotoneaster 55 Crataegus spp. 55 Cratoneuron communtatam 270 Cristella 228 Crocuta crocuta 75, 88-9 C. sp. 33 Cruciferae 184, 245, 266, 281, 369, 371, 373, 379, 390, 397-8, 403, 439, 458, 474, 477, 516, 542-3, 545-7, 565 Cryptogramma 245, 416, 433, 457 C. crispa 347-8 Curculionidae 133 Cyclas cornea (Sphaerium corneum) 584 Cyclocypris laevis 592 Cyclotella glomerata 240 Cymbella aspera 536 Cymindis angularis 262 Cynoglossum 550 Cyperaceae 69, 134, 183-4, 213, 218-19, 224-5, 228, 233-41, 244, 248-50, 252-5, 258-62, 265-71, 276, 279-84, 367-8, 370, 372, 377-8, 384, 387, 389-90, 392, 395-6, 402, 410, 414-15, 417, 420-2, 426-8, 430-1, 432-5, 439-41, 446, 448, 450, 458-9, 462-3, 464, 466, 468, 472-4, 476, 479, 483, 485, 489, 494, 497, 501, 503, 506, 511-12, 515-17, 528, 530, 533-4, 537-8, 542-3, 545-7, 550, 559-64, 568 Cypricercus fuscatus 592

#### Fossil index

Cyprideis torosa 592 Cypridopsis vidua 142 Cyprina islandica 52 Cyprinotus salinus 142 cf. Cystopteris 475

Dama sp. 33 Daphnia ephippia 142 Deronectes griseo-striatus 409 Deschampsia 347 D. flexuosa 279, 486-7, 514, 518 Desmids 426 Diacheila artica 262, 409 D. polita 262 Dianthus 266 diatoms 46, 230, 232, 240, 241-2, 247, 351, 527-8, 531, 534-6, 538, 554, 556-7, 559, 563-4, 569, 570, 573, 580, 584 Dicrostonyx torquatus 88 Didermoceros bemitoechus 75 Digitalis purpurea 344, 348 dinoflagellate cysts 35, 44, 73, 127, 426, 485, 563 Diphasiastrum alpinum 348 Diphasium alpinum 441 Diploneis interrupta 538 Dipsacaceae 245, 266 Diptera 134 Discus rotundatus 590-1 D. ruderatus 590-1 Drepanocladus aduncus 134, 270, 471 D. sp. 437 Drosera 369, 389, 489, 545 D. rotundifolia 381, 503 Dryas octopetala 392-4 cf. Dryas 474 Dryopteris 226, 271, 407, 423, 475, 477, 547 D. filix-mas type 281, 451 D. spp. 279 D. type 503 Dysticus lapponicus 262 Dytiscidae 133, 261-3 Elaphrus lapponicus 262, 409 Elateridae 133 Eleocharis 422 E. palustris 134, 142, 471 Elphidium 558, 564, 570, 573

E. articulatum 564 E. excavatum 563-4 Empetrum 183-4, 214, 217-19, 225, 233-41, 243-4, 253, 266, 269, 269-71, 271, 357, 367, 369-70, 378, 403, 411, 431-2, 457, 473-4, 476, 479, 490, 502, 542, 544 E. nigrum 280, 373, 450, 470, 486-7, 490 E. sp. 89, 133 E. type 424 Entomoscelis adonidis 262 Ephedra 474 E. distachya 515, 517 Epilobium 184, 265, 267-71, 283, 371, 373, 390, 403, 425, 474, 542-3, 550 Equisetum 258, 260, 267, 281, 283, 371, 376, 389-90, 403, 407, 439, 471, 475, 478, 483, 542-3, 545-6, 550, 561, 565 Equus 33, 43, 44, 88, 220, 573 E. cf. bressanus 33 E. ferus 88 Erica 409, 482, 502, 549 E. cinera 344 E. tetralix 381, 514 E. type 482, 502 Ericaceae 21, 133, 254, 265, 271, 403, 411, 415, 422-3, 429, 457, 460-2, 473-4, 489, 494-5, 497, 516, 524, 542, 544, 560, 564 Ericales 411, 415, 466, 468, 370, 389-90, 523 Ericoid 476 Eriopborum 252, 377, 383, 385, 500-1, 506, 519, 521 E. angustifolium 366, 381, 486 E. vaginatum 252, 366, 376, 381, 412, 460, 471, 486, 489, 511, 512-14, 517 E. spp. 36, 460-1, 511 Esox lucius 419 Euconulus fulvus 441 Eucypris gemella 142 E. heinrichi 592 E. pigra 592 Eudectes sp. 409 Eunotia spp. 240, 242-3 Euonymous 549, 560

*Euphrasis rivularis* 348 *Eurynchium* spp. 441

Fabaceae 522 Fagopyrum esculentum 281 Fagus 46, 235, 240, 250, 368, 376, 378, 388, 390, 396, 398, 401-2, 432, 457, 462, 476, 482, 496, 502, 514, 516, 525, 544, 547, 560, 564 F. sylvatica 280 Feronia blandulus 142 Festuca 344, 347 Filicales 69, 233-41, 245, 248-50, 253, 267, 269, 369, 371, 373, 379, 387, 389-90, 397, 403, 407, 415, 423, 426, 439, 469, 475, 478, 483, 516, 528, 530, 537-8, 542-3, 545-7, 550, 561, 563, 565, 568 Filipendula 69, 184, 224-9, 233-41, 245-6, 252-6, 259-60, 266-71, 280-1, 283, 357, 369, 371, 373, 378, 379, 382, 387, 389-90, 397, 403, 407, 412, 426, 430, 433-5, 439-40, 446-8, 451, 456, 458-9, 464, 469, 473-4, 477, 479, 483, 502, 520, 522, 542-3, 545-6, 550, 561, 565 F. ulmaria 516 Fissurina spp. 570, 573 Fontinalis antipyretica 430 foraminifera 22, 34, 46, 53, 59, 61, 126, 535, 538, 555-9, 562-5, 569-70, 573, 580, 584 Frangula alnus 587 Fraxinus 235, 240, 248-50, 268, 277, 344, 368, 376, 378, 386, 388, 390, 395-6, 398, 401-2, 406, 411-12, 415, 421-2, 424, 432, 447, 456-7, 459, 461-2, 476, 482, 489, 495-6, 501-2, 506, 514, 516-17, 525, 537, 544, 546-7, 549, 560, 562, 564, 588 F. excelsior 280, 284 Frustulia spp. 240

Galium 403, 407, 473, 475, 477, 479, 550, 561, 565 G. boreale 348

G. palustre 588 G. type 483, 542-3, 545-7 G. veruum 347 Genista type 475 Gentiana 389-90 G. cf. pneumonanthe 477 G. pneumonanthe 441 G. verna 382, 385, 392, 394, 441 Gentianella 389-90 Geranium 442 Gibbula sp. 484 Gnaphalium 477 Gramineae 69, 134, 183-4, 213, 218-19, 223-9, 227-8, 233-40, 244-50, 252-6, 259-60, 265-71, 279-84, 366-8, 370, 372-6, 379-81, 382, 384-5, 387, 389-90, 392, 394, 396, 398, 401-2, 407, 414-15, 417, 421-2, 425, 428, 430-1, 432-5, 438, 440-2, 455-6, 458-60, 464-8, 472-4, 476, 479, 483, 501, 503, 505-6, 511, 515-17, 528-30, 535, 537, 542-3, 545-7, 550, 559-60, 563-4, 566, 568 see also Poaceae Gyrinus opacus 262 Gyrosigma acuminatum 242 Haynesina germanica (same as Protelphidium germanicum) 570, 573 Hedera 235, 248-50, 254, 268, 368, 378, 388, 390, 396, 406, 411, 415, 424, 476, 482, 502, 542-4, 546-7, 549, 560, 564, 568 H. belix 266, 280, 284, 432, 457 Helianthemum 183-4, 214-15, 217, 225, 245, 252-3, 259-61, 267, 281, 368, 370, 373, 382, 385, 387, 389-90, 415, 422, 424, 430, 433-5, 438-9, 442, 451, 458, 466, 473, 475, 514-17 H. canum 392, 394 H. chamaecistus 283, 394 Helix 59-60 H. bispida 75 H. pulchella 75

Helodidae 133, 261-2 Helophorus fennicus 409 H. glacialis 228, 262, 409 H. obscurellus 262 H. sibricus 262 Herniara type 561 Herpetocypris ebringsdorfensis 592 Hippodamia arctica 262, 409 Hippophae 214, 224-5, 233, 244, 253, 403, 422, 424, 430, 435, 474, 516, 560, 564 H. rhamnoides 266, 276, 280, 432, 434, 457, 515, 517 Hippopotamus amphibius 43-5, 74-5 Hippuris 422, 471, 542, 546, 565 H. vulgaris 134 Homalothecium nitens 220 Homo 88-9 see also human in the **General Index** H. habilis 11 Homotherium sainzelli 33 Hordeum 504, 507 Hornungia type 502 Humulus type 502 Hydrobia (Peringia or Sbanaea) ulvae 68 H. ulvae 558, 573 H. ventrosa 573 Hydrobius sp. 142 Hydrocotyle 397, 407, 440, 475, 477, 483, 543, 546-7, 550, 556, 561, 565 H. vulgaris 267, 545, 587 Hydrophilidae 133, 261-3 Hylocomium 471, 501, 514 Hymenoptera 134 Hyocypris bradyi 592 Hypericum 390 Hypnum 251, 464, 511, 515 H. cupressiforme 441 Hystrichosphaeroidae "542, 550

Ilex 24, 44, 136, 138, 235, 249–50, 344, 378, 388, 390, 406, 411, 422, 476, 502, 506, 516, 544, 549 I. aquifolium 280, 284, 432, 457, **58**7 Ilyocypris 134 I. gibba 142 I. inermis 592 Iris 407, 415, 546, 550 Isoëtes 248, 250, 403, 407, 423, 542

Jadammina macrescens 538, 558, 563 Jasione 379, 546 Juncus 135, 232, 385, 440, 470, 479 Juniperus 183-4, 214-19, 225, 227-8, 233-41, 244, 248, 250, 252-6, 254, 259-63, 266, 268-71, 277, 357, 367-8, 370, 372, 382, 386, 388, 403, 411-12, 422, 428, 430-2, 434-5, 438-40, 464, 468, 472-4, 476, 479, 514, 516-17, 542-3, 549, 560, 564 J. communis 229, 277, 279-83, 446, 448, 450

Knautia 387 Kobresia simpliciuscula 381 Labiatae 245, 281, 371, 379, 389, 458, 475, 543, 545, 561 Labiatae Mentha type 550 Lactucae 467 Lacuna crassior 532 Lagena spp. 570, 573 Lamium type 425, 477 Larix 429 Lastrea 423 Lauria cylindracea 590-1 Leguminosae 371, 373, 387, 389-90, 397, 464, 466, 568 Leiodidae 133 Leiostyla anglica 590-1 Lemna 134, 407, 458, 542, 546 Leptodictyum sp. 430 Lepus timidus 88, 216 Liguilatae 244 Liguliflorae 266, 269, 425, 433, 438-40, 458-9, 564, 568 Limax spp. 268 Limnocythere spp. 134 Lingulodinium machaerosphorum 44 Linum 374, 389 L. catharticum 477

#### Fossil index

L. usitatissimum 477 Liquidambar 55 Littorella 371, 423 L. littoralis 532-3 L. cf. Potamogeton 373 Littorina 78 L. littoralis 68, 484, 573 L. littorea 60, 68, 75, 484, 532 L. obtusata 60 L. rudis 60, 68 L. saxatilis 68 Lonicera 457, 482, 542 L. periclymenum 284 Lotus 442, 475, 477 L. type 502 Lutraria sp. 532 Lychnis 266, 269, 440-1, 471 L. alpina 440 L. flos-cuculi 385, 471 L. type 564 Lycopodium 258, 379, 403, 415, 423, 426, 489, 543, 545-6,565 L. alpinum 371 L. annotinum 475 L. clavatum 267, 269, 373, 387, 389-90 L. inundatum 253, 387 L. selago 224-5, 228, 236-7, 241, 245, 248, 250, 252-6, 267, 269, 373, 387, 389-90, 458, 464, 469, 475 L. selinella 403 L. spp. 245, 248 Lycopus 407 L. europeus 517 L. type 477 Lymnaea glabra 590 L. palustris 590 L. peregra 267-8, 274 L. truncatula 590-1 L. spp. 134, 423 Lysimachia 389, 423 Lythrum 407, 483, 543, 546-7, 565, 568 L. salicaria 542

Macoma 78 M. baltbica 41, 68–71, 573, 584 Mactra sp. 68 Malva 537, 550, 565 Mammathus molar 44 M. primigenius 44-5, 88 Mariophyllum alterniflorum 238 marsh taxa 416, 426-7, 528-31, 534-8, 439-41, 562-5 See also named marsh taxa Matricaria type 281, 403, 407, 474, 477 Megaloceras 220 M. giganteus 75, 88, 419 Melampyrum 269, 387, 389, 530 Mentha type 477, 483 Menyanthes 185, 224, 369, 371, 373, 385, 387, 389, 397, 439-40, 503, 471, 475, 478, 511-12, 516, 556 M. trifoliata 142, 267, 385, 429, 587 Mercurialis 235, 240, 469, 502 Metopsia clypeata/gallica 409 Microthyrium 403, 407, 545 Microtus gregalis 88 M. oeconomus 88 Miliammina fusca 538 Miliolinella subrotunda 573 Mimomys 35-6 M. savini 38 Minuartia stricta 382 Molina 234 M. caerulea 376, 514 Monocotyledons 368, 371, 461, 505, 521, 523, 524, 535, 559, 563 Montia 373 mosses, hypnoid 371 Mustela erminea 88 M. putorius 88 Mya sp. 532 Myrica 234, 430-2, 456-7, 459, 462, 464, 466, 468, 502, 542-4, 546-7, 549, 560, 587 M. gale 279, 587-8 Myriophyllum 225, 233, 369, 371, 397, 403, 407, 545, 561 M. alterniflorum 238, 267, 281, 283, 373, 376, 469, 475, 478, 543 M. spic./vert. 458 M. spicatum 267, 283, 469, 475, 478, 483, 543 M. verticillatum 475, 478

Mytilus 78, 80 M. edulis 60, 68, 75, 532 Najas marina 251 Nannacandona faba 592 Narthecium 389-90 N. ossifragum 381 Nassa 78 Navicula dicephala 88, 242 N. digitoradiata 536 N. peregrina 536 Nebria nivalis 262 Nesovitrea cf. petronella 590-1 N. bammonis 268 Nitella 224 Nonion pauperatum 570 N. spp. 573 Nonionella spp. 570, 573 Notaris aethiops 142, 409, 441 Nucella lapillus 60 Nupbar 63, 134, 267, 281, 415, 458, 475, 545, 548, 550, 561, 565 Nymphaea 63, 134, 251-2, 267, 373, 403, 407, 415, 458, 475, 478, 483, 556, 561, 563, 565 N. alba 251, 281, 451, 469 Ochthebius pedicularis 262 Olophrum boreale 262, 409 O. fusca 441 O. rotundicolle 409 Onobrychis 390 O. opposityfolia 394-5 Oolina spp. 570, 573 **Operculodinium** 485 **Ophioglossum 373** Oreodytes alpinus 262 Osmunda 369, 407, 433, 483, 545, 550, 561 O. regalis 584-7 Ostrea 78 O. edulis 75, 484, 532, 573 Otiorrbynchus nodosus 409, 441 Oxalis corniculata 55 Oxychilus alliarius 590-1 O. cellarius 590-1 Oxyloma pfeifferi 134, 268 Oxyococcus 511 Oxyria 267, 425

O. type 397 Palaeoloxodon antiquus 44, 74-5 Paludella squarrosa 265, 270, 377 Panthera leo 88 Papilionaceae 267, 475, 502 Papilla muscorum 591 Paralia sulcata 534, 536, 573, 580 Paralimnocythere cf. diebeli 269 Parnassia 475 Patella vulgata 60-1, 532 Patrobus assimilis 441 Patrobus septentrionis 409 Pecten sp. 60 Pediastrum 253, 267, 403, 407, 426, 542, 546, 561, 563, 565 Pelophila borealis 409 Peucedarma palustre 588 Philopertha borticola 441 Pholas sp. 75 Pbragmites 232, 251, 383, 385, 429, 447-8, 511-12, 519, 527, 529, 548, 556-7, 559, 563, 566-9 P. australis 460-1, 463, 586-8 P. communis 446, 515, 517 Picea 68-9, 87, 136, 138, 282, 406 P. abies 135 Pilularia 373 Pinnularia 240, 242-3 Pinus 44, 63, 69, 135, 136, 138, 142, 183-4, 214, 223-9, 233-41, 244-50, 251-7, 259-60, 266-8, 274-7, 357-8, 360, 367-8, 370, 372, 375-6, 377-8, 380, 382, 384-6, 388, 390, 392, 395-6, 398, 401-2, 406, 408, 410-12, 415, 419-22, 424, 428, 430-2, 434, 438-40, 442, 447, 455-7, 459, 461-2, 466, 468, 474, 476, 479, 482, 489, 495-6, 501-2, 506, 508-9, 511, 514, 516-17, 528, 530-1, 533, 537, 542-4, 546-7, 549, 556, 559-62,

O. digyna 222, 348

564, 568, 579, 587-8 P. sylvestris 266, 280-4, 448, 450, 520, 522, 525, 587 Pisidium 441 P. casertanum 590 P. bibernicum 267-8 P. milium 590 P. nitidium 274 P. obtusale 590 P. personatum 590 P. subtruncatum 590 P. spp. 134, 268, 423, 441, 590-1 Planorbis 441 Planorbulina distoma 570, 573 Plantaginaceae 545, 561, 568 Plantago 368, 370, 385, 391, 421-3, 464, 466, 489-90, 493, 514, 516-17 P. coronopus 389-90, 501-2, 546, 550, 561 P. lanceolata 235, 240, 248-50, 267, 281, 284, 360, 362, 375, 379-80, 382, 383, 387, 389-90, 393, 397-8, 403, 412, 414-15, 417, 425, 428, 431, 432, 435, 438, 440, 442, 458-60, 462, 464, 467, 469, 473, 477, 479, 483-4, 489-90, 494-5, 497-8, 501-2, 506, 514, 516-17, 520, 522-3, 525, 528-30, 542, 545-6, 550, 561, 564, 569 P. major 253, 550, 561 P. major/media 267, 284, 388, 398, 458, 473, 475, 477, 497, 501-2 P. maritima 69, 184, 379-80, 385-7, 389-90, 392, 394, 397, 535, 538, 545, 548, 550, 563-4, 584 P. media 403, 447, 451 P. media/major 387, 390, 392, 425 P. spp. 245, 249-50, 564 Platystethus cornutus 409 Poaceae 276, 409, 412, 446-8, 450, 461-3, 494-6, 498, 520, 522-3, 525, 587 see also Gramineae

Poblia 464 P. nutans 518 P. wahlengergii var. glacilis 140, 142 Polemonium 248, 373, 425 P. caeruleum 394, 517 P. major 373 P. maritima 373 Polydora sp. 60 Polygala 458 P. amara 394 P. serpyllifolia 394 P. vulgaris 394 Polygonum 245, 440, 466, 469, 483, 545, 550, 565 P. amphibium 458 P. aviculare 477 P. bisorta 267, 387, 394 P. convolvulus type 561 P. persicaria 565, 569 P. viviparum 392 Polypodiaceae 281, 369, 433, 458 Polypodium 267, 269, 371, 373, 379, 387, 389-90, 397, 403, 407, 423, 458, 478, 483, 516, 537, 542-3, 545-7, 550, 561, 565, 568 P. vulgare 281, 469 P. type 503 Polysaccammina ipohalina 538 Polytrichum 471, 501 P. alpinum 224 P. strichum sp. 429 Pomatias elegans 591 Populus 251, 401-2, 410, 412, 421-2, 427, 471, 474, 542-4 P. tremula 224, 452-3 Potamocypris maculata 592 Potamogeton 63, 267, 269, 376, 397, 403, 407, 415, 422, 426, 440, 451, 458, 464, 469, 471, 475, 477, 478, 542-3, 545-7, 550, 556, 561, 565, 568, 587 P. alpinus 142 P. cf. lucens 471 P. filiformis 134, 142 P. praelongus 251, 513, 517 P. type 281, 283 P. spp. 251-2 Potentilla 249-50, 379-80, 387, 389, 397-8, 403, 475,

477, 542-3, 546-7 P. argentea 55 P. errecta 514 P. fructicosa 348 P. palustris 471 P. repens 441 P. type 267, 281, 458, 483, 502 Poterium 184, 458, 477 P. sanguisorba 515 Potomocypris fulva 592 P. wolfi 592 Primula 543, 565 Prionocypris serrata 592 Proteliphidium germanicum (same as Haynesina germanica) 558, 563-4 Prunus 403, 419, 421, 482, 546, 564 P. avium 280 P. spinosa 280 Psamma 582 Psammobia sp. 68 Psammoechus bipunctatus 409 Pstella vulgata 532 Psychodromus olivaceus 592 Pteridium 235, 240, 248-50, 269, 281, 348, 360, 369, 379-80, 387, 389-90, 397, 403, 407, 415, 423, 426, 462, 467, 478, 483, 497, 501, 503, 506, 516, 528-30, 538, 542-3, 545-6, 550, 561, 565, 568-9 P. aquilinum 281, 284, 348, 458, 469, 569 Pteridophytes 21, 402, 451, 469 Pterids 451 Pterosipda (monolete) 451 Pterostichus macer 262 Punctum pygmaeum 268 Pupa marginata 75 Pupilla muscorum 591 Purpura lapillus 75 Pycnoglypta lurida 262, 409 Quercus 44, 63, 68-9, 136, 138, 223-9, 235, 240, 244,

138, 223-9, 235, 240, 244, 246-50, 254-6, 261, 266-70, 276-7, 280-4, 344, 357-8, 367-8, 370, 375-6, 377-8, 380, 382, 384-6, 388, 390, 392, 395–6, 398, 401–2, 406, 408, 410, 412, 414–15, 419–22, 424, 428, 429–32, 435, 438, 440, 442, 447, 450, 455–7, 459–60, 461–3, 464, 466, 468, 471, 473, 476, 479, 481–2, 484, 494, 496, 501–2, 506, 509, **511**, 514, 516–17, 520, 522, 528–31, 533, 537–8, 542–4, 546–7, 549, 559–64, 568, 579, 581, 584–8 *Q. mixtum 562 Q. robur 429 Quinqueloculina* spp. 570, 573

Rangifer tarandus 88 Ranunculaceae 184, 244, 259-61, 266-71, 369, 371, 373, 379, 387, 389-90, 397, 407, 412, 415, 423, 426, 433, 458, 514, 516, 520, 522, 543, 568 Ranunculus 259-61, 403, 407, 471, 473, 475, 477, 479, 537, 542, 545-6, 550, 561, 564 R. acris type 281, 283-4, 451 R. sect. Batrachium 440 R. trichophyllus type 281 R. type 483, 537 Retusa obtusa var. pretenuis 68 Rhacomitrium 347 Rhamnaceae 457 Rhamnus 397, 422, 482 Rhaxella chert 34 Rhinanthus 389, 502, 550 Rhizopod 407 Rhynchonella psittacea 60 Ribes nigrum 283 Rivularia baematites 515 Rosa 440 Rosaceae 184, 235, 240, 245, 267, 269, 281, 369, 371, 373, 379, 387, 389-90, 397-8, 403, 407, 451, 458, 462, 475, 477, 483, 542-3, 545-7, 561, 565 Rosalina spp. 573 Rubiaceae 184, 225, 233-41, 245, 249-50, 252-5, 267, 269, 281, 283, 369, 371, 373, 379, 389-90, 397, 407, 447,

451, 458, 502, 516, 561, 565, 568 Rubiaceae Galium type 542-3, 546-7 Rubus 55, 537 R. chamaemorus 253, 389, 394, 486-7, 514 R. saxitilus 348 R. type 502 Ruderals 431, 473, 538, 569 Rumex 183, 214-15, 218-19, 224-8, 233-41, 249, 258-60, 267, 357, 366, 368, 370, 373, 382, 389-90, 403, 414-15, 422, 458, 462, 464, 466, 473, 483, 501-2, 514-16, 537, 542-3, 546-7, 550, 561, 565, 569 R. acetosa 238, 244, 249-50, 252-5, 265-71, 279-81, 283-4, 379, 397, 407, 425, 451, 458-9, 494, 497, 522, 525, 545 R. acetosa/acetosella 244, 250 R. acetosella 279-84, 398, 425, 446, 451, 474, 477 R. crispus type 279-81 R. obtusifolius type 477, 502 R. spp. 244, 249-50, 520, 525 Ruppia 584 Salix 49, 135, 138, 183-4,

223-9, 233-41, 244, 249-50, 253, 259-61, 266-71, 276-7, 279-83, 357, 367-8, 370, 372, 378, 382, 384, 386, 388, 390, 392, 395-6, 403, 406, 411-12, 415, 421-2, 424, 427, 432, 434-5, 438, 440-2, 446-8, 450, 453, 456-7, 461-2, 464, 466, 468, 470-4, 476, 479, 482, 496, 502, 514, 516-17, 533, 537, 542-4, 546-7, 549, 560, 564, 568, 584, 587-8 S. aurita 587-8 S. cinerea 587-8 S. berbacea 89, 213, 223-8, 236, 239, 241-2, 446 S. phylicifolia 224 S. viminalis 442

### Fossil index

S. sp. 429, 587-8 Sambucus 476 S. nigra 280 Sanguisorba 425, 502, 546, 565 Saussurea alpina 475 Saxicava sp. 60, 75 Saxifraga aizoides 348, 392, 394 S. beiraciifolia 394 S. bypnoides 348, 387 S. hyponoides type 283 S. nivalis 394 S. oppositifolia type 475 S. stellaris 387, 389, 392, 394 S. tenuis 394 S. sp. 440 Saxifragaceae 267, 269, 379 Saxifrage 348, 392, 394, 403, 441 Scabiosa 369 Scarabaeidae 133 Scheuchzeria 501, 503, 506 Schoenoplectus 421 Scirpus lacustris 251 Scolytidae 133 Scolytus carpini 44 Scorpidium scorpiodes 134, 437 Scrobicularia piperata 68 S. plana 68, 531, 532, 539, 558, 570, 573 Scrophularia 451, 550 Scrophulariaceae 379 Secale cereale 495, 504, 507, 520 Sedum rosea 348 Selaginella 237, 245, 253, 369, 371, 373, 385, 387, 389-90, 403, 426, 439, 471, 475, 479, 516 S. selaginoides 267, 385 Senecio 483 S. type 474, 477 Serratula type 425, 502 Serrica brunea 441 Silene 267, 440, 546 S. type 483 Silphidae 133 Simplocaria metallica 262, 409 Sinapis type 502 Solanaum dulcamara 587

Solidago virgaurea 344 Sorbus 482 S. aucuparia 280 S. type 474, 479 Sparganium 269, 369, 371, 373, 390, 561 S. type 69, 281, 283, 458, 503 Sparganium/Typha angustifolia 451 Spergula 389, 546, 550 S. type 425, 502 Spergularia 546, 565 Spermodea lamellata 590-1 Spermophilus major 88 Sphaerium corneum 591 (Sphaerium corneum) Cyclas cornea 584 Sphagnum 135, 232, 234, 240, 243, 245-6, 248, 250, 251-2, 254, 256-7, 265, 267, 269, 279, 281, 283, 366, 369, 371, 376, 379, 381, 383-5, 387, 389-90, 403, 407, 415, 422-3, 426, 429-31, 433, 451, 458, 460-3, 469, 470-1, 474, 478, 482-3, 488-90, 491-3, 497, 499-501, 503, 505-6, 508-18, 537, 542-3, 545-6, 550, 561, 565, 568 S. cuspidatum 252, 366, 371, 373, 511 S. cuspidatum/recurvum 514, 518 S. imbricatum 501, 505-6, 513-15, 519, 521, 523-4, 526 S. magellanicum 518-19, 521, 523-4 S. papillosum 270, 463, 519, 523-4 S. plumulosum 252, 270 S. recurvum 514, 518 S. riparium 512 S. s. Acutifolia 463, 521, 523-4, 526 S. s. Cuspidata 463, 519, 521, 523-4 S. subnitens 521 S. Subsecunda 524 S. teres 265, 270 S. warnstorfit 512 Sphagnum-Molina-Myrica zone 234

Id. Sphagnum 519, 521, 523-4.526 Spiniferites 485 S. spp. 44 Stachys type 281 Staphilinidae 133 Stauroneis phoenicentron 536 Stellaria 423 S. bolostea 545 S. media 440 S. type 483 Stenus plicipennis/p. repandus 409 Stephanorhinus haemitoechus 44 Succinea oblonga 134, 590 Succisa 184, 235, 244, 248-50, 269, 371, 379, 387, 389-90, 397, 477, 482, 502, 543 S. pratensis 267, 281, 425 Synedra nana 242 Tabulatae 561, 564 Taraxacum 467, 473, 474, 483, 503, 520, 522, 529, 545, 546, 550, 561, 564, 566, 569 Taxus 44, 136, 138, 249, 344, 421, 516 Tellina balthica 68 T. tenuis 539, 573 Tetrophis pellucida 518 Teucrium 442 T. scorodonia 344 T. type 475 Thalictrum 184, 214-15, 219, 233-41, 244, 252-6, 258-61, 267, 279-81, 369, 371, 373, 382, 403, 422-3, 425, 430, 433-4, 446, 451, 458, 473-5, 477, 479, 516, 542-3, 546, 550, 565 T. alpina 392 T. alpinum 89, 394 T. flavum 394 T. minus 224, 348 T. minus ssp. majus 394 T. minus ssp. minus 394 Thelypteris 267, 269, 426 T. dryopteris 281

T. palustris 281, 451

Tilia 223, 276-7, 235, 248-50,

Thymus 390, 392

254-7, 266-8, 357-9, 362, 368, 376, 378, 386, 389, 395-6, 398, 401-2, 406, 411-12, 415, 420-2, 424, 428, 430, 438, 440, 442, 447, 462, 466, 468, 476, 482, 496, 501-2, 506, 516, 528, 530, 533, 537, 543-4, 549, 559-60, 562, 564, 568, 588 T. cordata 280-4, 423, 457, 459 T. europaea 587-8 Tilletia 503 T. sphagni 403, 542 Tinodes waeneri 518 Tofieldia pusilla 393 Trapa natans 413-15, 417 Trichia 590-1 T. bispa 591 Tricbopborum caespitosum 366 Trichoptera 134, 228 Trifarina angulosa 570 Trifolium type 423, 502 Trilete 423 Triticum 504, 507 T. type 522 Trochammina inflata 538, 558, 563 Truncatellina cylindrica 591 Tubuliflorae 244, 266, 269, 433, 458, 542-3, 545, 550 Turritella comminus 46, 119 426 Typba 423, 426 T. angustifolia 407, 451, 466, 483, 542-3, 545-8, 550, 556, 561, 563, 565, 568, 586-7 T. latie 369, 371, 373 T. latifolia 224-5, 267, 281, 283, 369, 371, 373, 403, 407, 429, 433, 451, 458, 469, 475, 478, 483, 516,

537, 542–3, 545–7, 550, 565, 568, 586–7 Typba–Sparganium 475, 478

Ulex type 483 Ulmus 68-9, 223-9, 235, 240, 246-50, 254-7, 266-8, 274-7, 280-4, 357-61, 367-8, 374, 376, 377-8, 380, 382, 385-6, 388, 390, 392, 395-6, 398, 401-2, 406, 408, 410, 412, 414-15, 417, 419-22, 424, 428, 429-32, 435, 442, 447, 450, 455-7, 459, 461-3, 464, 466, 468, 476, 479, 481-2, 488-90, 495-6, 501-2, 509, 514, 516-17, 525, 528-30, 533, 537-8, 542-4, 546-7, 549, 559-60, 562-4, 568, 587-8 Ulmus decline 240-1, 246-50, 256, 274-8, 280-4, 359-61, 374, 376-8, 378, 380, 385-6, 388, 390, 392, 396, 399, 408, 410, 412, 414-15, 428, 430-2, 435, 447, 449, 459, 461, 476, 479, 481, 488-90, 498, 528-30, 566, 569 Umbelliferae 69, 184, 235, 244, 249-50, 266-7, 269, 281, 369, 371, 373, 378, 379, 387, 389-90, 397-8, 403, 407, 415, 423, 458, 466, 469, 475, 477, 483, 502, 516, 542-3, 545-7, 550, 561, 564, 568 Ursus 44, 75, 88, 206 U. arctos 88-9 Urtica 281, 379, 387, 407, 412, 466, 475, 477, 483, 497, 501, 565, 569 U. dioica 440, 514, 516-17 U. type 502

Utriculus obtusus 68

Vaccinium 450, 514, 544 V. myrtillus 348, 486-7, 514 V. oxycoccos 279, 511 V. uglinosum 348 V. vitis-idaea 514 Valeriana 245, 267, 369, 371, 378, 387, 389-90, 425, 475, 477, 516 V. officinalis 184, 373 Vallonia costata 590-1 V. excentrica 591 V. pulchella 590-1 Valvata piscinalis 134, 420 V. spp. 423 Varia 253 Veronica type 475, 477 Vertigo alpestris 590-1 V. angustior 590-1 V. antivirtigo 590-1 V. genesii 134 V. geveri 590 V. moulinsiana 590-1 V. pusilla 590–1 V. pygmaea 590-1 V. substriata 590–1 Viburnum 406, 482, 543 Vicia 442, 543, 546, 550, 565 V. sylvatica type 483 Viola lutea 394 V. palustris 224, 394 V. riviniana 224, 394 V. rupestris 394 V. sp. 385 Virgulina spp 570, 573 Viscum 379, 458, 505, 507 V. album 284 Vitrea crystallina 441 Vulpes vulpes 88

Zostera spp. 584 Zua subcylindrica 75 Zygnematallae 426

# General index

Note: Page numbers in **bold** and *italic* type refer to **tables** and *figures* respectively.

Abbot Moss 102, 213, 376 Abraham's Bridge 555, 571, 580 Acheulian artefacts 43 Acklington Formation 37 Sandy Bay 154-8 Aegelsee oscillation 273-4 aeolian sands 74, 76-7, 141-4, 219-20, 292-3 Holocene 355-6, 399-402, 437, 507 Holy Island 532-5 see also blown sand; dune systems; loess Aglionby 128 agriculture 235, 374-6, 408, 479 see also under Bronze Age; barley; cattle; cereal; forest clearance; Iron Age; medieval; Mesolithic; Neolithic; Norse; Roman; wheat Aikbank Farm Glacigenic Formation 125 Aikshaw Moss 188-93 Ainsdale 566, 571, 580 Aire Valley 89, 101, 119, 204 Airedale 98, 204 Allenton 45 Allerød Interstadial 16, 216, 222-9, 233-41, 256, 414, 431 alluvial sediments 135, 325-8, 354-6.364 Aln Valley 101, 129, 154,

163-4 Alnus glutinosa-Carex paniculata zone 588 Alnus-Betula V and VI 309 alpine cinquefoil 89, 348 see also potentilla in the Fossil Index alpine vegetation 227-8, 343 see also Fossil Index; Glossary of botanical names Alport Moor 360 Alston Block 93-5, 203-8, 335-6 rebound 25, 28, 95 Alt River 353, 552, 564-6, 569, 571, 574, 576, 577, 580-2, 584, 587, 588 and Downholland Moss 555, 559, 565, 569 Altcar Moss 555-7, 559, 563, 565-9 altiplanation surface 291, 340-3 Alum Pot Beck 203 Alvaston Formation 37, 45 Alyn River 116–17 amber 445-6 Ambleside 230, 328 Amersfoort 16 Angle Tarn 375-6 amino-acid ratios 41, 45, 61, 65, 68-71 Late Devensian 75, 126, 142 Middle Devensian 90

aminozone 13 amphibians, Pin Hole Cave 88 see also frogs Amthorpe 44 Ancholme valley 119, 589, 593 Anc's Hill 145-6 andesite tors 5 see also Cheviot, tors angiosperms 52 **Brassington Formation 21** see also Fossil Index; Glossary of botanical names Angle Tarn 250, 375 Anglezarke 27 Anglian 13, 17, 33-4, 36-42, 92-3 **Kesgrove Group 35** limit 92, 98, 115, 287-8 Anglian Till (Chalky Boulder Clay) 39 Anglo-Scandinavian revival 463 Anglo-Scottish Wars 520-5 animal bones 353, 483, 529, 570 Skipsea Withow Mere 418-19, 423, 428 Star Carr 444-6, 448-55 see also birds; frogs; fishes; mammals; amphibians; **Fossil Index** Annan basin 120 Annaside and Gutterby Banks site 4-6, 176-9, 191

Annaside Member 177-9 Coteley Member 176-9 **Coteley Bank Member** 177-9 Gutterby Spa Bank Member 177-9 Gutterby Spa Complex 177 - 8kettlehole sediments 176-9 sandur systems 178-9 Selker Member 176-9 Annaside Member 37 Annaside and Gutterby Banks 176-87 annelid worms 59 Ansdell, Lytham 540-1, 546-7, 551-4 Antian 17, 36 antler implements 444-6, 448-55, 529, 531 apatite fission track analysis 21, 24-5 Aqualate Hall 144-9 Aqualate Mere site 4, 6, 101, 129, 144-9 Arclid Member 37, 44 arctic fox 88-9 Arctic Freshwater Bed 17 Arenig 297-302 Armstrong's Pit 188-93 Arnside-Silverdale 272 arête 193, 197 Artemisia-Caryophyllaceae zone 226 Artemisia-Caryophyllaceae-Ly copodium selago-Gramineae zone 327 Artemisia-Rumex zone 226, 236-7 Asby Scar 24 Ash Tree Cave, Whitwell 88, 90 Ashop River 486-7 Askham Bog 256, 357-8, 364 Askrigg Block 24, 26, 28, 203-8, 336 Aspatria 128, 187 Atlantic period 240, 243, 358, 367-76, 552, 581 Farne and Holy Islands 535, 539 Leash Fen 494 Lytham 552 Mere Sands Wood 398-9

Valley Bog 377-81 see also pollen zones atmospheric pollution 491, 493 Atwick 143, 418 aurochs 33, 44, 216, 264-5, 271 Downholland Moss 569 Formby Point 569, 573-4, 578-9 Hartlepool 529 Skipsea Withow Mere 419 Star Carr 444-6 Upper Teesdale 392 Austerfield Bed 37, 44 Austwick Formation, Norber Erratics 200-3 Aveley 41, 44, 69-70 axe Lower Cave Earth 45 Neolithic 375, 494, 531, 578, 588 Ayre Formation 37 backwall failure 175, 290-1, 341, 345 Bag Mere 217 Baggy Moor 364 Baginton sand 17 Baginton–Lillington gravels 17 Bakewell Formation 37, 40 Balby 39-40 Balby Formation 37, 42 Ballacottier Member 37 Ballacregga Member 37 Ballaleigh Member 37 Ballaquark Member 37 Ballateare Member 37 Ballaugh Formation 37 Ballaugh Member 37 Ballavarkish Member 37 Ballure Member 37 Ballykelly Oscillation 126 Ballyre Member 37 Bamburgh 160, 198 Bamburgh Formation 37 Thorpe Bulmer 469 Bangor Lake 116-18 Bar Hill-Ellesmere-Wrexham moraine 91, 114-19, 144-9, 279 barbed points, antler 258-9, 264 Skipsea Withow Mere

419-20, 423-4, 428 Star Carr 444-6, 453-5 Barfield Tarn 176, 359-60, 374, 376 Barham Soil 82 barley 504, 507 see also cereal Barmston 72, 75, 143 Barn Scar Sand and Silt Member 123 Barnsley 39-40, 129 Baronwood Member 37 Baronwood-Low Plains deltas and eskers 102, 104-5, 107 barrier growth 566-9, 579-82 Barrock Fell 102 Barry's Island 443, 454-5 Barton Hall 557-8 Baschurch 362, 364 Basement Till 32, 42, 56 Dimlington 73, 75, 139-44 Kelsey Hill 80-1 Sewerby 72-7 Speeton 65, 66-71 Wolstonian 56, 70 see also Bridlington Member; Warren House Till Bassenthwaite 323, 325 basiphiles 243 Baventian 17, 34-6, 39 Bawtry 39 Beachy Head 321 Beacon Hill 102 beads 446 Beal Point 532, 534 bear 44, 75, 88, 206 beaver 421, 428 Beeley Moor 494 Bees Nest Member, lacustrine 21 - 4Bees Nest Pit 23, 40 Beeston 17 Beeston Terrace 45 Beestonian 17, 34-6 beetles 133-5, 136-8, 215-16, 258-9 thermophilous 183 see also coleoptera; Fossil Index Belderg readvance 126 Beldon Cleugh 101 Bellwater Moss 187 Bellyside Valley 99

Ben Loyal 288 Betula zone 236-7, 279-80, 282 - 4Betula-Alnus-Salix zone 234 Betula-Artemisia zone Betula-Cyperaceae-Filipendula zone 266-71 Betula-Gramineae zone 279, 282 - 4Betula-Juniperus zone 226, 228, 236-7, 237-8 Betula-Juniperus-Rumex zone 237 Betula-Rumex zone 225, 228, 236 Betula-Salix carr 283 Betula-Salix-Filipendula zone 268-71 **Bidston Moss 361** Bielsbeck 44-5 bilberry 348, 486-7 see also Vaccinium in the **Fossil Index** Bingley Bog 217, 256, 270-1 Bingley Bog Formation 37, 217, 264 Tadcaster 251-7 Willow Garth (Boyton) 436 birch See Betula in the Fossil Index birds 88, 446, 449 crane 570, 573, 578 Birkdale Dunes, Formby 580 Bishop Middleton 362-3, 398-9 Bishop's Court Member 37 bison 43-5, 75, 79, 88, 206 Bizzle 99 Black Brook 145, 148 Black Burn 335 Black Combe 128, 176-9 sandur 101, 116, 128 Black Combe Formation 37, 180 - 7Black Death 463, 520-5 Black Dub 191 Black Law Ridge 165-7 Black Rhadley Hill 297 blackberry 55 see also Rubus in the **Fossil Index Blackhall Colliery Formation** 36-8, 53-8 Blackhall, Durham 35-8

Blackhall Member 37 Blackhall Rocks 51 Blackhall Till (Lower Boulder Clay) 53-5 Blackmere pool 148 Blackstone Edge site 5-6, 293, 296, 302-4, 318 Blaeberry Gill Boulder Gravel 125 Blake event 36 blanket bog 354, 356-7, 361, 377, 380-1 Featherbed Moss 486-93 Leash Fen 494-9 Scaleby Moss 375-6 Upper Teesdale 381-5, 392-5 Valley Bog 377-81 Blea Tarn, Langdale site 4, 6, 214-18, 229, 241-50 Holocene 375-6 Interstadial 213, 215-18, 236, 241 Bleaklow 486, 493 Blelham Bog site 4, 6, 230-41, 242, 250, 255, 377 Coniston Series 230, 232 Devensian Gravels 231-3, 237-41 Late-glacial 212-13, 215-18, 220 Windermere Interstadial 230-9 Blelham Formation 37 Blelham Peat Formation 125 Blelham Tarn 217, 232, 234 **Blengdale Glacigenic** Formation 90, 125 blockfields 290, 294, 299-302 Burbage Brook 307–10 Cross Fell 335-43 summit Helvellyn 194-7 blocks, perched 200-3 slopes 290, 294, 307-10 blocky scree 204-6, 294 slopes 335-7, 343-8 blown sand 74, 220, 293, 356, 539-41 see also aeolian sands; dune systems; loess Bluecaster dolerite clasts 98 **Blundellsands Sailing Club** 584 Blyth Valley 129

Bobbitshole 17, 68-9 bog 362 oligotrophic 508-12 ombrotrophic 351-2, 354 Bolton Fell Moss and Walton Moss 518-26 Chat Moss 352 Downholland Moss 556 Featherbed Moss 486-93 Fen Bogs 460-3 Fenton Cottage 352, 360, 362-4 Lindow Moss 499-508 Malham Tarn Moss 518-26 **Rusland Moss 352** bog bean 366 see also Menyanthes in the **Fossil Index** bog bodies, map of sites 507 bog bursts 492 **Bolders Bank Formation 127** Bollihope Bog 363 Bølling Interstadial 215, 225, 233, 236-9, 256 Bølling-Allerød Interstadial 211, 256, 263 see also Windermere Interstadial Bolton Fell Moss and Walton Moss site 6, 363, 377, 491, 518-26 Bonfield Gill Head 360, 461 Boothby 105 Boothby Bank 128 Bootle Fell 178 Boreal 14, 63, 134, 261-4, 535, 552, 581 Blea Tarn 242, 244-50 (Flandrian Chronozone I) 357-8 Neasham Fen 395-8 Skipsea Withow Mere 419 Tadcaster 255 Valley Bog 377 Boreal-Atlantic 242-3, 274, 357-8, 367, 552, 584 see also pre-Boreal; Sub-Atlantic; Sub-Boreal boreholes 46, 73, 78, 128, 181, 198 Bradford Kames 160-4 **Burland** 87 Carleton Hall 90

### General index

Chelford 133 Formby Point 572, 580 M55 113 M62 113 Martins Mere 402, 406 QBH19 184-5 Whin Sill 198 see also Nirex; cores Borrobol 264 Borrowdale Volcanics 194-7, 241. 245-6 clasts 59, 98, 137, 181 periglacial 323-5, 328-32, 343-8 Bosies Bank Sequence 97 **Boulton Moor 45** Bowness-on-Solway 197 Boynton Willow Garth 436 bracken 240, 281, 348 see also Pteridium in the Fossil Index Bradford Goldenhill 159-60 Bradford Kames site 4, 6, 101, 105-10, 158-64, 217, 357 Late-glacial 217, 473 Bradwell Sitch 358 Bramertonian 33 Brampton kames belt 101, 105-10 Brampton Member 37 Brandersburton 143, 423, 441, 455 Brantingham bone 129 Brassington 22, 23, 311 Brassington Formation 21-4, 29, 40 Brayton Barff 39-40, 12 Breckland 385 **Breconshire 279** Briarfield 353 Brickhills Farm 589 Bride Member 37 Bride moraine 97, 116, 126 Bridestones site 5-6, 293, 296, 314-17 Bridge Mill, Holy Island 532-5, 538-9 Bridlington 71, 75, 143 Bridlington Crag 56, 73, 79, 139 Bridlington Member 77 Brigantian 375 Brigantian Limestone 198-9 Brigg 589

Brimham Rocks site 5-6, 293, 296. 304-6 Brockmill 533 Bronze Age 206, 240, 309, 360, 362-3 barrows 356 clearance, Bolton Fell Moss and Walton Moss 520-5 Castlethorpe 593 Featherbed Moss 489-93 Leash Fen 494-9 Martin Mere 407-8 Neasham Fen 398-9 Red Moss 409-12 Scaleby Moss 374-5 Skipsea Bail Mere 417 The Bog, Roos 435-6 Upper Teesdale 385, 392-4 Valley Bog 380-1 collared urns 494 Downholland Moss 566, 569 Fen Bogs 461, 463 Formby Point 569-82 Hartlepool 529, 531 Low Hauxley 483-5 Broomhouse Farm 217-18, 220 Brørup 16 Brown Earth soils 356 Brundon 44 Brunhes 15.36 Brunstock Member 26, 37 Brunt Hill Farm 62-4 Brown Cove 194 bryophyte 219, 245, 264-5, 347 Cross Fell 344 Kildale Hall 264-71 Malham Tarn Moss 518 Mere Sands Wood 402 Scaleby Moss 366-76 Skipsea Bail Mere 416 Valley Bog 377 Willow Garth 437, 439-41 see also mosses; Fossil Index Buckingham till 35 Budle Bay 158-64 **Buildwas** 112 see also Lake Buildwas Bullman Hills 335, 342-3 **Bungalow Formation 37** 

Bunter Sandstone 149, 292 Burbage Brook site 5-6, 291, 293, 306-10 Millstone Grit Group 306 Burbage Gravel 309 Burbage Head 309 Burbage Terrace 309 Burland borehole 42, 87 Burland Member 37 Burnhope Seat 342-3 Burnmoor Tarn 242, 363, 375-6 Burscough Moss 403, 406, 408 **Burstwick** 78 Burton Goldenhill 159-64 Burton Salmon 256 Butterby Member 37 Buxton 26 Byland Abbey 467 Cairngorm Mountains 175, 288, 291-3, 296 Calder River 42, 125 Caldew Mires 128 Caldew River valley 128 Callaly Moor 362 Calluna vulgaris-Eriophorum vaginatum mire 514, 517, 519 Cam Beck Valley 127-8 Cam Loch 236-9 Camp Century core 16 Camp Hill Moss 362, 365 Caral Beck 48 Caral Gully 48 carbonate benches, Hawes Water 271-8 Carboniferous Limestone 23, 204-8, 272, 310-11, 335 caves 45-6, 207-8 Lower, Melmerby Sugar Limestone 381-3, 394 Malham Tarn Moss 512 Carboniferous Lower Coal Measures 494 Carboniferous Middle Coal Measures 480 Carex echinata-Sphagnum recurvum mire 514 Carlswark 307-8 Carleton 89-90, 144 Carleton Hall borehole 90 Carleton Silt Formation 123 Carlingill 356, 364

Carlisle 121, 128 Carlisle Formation 37 Carlisle Plain 91, 94-5, 110-13, 127-9, 191 carr 231-2, 234, 272, 283 Holocene 352, 355, 420, 428, 436 Leash Fen 494, 498 Lindow Moss 500, 506 Malham Tarn Moss 517 Star Carr 443 The Bog, Roos 429 Carr House Sands 527 Carrow Hill 110-12 Carstairs kames 163 Carwyn Member 37 Cassington Member 13 Castle Bank 124, 128 Castle Eden 22-3, 51-2 Castlethorpe site 6, 589-93 Castleton caves 41 cat, dirk-toothed 43 cattle 529, 569, 573-4, 578-9, 582 Cauldron Snout 382 Cautley Snout waterfall 381 Cave Oolite erratic 39 caves 3-4, 33, 88-90, 213, 216 Craven district 43, 89 **Giggleswick Scar 203-8** Hoxnian 41 Ipswichian 43-5 pre-Devensian 33-8 Caves Haven 532 Cawood 220 Celtic sacrifices 504-5, 507 Celtic Sea 21, 97, 119-27 Central Graben 25 cereal 235, 240, 281-4 Holocene 360-5, 374-6, 379-80, 495, 504 see also barley; wheat; Fossil Index Chalk 23-9, 137, 175, 217, 302 Dimlington 139-44 Sewerby 73-4, 76, 89 Speeton 67, 71 Willow Garth (Boynton) 436-42 Chalky Boulder Clay 39 Chapel Moss 187-8 Chapel-le-Dale 99, 201-3, 204 charcoal 218, 250, 264-5, 271

Castlethorpe 593 Downholland Moss 569 Fen Bogs 463 Hartlepool 529, 531 Hightown 588 Holocene 353-65 Lindow Moss 506 Malham Tarn Moss 517 Martin Mere 408 Star Carr 446-8, 453-4 Willow Garth 442 Charlton 160, 163-4 Charnwood Forest 288 Chat Moss 217-18, 352, 585 Chatsworth Grit 306-7 Burbage Brook 306 Chelford Formation 37, 87, 131-5 Chelford Interstadial 17, 87-9, 131 Early Devensian 131-2, 134-5 Four Ashes 138 Chelford site 4, 6, 41-2, 87-8, 131-5, 139, 288-9 Cheshire 42, 96, 98, 101, 114, 284, 354, 356-7 Chelford 131-5 facies 37 Holocene 357-8, 552 Late-glacial 217-18, 292 Lindow Moss 499-508 Wybunbury Moss 508-12 Cheshire Basin 24-9 Cheshire-Shropshire Lowlands 91-3, 96, 113-19, 129 Holocene 351-65 periglacial 219, 288 Thurstaston 149-54 Chesterfield 39, 42 **Chesterhill Dean Limestone** 159-60 Chetwynd Park 145-8 Cheviot 175, 218, 288, 291, 336 andesite 59, 98, 155, 319 Holocene 354, 358-63, 365 ice 33, 87, 92–9, 101, 113, 199, 319 lake 129 melt channels 154-8, 164-9, 319-20 pluton 199 tors 292-7

Cheviot Tors site 5-6, 293-7, 319-20 see also Humbleton Hill and the Trows chianophilous 241 see also snow bed conditions Chilterns 83 Chisworth 169 Chorley 129 Christon Bank 160-1 Church Eaton Brook 145, 147-8 Church Hole 90 Church Moss 218-19 Church Point, Newbiggin 158 Church Stretton 117, 219 cirques 3, 49, 98-9, 125, 130, 132, 175-6, 290-1, 219, 243 Helvellyn 193-7 Cleveland 90, 92, 94, 113, 173 Kildale Hall 213, 264-71 Seamer Carrs 431 Clieves Hill 219, 400-1 climate shifts 4, 7, 15, 87-9, 135 Bolton Fell Moss and Walton Moss 518-26 Devensian-Holocene 41-3, 95-100, 211-12, 263 Featherbed Moss 488-93 Fen Bogs 460-3 Holocene 351-5 humidity and vegetation 518-26 Late-glacial 186-7, 211-19, 236-8, 425, 428 Late-glacial-Holocene 255-7, 257-65, 266-71, 271-8 Leash Fen 494-9 Lytham 539-54 Malham Tarn Moss 513-18 Old Mere, Hornsea 455-60 Thorpe Bulmer 472-3, 479 Willow Garth 435 see also vegetation change; diachronous vegetation change CMCP zones 279-81 coal 258, 336 see also lignite Coal Measures 26, 156, 181, 312-13, 326, 494

Coalbrookedale 147 Coat Dyke End 589, 593 cobbles 61, 185-7, 221 Thurstaston site 150-4 Cock Cove 194 Cockermouth 112 Cockle Hill 159 Cockle Ridge 160-4 Cockley Moss 187-8 col gullies 165-9, 170-1 Colchester Formation 35 Waldringfield Member 35 coleoptera 132-4, 136-8, 142, 183-7, 423 Gransmoor 258-64, 446 Late-glacial 183, 215, 219, 226-8, 238-9, 242 Lindow Moss 506-7 Red Moss 409-12 see also beetles; Fossil Index Collar Beck 128 College Valley 99 Collier Gill 360 Common Moss 187-8 Condover 216 conifers 21, 135, 250 see also Fossil Index Coniston Series 230, 232 copper 504-5 Coquet Valley 26, 101, 129 Corbel formula of weathering 200 - 3core, 552A (DSDP) 15 B200-1 97 Camp Century 16 deep-sea 11-14 Hawes Water 272-8 ice 14-17, 212, 214-15 ST/-09/89 97 V28-239 15 Corney Fell 128, 178-9 Cornhill 101 corries, see cirques Corton Cliff 17 Corylus avellana zone 280, 282 - 4Corylus-Betula-Pinus woodland 309 Cote Gill 201 Coteley Bank 176 Coteley Bank Member, Annaside and Gutterby Banks 37. 176-9 Cotswald scarp 35

cotton grass 486, 489 see also Eriophorum in the **Fossil Index** Cow Green 335, 381 Crag Lough 198-9 Cranberry Bog 217, 357, 385, 473 Cranberry Rock 298-302 crane footprints 573-4, 578 Cranstal Member 37 Craster 163-4 Craven Arms 297 Craven District 43, 45, 89, 358, 361 **Giggleswick Scar 203-8** Malham Tarn Moss 512-18 Craven Fault Zone 199-203, 203-8 Craven Lowlands 130 Craven Uplands 27, 43, 45 Craven-Lonsdale 357 Cresswell 480 Cresswell Crags 42-3, 88-9 Cresswell and Newbiggin Shores SSSI 154 Creswellian points 206 Criffel 94, 98, 189 Crin Edge 25 Croal River 409 Cromer Till 17, 39 Cromerian 13, 17, 35-8, 57 Warren House Gill 51-2, 55.58 Cronk Ny Lea Member 37 Cronkley Scar 343 Crook Hill-Cockle Ridge 160-3 Crosby 355, 571, 582 Crose Mere site 6, 216-17, 220, 278-84 Holocene 359, 362, 364 Late-glacial-Holocene 278-84 Cross Fell site 4, 6, 287-91, 334-43 Crosby Moor delta 128 Crossgates 46 crowberry 486-7, 490 see also Empetrum in the Fossil Index Crummackdale 200-3, 204 cryoplanation platforms 175-6, 290-1 Burbage Brook 308-10

Cross Fell 340-3 Stiperstones 297-302 Wasdale Screes 343-8 cryoturbation 304 cuesta landscape 101, 197-200, 306-10, 358 Cumbria 37, 88-91, 97, 99-100, 130 Annaside and Gutterby Banks 176-9 Blea Tarn 241-50 Blelham Bog 230-41 Bolton Fell Moss and Walton Moss 518-26 coast 33, 91, 126, 577 see also Black Combe Cross Fell 324-43 Grasmoor 328-32 Helvellyn 193-7 Holme St Cuthbert 187-93 Holocene 351-65, 365-77, 518-26, 552 and Irish Sea icesheet 112-27, 149-54 Late-glacial 182-5, 213-20, 236 Low Wray Bay 220-30 St Bees 179-87 Sandbeds Fan 325-8 Scaleby Moss 366-77 Scandal Beck 62-5 Skiddaw 332-4 Thornsgill and Mosedale 46-51 Throstle Shaw 323-5 Wasdale Screes 342-8 Cunswick Tarn 272 Curraugh Formation 37 Cyperaceae zone 228 Cyperaceae-Artemisia-Rumex zone 266-71 Cyperaceae-Empetrum zones 228, 237 Cyperaceae-Gramineae-Artemi sia zone 266-71 Cyperaceae-Gramineae-Betula zone 266-71 Cyperaceae-Juniperus-Salix zone 266-71 Cyperaceae-Selaginella (+Betula) zones 226, 228, 237 Cyperaceae-Thalictrum-Rume x zone 237

Dalston 128 Dalton 120 Danes Moss 360 Dark Ages 491, 498-9 Dark Peak 40 Dartmoor tors 313, 314, 317 formation 288, 290, 293-4, 296, 301-2 Davisian concepts 26-9 Dead Crags 288, 332-4 debris flow 213, 219, 290, 294 Cross Fell 36-43 Throstle Shaw 323-5 Wasdale Screes 343-8 Dee River 98, 116-17 Deep Clough 361-3 deer 33, 44-5, 52, 569 fallow 52 giant 45, 75, 88, 419 red 44, 52, 265, 392, 419 Formby Point 569, 573-6, 578-9, 582 Hartlepool 529, 531 Hightown 584 Star Carr 444-6, 448-55 roe 44, 446, 452, 529 Delamere moraine 91, 114-19 deltas 112, 116-19, 121, 127-9, 174 Aqualate Mere 146-9 Brampton 108 and eskers 102, 104-5, 120-7, 187 Holme St Cuthbert 187-93 Bradford Kames 163-4 Denbighshire 22-3 Denekamp 16 Dent Fault 203 denudational unloading 25, 27-9 Derbyshire 23, 33, 37, 40-1, 87 caves 36-8, 88-9, 216 Ecton 320-3 facies 37 Group 5 cave system 36-8 Holocene 356, 361 periglacial 288, 310-14, 320-3 Tadcaster 251-7 Wyns Tor 310-14 Derbyshire Peak District 21-4, 29, 40-1, 87 Derwent (Cumbria) Valley

sandur gravels 101, 103 Derwent (Derbyshire) Basin 308-10 Derwent (Derbyshire) Valley 23, 25, 41-2, 45, 88 Tadcaster 251-7 proto-Derwent drainage 42, 65-6, 71 Derwent (Durham) Valley sandur system 101 Devensian 13-18, 34, 36-9, 79, 87-206 Early 48-51, 87-9, 95, 287-92 Blackhall Till (Lower Boulder Clay) 53-5 Chelford Interstadial 37, 87, 131-5, 138 Four Ashes 87-90, 136-9 Sewerby 72-7 Holderness 73-7, 79 ice limit 39-43, 91-3, 114-27, 287-8, 291-2, 295 ice margin 81, 82, 92, 114-27, 145-6, 264-5, 297 Late 90-131, 220, 240-1, 287-92 Aqualate Mere 144-9 Blengdale Glaciogenic Formation 90 Cheviot Tors 319 climate change 4, 7, 87, 234-41 Dimlington 79, 138, 142-4, 431 Ecton 322-3 extent 92-3, 114-29, 211, 264 Harwood Dale Moor 81-3 ice advance 89, 264, 270 Irish Sea ice-sheet 114-27 Kildale Hall 264–71 Newtondale and Hole of Horcum 171-9 Norber Erratics 202-3 patterned ground 200-3, 289, 297-302 relict vegetation 392-5 Roman Wall 199 St Bees 179-87 Throstle Shaw 323-5 Thurstaston 292

see also end-Devensian Late-Flandrian, Star Carr 446, 454 Late-Holocene 62 Burbage Brook 309-10 Castlethorpe 589-93 Crose Mere 278-84 Fen Bogs 460-3 Formby Point 570 Gormire 464-9 Hawes Water 271-8 Malham Tarn Moss 512-18 Mere Sands Wood 399-402 Old Mere, Hornsea 455-60 Sandbeds Fan 325-7 Skipsea Withow Mere 418 - 29Star Carr 443-4 Tadcaster 251-7 The Bog, Roos 429-36 Thorpe Bulmer 469–79 Willow Garth (Bonyton) 436-42 Late-mid-Holocene, Skipsea Bail Mere 413-17 Middle 62-5, 88-90 periglacial 287-9, 301-14, 314-17, 317-20 Ecton 320-3 Sandbeds Fan 325-8 Throstle Shaw 323-5 Termination 212 till 39, 41-2, 46, 49, 112-19 Devensian Stadial, Annaside and Gutterby Banks 176-9 Harwood Dale Moor 81-3 Low Wray Bay, Windermere 224-9 Thornsgill and Mosedale site 46-51 Warren House Gill site 51, 53-5, 56-8 Devensian-Holocene, Red Moss 408-13 Devil's Chair 298-302 Devil's Dyke 175 Devoke Water 242, 242-3, 363, 375-6 diachronous vegetation change 358, 362 Neasham Fen 380

Red Moss 380, 412 Scaleby Moss 374-5 Thorpe Bulmer 473 Upper Teesdale 391 Valley Bog 380 diamicton 42, 50, 60 diatoms 46, 230, 232, 240, 351 Blea Tarn, Langdale 241-2, 247 Downholland Moss 556-7. 559.569 Formby Point 570, 573, 580 Hartlepool 527-8, 531 Hightown 584 Holy Island Elwick 534-6 Dimlington 72, 97, 143, 431 **Dimlington Silts** 425 Dimlington site 139-44 Dimlington site 4-6, 69, 72-5, 78-9, 97, 113, 126, 138, 139-44, 270 Dimlington Stadial 5, 69-70, 76-7, 78-81, 133 deglaciation 59, 122-7, 212-14, 220 Devensian 92-3, 122-7, 138, 263 Advance 143-4 Dimlington 141-4, 259-64 Sewerby 71-2 Devensian-Holocene 263 Harwood Dale Moor 83 Sewerby site 75-7 Din Moss 217-18, 220, 357-8 Dinantian 24, 100, 197-9, 203-8, 320-3 Malham Tarn 512-14 Dingle Bank Quarry 132 dinoflagellate cysts 35, 44, 73, 127, 426, 485, 563 Dishforth Bog 216 Dodd 323-5 Dodd Wood Scree Member 48-51 Dog Hole 90 Dog Mills Member 37 Dogger Bank Formation 127 dogs 453, 574-5 Doncaster 39, 72, 129, 255 Dorrington 112 double peak Betula, Gormire 479

Kildale Hall 473 Seamer Carrs 473 Tadcaster 473 The Bog, Roos 473 Thorpe Bulmer 473, 479 Douglas River 409 Dove Hole Formation 37 Dove Holes 33, 40 Dove Point 353, 356, 587 Downholland Brook 555-6, 565, 580 Downholland Moss site 4, 6, 352, 401, 554-69, 571, 576, 580 Downholland Silt 404-7, 566, 582 Doxford Hall 160-3 Drab or Skipsea Till 75-7, 140 Sewerby site 74-7 see also Skipsea Till drainage 25, 99, 112, 128, 353-4 Aqualate Mere 148-9 Cheviot 164-9, 319-20 Downholland 554 Hartlepool 508 Malham Tarn Moss 518 Skipsea 413, 419 Star Carr 444 The Bog, Roos 429 Willow Garth (Boynton) 436 Drawdykes Castle 128 Drenthe advance 40 Drigg Beach Member 124 Drigg 46, 89-90, 122-7 Drigg Moorside Silt Member 124 Drigg Till Formation 42 Druidale Member 37 drumlins 38-9, 42, 48-9, 95-6, 114, 120, 126, 129-31 Cross Fell 335, 342 **Giggleswick Scar** 204 Harrington 102-4 Holme St Cuthbert 187-93 St Bees 185 Vale of Eden 62-3 Druridge Bay 480-1, 484 Duddon 176 Dun Fell Sandstone 335-43 dune systems 112, 355-6, 559, 565-6, 569, 580-2 Formby Point 569-70,

580-2 Lindow Moss 499 Low Hauxley 480-5 Lytham 543-4 Old Mere, Hornsea 459 see also aeolian sands; blown sand; loess Dunford Bridge 360 Dunsmore gravels 17 Durham 40-1, 90, 101, 112, 217 - 19coast 33, 42, 51-8, 256, 532 Cranberry Bog 473 East Plateau 398-9 Hartlepool 526-32 Holocene 357-65, 377 Neasham Fen 395-9 Shippersea Bay 58-62 Thorpe Bulmer 469–79 Warren House Gill 51-8 Durham Complex 57-8 Durham Member 37 Earl Wark 307-8 Easington 45, 51-2, 57-62, 141, 532 Easington Formation 37, 58 East Anglia 33-8, 38-44, 92, 289-90, 302 East Dipton 101 East Durham Formation 37, 56, 62, 470 Blackhall Member 37 Horden Member 37 Peterlee Member 37 East Moors See Southern Gritstone Moor 493 East Retford 42 East Sterndale 45 Easton Bavents 17, 34 Ebbing and Flowing Well 206, 206-8 Ebchester Formation 37 Eburonian 36 echinoid spines 68, 68 Ecton Limestone 321 Ecton site 6, 292, 320-3 Edder Acres Lake 57-8, 129 Eden Lacey 102, 104-5 Eden Member 37 Eden Valley 62, 101-10, 127-8, 214 Edenhall to Great Salkeld esker 102, 105

Edenside 42, 90, 101-5, 130, 185 Edgar's Arch Cave 45 Eemian 36 Ehen Valley Sand and Gravel Member 123 Ehen Valley Silt Member 123 Ehenside Tarn 374, 376 Elder Bush Bed 37 Elder Bush Cave 45, 88 elephant 33, 44, 51, 74-6, 79 elk 216, 218, 444-6, 451-3 Ell Hill 160-4 Eller Beck 172, 460 Eller Gill 355 Ellesmere 114-19, 145-9, 279, 345 Elmore Member 37 Elsterian 36, 39-40 Embleton 161, 163-4 end-Devensian Stadial, Hawes Water site 272-8 Kildale Hall 264-71 Low Wray Bay 226-9 end-Devensian-Holocene 234 - 41weathering 304 englacial streams 164-9 Ennerdale granophyre 29, 137, 181 Ennerdale Water 125, 363 Eocene 25, 27 erect stones 194, 196, 336-43 Eriophorum-Calluna layer 514, 517, 519, 521 erratics 73-7, 93, 98, 113, 186, 313 Cheviot and Southern Uplands, Sandy Bay 155 Lake District and Southern Uplands 94, 113, 133, 152 Pennine slopes 39, 317, 335 see also Scandinavian; Scottish; granites; Norber; pseudo-erratics **Escrick Formation 37** Escrick Moraine 72, 119, 143, 251 - 7Eshton Tarn 359, 361-2 Esk River 264 Eskdale 98, 100, 120, 128, 137, 144, 172-4 eskers 4, 38-9, 101-5, 128

Annaside and Gutterby Banks 178-9 Aqualate Mere 144-9 Bradford Kames 101, 158, 159-64 Gransmoor 258 Harrington 102-4 Holme St Cuthbert 187-93 Skipsea 413, 419 Eskimo, hunting by 451 Esthwaite Water 243 Estuarine Beds 81-3 estuarine environment 41, 43-4, 65, 68-71, 532-5 etch pits 303-4 etchplanation 28-9 Etches Cave 45 Etherow Valley 169-70 eutrophic sites 352-3 Ewe Crag Slack 353-4, 360 Exmoor 288, 293 Extwistle Moor 360, 364-5 Fairfield 193-4 Falcon Clints 381 Falloden Hall 160-1 fans 114-19, 144-9, 290, 325-7 Bradford Kames 163 Sandbeds Fan 325-8 Farm Wood Member 37, 44, 132 Farne Islands, Inner 535 Faugh 108-10 Featherbed Moss site 4, 6, 352, 364, 365, 486-93, 498 Featherbed Top 486 Fellend Moss 358, 362-5 Fen Bogs site 4, 6, 353–4, 455, 460-3 Holocene 353-4, 359, 362-5, 460 Roman-present 460-3 fen vegetation 217-19, 234, 269, 274-5 Fen Bogs 460-5 Hightown 584, 586 Holocene 353, 359-60, 376, 508-12 Malham Tarn Moss 512-18 Sefton coast 577-9 Walton Moss 519 fen-carr 234, 272, 353, 358, 461

Hightown 584-5 Lindow Moss 506 Malham Tarn Moss 512-18 Skipsea Withow 428 The Bog, Roos 429 Willow Garth 436 Fenham Flats 532-3 Fenland Lake 174 Fennoscandia 135, 138 Fenns Whixall Member 37 Fenton Cottage 352, 360, 362-4 Fern Bank Silt Member 125 ferns 69, 226, 235 see also Fossil Index Filey Bay 42, 44, 65-72 Filey Formation 37 fire, alteration 218, 271, 359-65, 375 Leash Fen 494 see also muirburn Fish Pond Beck 234 fishes 51, 88, 419, 454, 483, 529 Fishgarth Wood Member 124 fissure deposits 35-6, 43-5, 51-8 fjell field 224 Flamborough End Moraine 444 Flamborough Head 72, 97, 143, 292 Flamborough Member see Sewerby Gravels Flamborough moraine 65-6, 70, 71-2 Flandrian 17, 36-8, 48, 211-12, 219-20, 356-8, 361, 479 Blea Tarn, Langdale 241-7 Blelham Bog 230, 234-6, 240 - 1Gransmoor 325-8 Kildale Hall 268–71 Low Wray Bay 222, 222-9 St Bees peat 180, 183-5 sites 351-65, 365-593 Tadcaster 253-7 Wasdale Screes 347 Flandrian Chronozones 357-8, 410-12, 358, 414, 419, 559-61 flaser bedding 141, 143 Flashbrook Manor 145, 148

flint 52-3, 137, 155, 220 Hartlepool 529, 531 Late Mesolithic 483-4 scatters 451, 574, 577 Skipsea Withow Mere 419-21, 423-4, 427-8 Star Carr 444, 447, 453-5 Flintshire 22-3 Flixton 218, 220, 360 Flixton Lake reconstruction 443-55 flora, Austerfield 44 Castle Eden 23, 51-2 Chelford 133 Derbyshire 23, 42-3 exotic 52, 55 Ipswichian 44-6 St Bees 180-7 Speeton 68-9 see also pollen flow tills 110-12, 116 flowstone 42, 45, 88-9 Food Vessel People 494 footprints 353, 569-82, 584 hunters', Formby Point 569, 573-9 foraminifera 22, 34, 46, 53, 59, 126 Downholland Moss 555, 556-9, 558-9, 563-5 Formby Point 570, 573, 580 Hightown site 584 Holy Island Bridge Mill 538 Speeton Shell Bed 61 forest clearance 247-50, 309, 353-6, 359-65 Bolton Fell Moss and Walton Moss 520-6 Castlethorpe 593 **Downholland Moss** Featherbed Moss 489-93 Fen Bogs 461-3 Gormire 465-9 Hartlepool 528-32 Holderness 417, 428 Leash Fen 494-9 Low Hauxley 484-5 Malham Tarn Moss 517-18 Nesham Fen 398 Red Moss 412 Scaleby Moss 374-6 Skipsea Bail Mere 417

Skipsea Withow Mere 426-8 The Bog, Roos 435 Thorpe Bulmer 471-9 Upper Teesdale 385, 391-5 Valley Bog 380-1 disturbance 354, 359-65 dominance 356-9, 382-5 submerged 352-3, 526-32 Forest Beds 584-6 Forest of Bowland 26-764 Formby and Leasowe Marine Beds 584 Formby Point site 4, 6, 355-6, 552, 555, 569-82 hunters' footprints 569, 573-82 Forton 145-9 Fortress Dike 356 Fountains Abbey 467 Fountains Earth 361 Four Ashes Formation 37, 136 - 9Four Ashes site 4, 6, 17, 44, 87, 89, 119, 131, 136-9, 288 - 9Ipswichian-Devensian 87-90 fox 88 Fox Earth Gill 358-9 foxglove 344, 348 Foxholes 442 Foxhouse South opencast mine 112 Fozy Moss 198, 363, 365 Framwellgate Member 37 freeze-thaw 341-2, 345, 347 freshwater mires, Skipsea 413-17, 418-29 frogs 423 frost 67, 71, 287, 296, 332-4, 344-8 action 197, 220, 287-9, 322-4, 335-43 heave 195-7, 330-2, 336-43 shattering 290, 295-8, 318-19, 325-8 Brimham Rocks 305 Cross Fell 342-3 Langlee tors 320 Skiddaw 333-4 Wasdale Screes 345-8

wedging 312-13, 347-8 see also permafrost Fuhne Advance 40 fungi 21 Furness 28-9, 46, 126, 130 Annaside and Gutterby Banks 179 Holme St Cuthbert 192 Fylde 114-19 South 539-54 Gainsborough 42 Gait Burrows National Nature Reserve 272 galets sculptés 518 Galley Moor 45 Galloway 120-1 Gaping Gill 201 Garbutt Wood Nature Reserve 464 Gargrave Fault 207 Garths 216 gastropods 80, 268, 274, 573, 580 gelifluction 76-7, 290, 341-3 Cross Fell 290, 335-43 Grasmoor 290 Helvellyn 290 Skiddaw 290 Star Carr 446 geochemistry 241-50, 351 Blea Tarn 244-50 Blelham Bog 234, 239-41 Gormire 465, 467 Hawes Water 273-4 human 500-1, 504 Lindow Moss 501, 504-5 Wybunbury Moss water 508-11 geothermal gradients 24-5 Gerzensee oscillation 273-4 Giggleswick Scar site 4, 6, 203-8 Gillcambon Beck 42 Gilling Beck 94, 101 Gilman Point 321 Gilsland esker system 102 GISP ice-core 26-7, 263 glacial, deposits 4-5, 90-1, 112-19 diversion 42 erosion 24-9, 96-9, 203-8 maximum 33, 94, 114-19, 212-16

plucking 45-6, 175, 199, 203 - 8rafts 69-71, 79-81, 154-8, 335 see also ice rafts succession theory 90-1 transport 79-81, 200-3 troughs 99, 106, 108, 292 glaciation 11-18, 34-43, 87-93, 211-19 'Early Scottish' 42 local 96-8 glacier and till deposits 34-5, 112-13, 127-31, 152-4, 342-3 glaciofluvial 100-13, 129, 211, 219, 290-2 Annaside and Gutterby Banks 178-9 Bradford Kames 158-64 channel, Fen Bogs 460-3 Holme St Cuthbert 188-93 Sandy Bay 154-8 glaciokarst 2-3, 99-100, 200-3, 203-8 glaciolacustrine 21, 57, 109, 120-2, 127-9 Bradford Kames 158-64 Kildale Hall 264-5 St Bees 184-7 Warren House Gill 57-8 see also ice, lakes glaciomarine 35, 38-9, 42, 46, 120 - 7glaciotectonic 13, 67, 91, 122, 126-7, 179, 182 Dimlington 141-4 St Bees 126, 179, 182, 185-7 Sandy Bay 154-8 Scandal Beck 46, 64-5 Sewerby 77 Speeton 68-71 see also deformation till Glanllynnau 93, 186-7, 239, 264 Glannoventia Formation 90, 123 Glasson Moss 365 Glen Ballyre Bed 37 Glendermackin River 46-51 gliding blocks 194-7 Gnosall 145, 147-9 Golden Fleece M6 interchange

110-11 Goldenhill Farm 159-64 Goldscleugh Valley 99 Goole 44, 72, 101, 143 Gordale 514 Gormire site 4, 6, 213, 351, 464-9 Late Devensian-Holocene 464 Loch Lomond Stadial 467 Gosforth 102, 122-7, 128 **Gosforth Glacigenic Formation** 125 Gosforth Oscillation 16, 91, 116, 124, 126-7 St Bees 186-7 Gowy Valley 353 Goyt Moss 488 Govt River 169 Grace Formation 13 Grains Law 165-7 Gramineae-Betula-Cyperaceae zone 279, 282-4 Gramineae-Cannabiaceae zone 282 - 4Gramineae-Cyperaceae zone 279, 282-4 Gramineae-Empetrum-Filipen dula zone 268-71 Gramineae-herbs-Empetrum zone 236 Gramineae-Pteridium aquilinum zone 281-2 Gramineae-Thalictrum-Rumex -Empetrum zone 236-7 Gramineae see also Poaceae Grand Pile deposit 16 Grange Formation 37 granites 288, 303, 318, 335-6 Cheviot 166, 288-9, 319-20 erratics 40, 42, 49, 98, 137, 155 tors 5, 290, 292-6 and uplift 24-5, 28-9 see also Criffel; Ennerdale; Shap; Weardale Gransmoor site 6, 212, 217-20, 256, 257-64, 271, 414 Holocene 359, 428, 435 Late-glacial Interstadial 256, 257-64, 426, 431, 435, 446 Loch Lomond Stadial 193, 256, 257-64

Grasmoor site 6, 193, 290, 300-2, 328-32 grass-sedge 138, 239 Late-glacial 214, 217, 226, 250, 255, 268-71 grasses 347 grassland 249, 279, 283, 398, 593 calcareous 53, 357, 384-5, 392, 441-2 Holocene 357, 360-5, 380 post-interstadial 214, 272-4 pre-Devensian 33 see also forest clearance; cereals Great Almscliff Crag site 5-6, 293, 296-302, 317-19 Great Close Mire 513, 514 Great Close Pasture 360 Great Douk Pot 207 Great Driffield 71-2, 143 Great Dun Fell 334-43 sorted stones 290, 339-43 Great Easby 124, 128 Great Easby Member 37 Great Langdale 241-4, 247, 250 Great Marten Moss 539 Great Mell Fell 47 Great Salkeld 102 Great Scar Limestone, Malham Tarn Moss 512 Great Standrop 319-20 Great Wold Valley 436-42 Green Croft Till 124 Green Fell 343 Green Lane, Furness 214 Green Slack 199 Greening's Farm 405-6 Greenland 11, 16, 95, 175, 262-4, 290, 412 Late-glacial 212, 214, 229, 255, 258-64 Interstadial 214, 264 Stadial 264 Greggains' Pit 188-93 Greystoke 42, 47 grèze litées, Throstle Shaw 323-5 Grike 123-5 grikes 46, 205-6 Grindleybrook Channel 117 **GRIP** event terminology 211-19, 255-4

Group 5 cave system 36-8 grus 296, 302-4, 304-6 Great Almscliff Crag 317-19 Gully Cave 206, 206 Gutterby Member 37, 180-7 Gutterby Spa Bank Member, Annaside and Gutterby Banks 176 - 9Gutterby Spa Complex, Annaside and Gutterby Banks 177-8 Gutterfoot 180-7 Guttersfoot Sand Member 124 St Bees 182-3, 185-7 Gypsey Race 436 gyttja 218, 276, 314, 351 Lindow Moss 500 Lytham 541 Skipsea Bail Mere 414 Willow Garth (Boynton) 437-8, 442 Hadrian's Wall 197-200, 525 Halkyn Moraine 117 Hall Carlton borehole 90 Hallbankgate 102, 108 Halling Member 13 Hallowell Moss 361-5 Halsham Drain 429 hard water error 93, 212-13, 258, 271 Skipsea 414, 428 Hardbanks 108 Hards Cottage Pit 188-90 hare 45, 88, 216 Harringtom Member 37 Harrington outwash 101-3, 191 Harry Hallam's Moss 201-3 Hart Bog SSSI 470 see also Thorpe Bulmer Hart Warren to Hawthorn Dene SSSI 58 see also Shippersea Bay site Harthope valley 319-20 Hartle Dale Bed 37 Hartlepool Bay 353, 361, 527, 531 Hartlepool site 4, 6, 52, 113, 526-32 Harwood Beck 335 Harwood Dale Moor site 41, 46, 81-3, 363 Hatchmere 357, 361

Hatfield Moor 353, 360, 362, 364 Hathersage Moor 306, 494 Hathersage river terrace 41 Hawes Water site 6, 214-16, 271-8 head 290, 308-9 heathland, Holocene 356-7, 360-5 Hekla tephra 352, 363 Heinrich events 95-7, 176-9, 186,192, 212-13 see also surge behaviour Helophorus glacillis zone 228 Helsby Marsh 552 Helsington Moss 363 Helton Tarn 218, 272 Helvellyn site 4, 6, 26, 121, 193-7, 287, 289-90, 328, 330-3 Hemingbrough Formation 37 Hen Hole 99 Henglo 16 herbs 214-19, 226-7, 235, 238-9, 252-7, 266-79 see also tall-herb; vegetation; glossary of Botanical names; Fossil Index; Herrington 158 Herrington Member 37 Hertford River 443-4 Hertfordshire 34, 83 Hessle Till 140-4 see also Bridlington Member; Drab Till; Purple Till; Dimlington Silts Heyhouses Lane 539-41, 543, 551-4 Higger Tor 307-8 High Bridestones 171, 314-17 High Force 336 High Moor 356 High Pike 287, 330 High Scald Fell 335 High Street 27 Hightown 555, 571, 574, 578 Hightown site 6, 582-8 Hillhouse Coastline 399-400, 402-3, 404-6, 556, 561 Hindlow Cave 23, 44 Hipper Sick 35 hippopotamus 43-5, 74-6 Hoe Grange Quarry Cave 45 Holderness 45, 56, 73-7, 79,

113, 138 Dimlington 139-44 Holocene 351, 356, 361, 413-17, 418-29 Late Devensian 93, 413-17 Late-glacial 215 Old Mere, Hornsea 455-60 Skipsea Bail Mere 413-17 Skipsea Withow Mere 418-29 The Bog, Roos 429-36 Holderness Formation 77, 143-4, 413, 418, 429-31 Dimlington 139-44 Holderness Tills 75 Hole of Horcum 175-6, 291 see also Newtondale and Hole of Horcum site Holmbrook Till Member 123 Holme Dub 188-93 Holme St Cuthbert Member 37 Holme St Cuthbert site 4-6, 120, 127, 179, 187-93 Holme upon Spalding Moor 39 Holmeside Clay Member 124 Holocene 11-18, 33, 287-348, 309, 351-65 Blea Tarn, Langdale 244-50 Crose Mere 278-84 GCR site descriptions 365-593 Gransmoor 257-64 Hawes Water 274-8 Hessle Till 140-1 Kildale Hall 264 Low Hauxley 480-3 Roman Wall 197 Tadcaster 254-7 Thornsgill and Mosedale site 47, 50-1 Wybunbury Moss 508-12 see also Flandrian Holsteinian 36 Holy Island site 6, 94, 532-9 Homer Green 555, 565 honeycomb weathering 307, 310, 316 Hope Terrace 88 Hoppen 159-64 Horden Colliery tipping 51 Horden Member 37 Horden Point 53-8

Horden Till (Upper Boulder Clay) 54-8, 55-8 Hornsea 143, 423, 455 see also Old Mere Hornsea Member 143, 413, 418 horse 33, 43, 88, 220 Horse Hill 160-1 Horwich 408 Hoscar Moss 359-60 House Hill 377 How Man Till Member 124, 181-3, 185-7 How Mill 108 Howardian Hills 129 Howbeck Brook 508 Howgill Fells 26, 28, 42, 94-5, 98, 364 Holocene 355 Late-glacial 216 Hoxne 13, 17, 41 Hoxne Formation 13 Hoxnian 13, 17, 33, 36-43, 45 interglacial 38, 41, 60, 65 Kirmington 61, 69-70 Huby 317 Hull 72, 76, 78, 143-4 Hull River 219, 413 human 353-65, 374-6, 380-1, 578 artefacts 43, 88-90, 206, 216, 218, 220, 258-9 footprints 569-82 impact 446-55, 501, 504-7, 528-32 remains 43, 206, 207-8 Austwick 507 Grewelthorpe Moor 507 Hartlepool 531 Lindow Moss 499-508 Low Hauxley 485 Red Moss 507 Scaleby Moss 507 Seascale Moss 507 Whixall Moss 507 Worsley 507 see also bog bodies see also agriculture; antler implements; axe; barbed points; forest clearance; hunter-gatherer; hut circles; medieval; Neolithic; Palaeolithic; Roman

Humber Estuary 68, 71-2, 78, 119 Humber Lake 119, 129, 144, 174 Late-glacial 214, 255 Humberhead Levels 219, 352-5, 360 Humberside 79-81, 211, 351-65, 589-93 Castlethorpe 589-93 Kelsey Hill 77-81 see also Holderness Humbleton Burn 165-9 Humbleton Hill and the Trows site 4, 6, 100, 164-9 humic acids 304, 306, 311-13, 316, 356 Lindow Moss 504 Hunstanton 97 hunter-gatherer 360, 417, 442, 443-55, 569-79 hut circles 517 Hutton Henry 362-3, 398-9 Hutton Henry Bed 37, 46 hyaena 33, 43, 45, 75, 88, 90 ice 83, 87, 91-9, 150, 154-8 basal thermal regime 40, 82, 96, 100, 154-8 caps 33, 87, 119-27, 169, 287 Cheviot 92-8, 319-20 core records 212, 214-15, 257-64, 270 decay 110-12, 114-27, 131, 144-9, 213 Bradford Kames 158-60 Kildale Hall 264-5 Low Wray Bay 222 Sandy Bay 154-8 divide 92-8, 118-20, 342-3 front 108-10, 127-9, 144-9, 179 limits 72, 143, 145-50 Gormire 464 Scottish Readvance 128 lobes 57, 72, 75-7, 128-9, 138 Blea Tarn 242-3 Kildale Hall 270 Thurstaston 154 margin 35, 79, 161-4, 291-2 Blelham Bog 232

St Bees 185-6 Stiperstones 301-2 marginal 102, 114, 120-6, 180-7, 211 Brampton Kame belt 105-6 Ludworth Intake 169-71 Newtondale and Hole of Horcum 172-6 Speeton 65-6 movement 33-4, 40, 67, 93-9, 103-9 Blea Tarn 241 Cross Fell 242-3 Irish Sea 114-27 Low Wray Bay, Windermere 56 Roman Wall 199-200 Sewerby 71, 74-5 Thornsgill and Mosedale 46-7.50 to N 325-6 to SE 55, 138, 176-9, 182, 188 to SSE 40, 93, 150-4 to SW 68, 102, 141 Warren House Gill 52-3, 55-8 W-E 99, 115, 119, 199-200 rafts 11, 34-5, 69-71, 79-81, 95-7, 186 Holocene 376 retreat 57-8, 93-100, 119-27, 240-1 Bradford Kames 159-64 Kildale Hall 264-5, 270-1 Newtondale and Hole of Horcum 171-6 St Bees 186-7 Tadcaster 251-7 sources 33-40, 42, 90-9, 138 stagnation 90, 101-5, 110-12, 128-9, 131 Blelham Bog 232 Newtondale and Hole of Horcum 174-5 St Bees 185-7 surge 72, 75-7, 93, 270, 425, 431 volume 12-18, 93-4, 96 wedges 75, 77, 136-8, 289, 292

#### General index

see also glacial; lakes; subglacial; supraglacial; thermal regime ice-front oscillation 90-1, 123-7, 216, 218-19 ice-walled channels 112 Idle River 44 Ilford 41, 44, 69-70 Ilfordian 43 Speeton Shell Bed 61, 65-71 Speeton site 66–71 Ilfordian-Ipswichian, Shippersea Bay 61 Illgill Head 343-8 Ince Blundell 353, 555, 571, 574 Ingleborough 26, 200-3, 203-8, 517 Inner Farne Islands 535, 539 insects 44, 46, 56, 211-12, 218-20, 446 Blelham Bog 236, 239 Chelford 88-9, 133 Dimlington 140 Four Ashes 88-9, 136, 138 Gransmoor 258-64 Holocene 352 Lindow Moss 499, 506-7 Low Wray Bay 227-9 Red Moss 409-11 St Bees 183, 186 Skipsea Withow Mere 418, 423 Willow Garth (Boynton) 441 - 2see also beetles; coleoptera; **Fossil Index** interglacials 11-12, 13-18, 33 Cromerian 35-8 Hoxnian 38-41 Ipswichian 5e 38, 43-6, 74-6 intertidal wetlands 352-3 invertebrates 515 see also annelid worms; beetles; coleoptera; gastropods; insects; molluscs; snails; Fossil Index Ipswichian 13, 17, 33, 36-46, 87, 88, 143, 292 Bobbitshole 68 Easington Beach 61 Kelsey Hill 78-81

palynology 41, 44 Sandy Bay beach 155 Scandal Beck Bed 62-4 Sewerby 61, 71-7 Shippersea Bay 61-2 Speeton 66-71 Thornsgill and Mosedale site 48-51 Upper 33, 38, 43-6 Ireland 97, 119, 130 Irish Sea icesheet 91-9, 112, 114-31, 176-9, 185-7 submerged forests 526-32, 573-4, 579, 582-8 Irish Sea Basin 4-5, 21, 24-5, 33.336 Devensian 91-9, 131, 149-54 pre-interstadial 213 Thurstaston 149-54 Irish Sea Till 136-9 iron 243-4, 463 Iron Age 309, 354-7, 360, 363-4 bog recurrence 352, 354 Bolton Fell Moss and Walton Moss 520-5, 523, 526 Fen Bogs 463 Leash Fen 495-9 Lindow Moss human remains 504-5 Malham Tarn Moss 517 The Bog, Roos 435-6 Thorpe Bulmer 479 Valley Bog 381 Ironbridge Gorge 112, 117, 129, 148-9 Irt-Mite misfit valley 124 Irthing Formation 37 Irthing Valley 42, 127-8 Island Carr 589 Isle of Man 37, 93-4, 97, 116, 126. 336 Isle of Man Formation 37 Islington 145, 147-8 isostatic rebound 24-5, 96, 119-27, 535, 539

Jacob's ladder **394** Japanese hornbeam **55** Jervaulx Abbey 467 Jessen–Godwin zones **236**, 272–8

see also pollen zones jointing 298, 307, 312-14 Bridestones 314-17 Brimham Rocks 305 Burbage Brook 307-8 Craven Fault 207 Cross Fell 341-2 Great Almscliff Crag 317-19 Wasdale Screes 345-8 Wyns Tor 311-14 jökulhlaup deposit 14, 102, 174 Juniperus zone 215, 225, 228-9, 236-7, 241 Juniperus-Empetrum zone 237 Juniperus-Rumex zone 237 Jurby Formation 37 Ballaquark Member 37 Ballateare Member 37 Cranstal Member 37 Glen Ballyre Bed 37 Jurby Head Bed 37 Nappin Member 37 Phurt Member 37 Trunk Member 37 Jurby Head Bed 37 kames 4, 38-9, 101-2, 105-10, 128 Aqualate Mere 146 Bradford Kames 158-64 Gransmoor 258 karren 99 karsts 5, 22-4, 28-9, 99-100 Kelco Caves, Greater and Lesser 206 Kelsey Hill Gravels, Kelsey Hill 78-81 see also Mill Hill Member Kelsey Hill site 77–81 Kendal 130 Kenn Formation 13 Kenslow Member 21-4 Keppel Cove 194 Kesgrave Formation 34-5 Kettering till 35 kettleholes 4, 93, 101-5, 112, 114 Annaside and Gutterby Banks site 176-9 Aqualate Mere 144-9 Blelham Bog 231-41 Gransmoor 257-64

Kelsey Hill 79 Kildale Hall 264-71 Late-glacial 125, 211, 213, 216 Neasham Fen 395-9 Rossall Beach 211 St Bees 180-7 Skipsea Bail Mere 413 Thorpe Bulmer 469-70 Keyingham Drain 429 Kidderminster Formation 13 Kildale 100, 144, 172-4 Kildale Hall site 4, 6, 213, 216-17, 220, 256, 264-71, 360, 473 Kildale-Eskdale Lake 172-4 Kilham Long Barrow 442 Killard Point Stadial 97, 126 Kilnsey 98 Kimmeridge Clay 66-7, 69 Kinder Scout 486, 488, 493 Kinderscout Grit Group, Brimham Rocks 305-6 King's Crag 198-9 King's Pool 215, 217, 360, 364 Kingsdale 204 Kinsey Cave 204-8 Kiondroughead Formation 37 Kionlough Member 37 Kirk Michael Member 37 Kirkby Stephen 98 Kirkbymoorside 45 Kirkcudbright coast clasts 189 Kirkdale Bed 37 Kirkdale Cave 45 Kirkham Abbey Gorge 129 Kirkham Formation 37 Martin Mere 404-6 Mere Sands Wood 399-400 Kirkham Member 21-4 Kirkham moraine 91, 114, 116 Kirkhead Cave 45, 220 Kirkhead Hill 45 Kirmington 41, 61, 69 Kite Hall Wood 539 **Knightley Grange** 148 Knighton 145, 148 Knock Fell 335 Knowsley Park 357-60, 364

Laddray Wood Palaeosol 48 Lady Clough 486–7 Lady Clough Moor 360 Lady Green 555, 574 Lake Buildwas 129, 147-9 Lake District 24-9, 49, 88, 93-9, 113, 119, 130, 336 erratics 39-40, 42, 49, 53, 88, 98, 152, 199 Holocene 351-66, 375 ice 33, 42, 87, 90-9, 122-30, 138 Late-glacial 215-20, 239-40, 287 - 8palaeosols 41, 82 periglacial 193, 287-8, 323-5, 328-34, 343 Readvance 127, 222-9 Lake Lapworth 129, 147-9, 175 Lake Newport 129, 144-9 Lake Wear 128-9 lakes 100-1, 172-6, 271-8, 278-84, 419-29 basins 351-2, 359, 464-9 glacial 39-41, 43, 54, 57, 127-30 Devensian 90, 99-101, 127-9, 140-4 Yorkshire coast 76-7 ice-dammed 100-1, 127-31, 169-70, 444 Newtondale and Hole of Horcum 171-6 ice-walled 102-5, 110-12, 116-19 Aqualate Mere 129, 144-9 Brampton kames 105-10 Harrington 102-4, 110-12 Martin Mere 402-8 pro-glacial 57, 91, 100-5, 144-9, 163-4 Aqualate Mere 144-9 Bradford Kames 163-4 Holme St Cuthbert 187-93 Newtondale and Hole of Horcum 171-9 St Bees 101, 185-7 Lambden Valley 99 Lamgdale Combe 375-6 Lancashire 27-8, 33, 90, 92, 94, 98-100, 113-14, 399-402, 402-13, 539-54, 554-69, 569-88 facies 37 Flandrian 351-65, 552

Hawes Water 271-8 Late-glacial 217, 219, 271-8, 287-8 M62 borehole 113 landforms 4-5, 7, 101-31 see also named types of landforms Landnam clearance 240, 375 landslides 351-2, 356, 464, 467 Lane End 145, 148 Lanerstock Member 37 Langdale 356, 375 Langdale Combe Valleys 246-50, 375 Langham 44 Langlee Crags 319-20 Langley Brook 406, 408 Lapwing Bed 37, 132-5 Lapworth Lake 129, 147-9, 174 larvikite 52 Last Glacial Maximum 11-17, 92-4, 115, 125-7, 138, 142, 287 - 8Last Termination 211-12 Late-glacial 2-8, 211-84 Interstadial 87, 186-7, 211-12, 233-41, 259-64 Gransmoor 257-64 Hawes Water 271-8 Kildale Hall 264-71 Tadcaster (Ib) 255-7 post-Interstadial 219-20 pre-Interstadial 212-14 to Holocene 351-593 Lathkill 23, 36-8 Lathkill Dale 322 Latrigg Grèzes Member 48-51 Thornsgill and Mosedale site 48-51 Laurentide ice sheet 320, 548 Lazonby 102, 104-5 Leachfield Moss See Leash Fen Leash Fen site 6, 361-3, 493-9 Leech Burn 319-20 Leeds 39-40, 45, 101, 129, 144 Lenham 22 Leasowe 584-6 Levisham 4, 171, 314 lichens 301, 347 Lidderton Hill 159-60, 163 Lifeboat Road 355-6, 574,

576, 579 lignite, Carboniferous Limestone 23 Kenslow Member 21 Limekiln Gill 52 limestone 39-40, 43, 55, 62-5, 215, 217-18, 320-3 and forests 356-9, 362, 365, 384-5, 392 pavements 20, 23-4, 99-100, 272-3 Malham Tarn Moss 512, 517 Norber Erratics 200-3 Oland 517 pedestals 200 solution 23-4, 202-3 tors 310-14, 314-17, 320-3 Lincoln Edge 129 Lincoln Gap 129 Lincolnshire Limestone, Castlethorpe 589 Lincolnshire Wolds 34, 41-2, 45, 93, 143, 292 Lindal Cote Bed 37 Lindal Cotes 46 Lindal-in-Furness 46 Lindisfarne See Holy Island Lindow Common 500 Lindow Moss site 6, 352, 360, 364, 499-508 Linhope Burn 319-20 Linhope Spout Formation 37, 319-20 Linstock 128 Linton Mires 517 lion 44-5, 88 Lion's Mouth or the Arch Cave 88 Lismore Fields 361 Litées Member 48-51 Thornsgill and Mosedale site 48-51 Little Climatic Optimum 491 Little Crosby 355, 571, 574, 578 Little Dun Fell 334-5, 339 Little Fell 178 Little Hawes Water 272-3, 359, 361 Little Ice Age 346-8, 463, 526, 582 Little Langdale 241-3 Little Mell Fell 47

Little Welsh Readvance 114-19 Littleborough-Ripponden road 303 Littleworth 145, 148 Liverpool Bay 353 Llanilid 264 Lobbs Sand and Gravel Member 37 Thornsgill and Mosedale site 48-51 lobes 90-9, 290, 294, 332, 344-5 Cross Fell 336-41 Loch Lomond Advance 243 Loch Lomond Readvance 97 Loch Lomond Stadial 99, 125, 211-12, 219-20 Blelham Bog 232-41 Cheviot tors 319 Cross Fell 343 Gormire 467 Gransmoor 257-64 Hawes Water 272-8 Helvellyn 193-7 icefield 94, 287 Kildale Hall 267–71 Low Wray Bay 222, 226-30 Ludworth Intake site 171 Malham Tarn Moss 517 Red Moss 409-12 St Bees 180 Sandbeds Fan 325-7 Shirdley Hill Sands 292, 399-401, 406 Skiddaw 332-4, 334 Skipsea Withow Mere 421-8 Tadcaster 253-7 The Bog, Roos 431-5 Thornsgill and Mosedale site 46-51 Thorpe Bulmer 479 Throstle Shaw 323-5 Upper Laminated Clay 227 Wasdale Screes 346-8 Willow Garth 439-41 Wolf Crags Formation 46 see also Younger Dryas event, GS-1 Lodgement grey till 112, 154-5 Lodhams Slack 198-9 loess 11, 14-17, 292, 436 Ecton 321-2 reworked, Willow Garth

(Boyton) 436-7 Sewerby 74-7 Warren House Gill site 52-6 see also aeolian sands; blown sand; dune systems Long Barracks 159-61 Long Bog 535 Long Crags 319-20 Long Lane, Formby 552, 580 Longcliffe 45 Longendale 42, 356, 358 Longlee Moor 217 Longscar Rock 526-7 Lonsdale 207, 241-50, 552 see also Hawes Water Low Bridestones 171, 314-17 Low Furness 42 Readvance 91, 116, 120-1, 179 Low Hauxley site 6, 480-5 Low Hurst organic sands 62 Low Plains pit 102, 105-7 Low Wath Till Member 123 Low Wray Bay, Windermere site 4, 6, 220-30, 242, 250, 377 Late-glacial 212-13, 215-17, 220 Loch Lomond Stadial 226-9 Low Wray Farm 240 Lowca Till Member 103, 123, 177-8, 181-7 Lower Boulder Clay 52-5 Chelford 132-5 Sandy Bay 154-8 Shippersea Bay (Easington) 59 Stockport Formation 135, 151 - 3Thurstaston 149-54 see also Blackhall Till Lower Cave Earth 45, 88 Lowestoft Formation 13, 41 Lowestoft Till 17 Lucayon Caverns 17-18 Luce Bay Formation 37 Ludham borehole 17 Ludhamian 17, 36 Ludworth Intake site 4, 6, 100, 169-71 Lune Valley 25 Lunedale Fault 335 Lunn Tor 311 lynx 206 Lytham Formation 37

Lytham site 4, 6, 17–18, 356, 359, 539–54, 580

Macclesfield 114, 132 MacDonald Sequence 97 Maelor moraine 114-19 Magnesian Limestone 470 erratics 112-13, 398-9 Shippersea Bay 58-62 Warren House Gill 51-8 see also fissures magnetic susceptibility 351, 464-8, 579 Main Glaciation Drift 42 Main Phase deglaciation 121-7 Mainsgate Wood Sand and Gravel Member 124 Malham Limestone 203-8, 217 Malham Tarn Moss site 6, 23-4, 98, 207, 217-18, 272, 351, 359-60, 512-18 mammals 43-4, 45, 51-2, 61, 88-9 see also animal bones; arctic fox; aurochs; bear; beaver; bison; cat; cattle; deer; dog; elephant; elk; fox; hare; horse; hyaena; lion; lynx; mammoths; mastodont; pig; reindeer; rhinocerous; rodents; shrews; tiger; voles; water vole; wolf, wolverine; **Fossil Index** mammoths 44-5, 79, 88, 89, 216 Muncaster Fell 123-6 Manchester (Greater), Ludworth Intake 169-71 Manifold Valley 2, 23, 42, 45, 320-3 Manstone Rock 297-302 Mappleton 141, 143 marine transgressions 401, 407, 535 Downholland Moss 554-69, 576 Formby Point 570-82 Hightown 585-8 Lytham 539-54 Market Weighton 44 Marros Sands GCR site 321 Marsh House 180-1 marsh taxa See Fossil Index

Marsworth 41, 42-3 Martens Both 358 Martin Mere site 6, 352, 402-8 Maryport 112, 120-1, 128 mass wasting 290, 292-6, 319-20 mastodont, gomophothere 33 Matuyama 15, 36 Maudsdyke Till Member 123 Mawbray 192 May Moss 360, 463 Meadow House Clay Member 124 medieval 364-5 Bolton Fell Moss and Walton Moss 523, 526 drainage 413, 455 dune systems 355, 581-2 Featherbed Moss 489-93 Fen Bogs 463 Formby Point 581-2 Gormire 465-9 Leash Fen 495-9 Malham Tarn Moss 517 Thorpe Bulmer 479 Melmerby Scar Limestone 381-95 meltwater 42, 57, 76-7, 119-27, 211, 214, 291 channels 4, 93, 100-12, 114-30, 353-4 Annaside and Gutterby Banks 176-9 Bradford Kames 161-4 Chelford 135 Gormire 464-9 Green Fell 342 Humbleton Hill and the Trows 164-9 Low Wray Bay 226-8 Ludworth Intake 4, 100, 169-71 Newtondale and Hole of Horcum 171-6 Roman Wall 197-200 Thurstaston 150 Cheviot 164-9, 319 glaciokarst 2-3, 99-100, 200-3, 203-8 see also channels; Heinrich events; ice; subglacial Menapian 36 Mercia Mudstones 132-3 Mere Hall 406

Mere Sands Wood site 6, 399-403 Merrivale 296 Mersey estuary 98, 101, 117, 218-20, 569, 582, 585 Merseyside 352-3, 355-7, 363 Formby Point 369-82 Hightown 582-8 Mesolithic 309, 353-4, 359-60, 577, 588 Early 353, 428 Fen Bogs 461-3 flints 483-4 Formby Point 577-9 Skipsea Withow Mere 419, 423-4, 428 Great Wold Valley 442 Hartlepool 530-1 hearth 446 Holderness 417, 419, 423-4, 428 hunting 427-8, 441, 493, 569-82, 588 Low Hauxley 483-5 Star Carr 443-55 Valley Bog 380-1 Messingham 220 Mid-Cheshire Ridge 93, 117, 170 Middle Cliff, Speeton 66-7 Middle Grit Group 306-10 Burbage Brook 306 Middle Pond 535 Middle Sands, Stockport Formation 135, 151-3 Thurstaston 149-54 Warren House Gill 55 Middleton-in-Teesdale 198, 203, 336 Midlands 25, 35, 40-1, 43-4, 98 Mill Hill Member 78-81 see also Kelsey Hill Gravels Millbeck Formation 48-51 Millington Pastures 175 Millstone Edge 306–10 Millstone Grit 5, 26-9 tors 5-6, 292-6, 302-14, 317-19, 334-43 Minchin Hole 41 minerogenic sediments 227, 229, 239-40, 252, 284 Blea Tarn, Langdale 242-7 Gransmoor 257-9

Holocene 353-4 Kildale Hall 269 Star Carr 446-7 Willow Garth 436 Minninglow pits 23 Miocene 21, 25, 27, 55 Miocene-Pliocene 40 Pocket Deposits 21-4 mire formation 352-4, 460-1 Mire Holes 360 Miterdale 128 Mold 114-19 Molinia caerula-Potentilla errecta mire 514 Molluscan Assemblage Zones 589-93 molluscs 55, 134, 211-12, 215, 220 **Bielsbeck** 44 Castle Eden 51 Castlethorpe 589-93 Chelford 132 Cromerian 35, 38 Downholland Moss 558 Formby Point 573 Hartlepool 529, 531 Hawes Water 274 Holy Island 532-3 Ipswichian 44-5 Kelsey Hill site 78-81 Kildale Hall 264, 267-9 Malham Tarn Moss 513 Neogene 22 Oakwood Quarry 132-4 Sewerby 73-6 Shippersea Bay 59 Skipsea Withow Mere 418-20, 422-3, 427-8 Speeton Shell Bed 65, 67-71 Willow Garth (Boynton) 436, 438, 441 Monar Member 37 Montpelier maple 45 Mooar Member 37 Moor House 335, 342 Moor House and Cross Fell SSSI 377-81, 395 Moorcock Planatation 366 Moorthwaite Moss 214 moraines 4, 92, 97, 114-26 Morden Carr 357-9, 361 Morecambe Bay 24, 45, 128, 130, 214

Holocene 374, 552 Morecambe Formation 37 Morpeth 154 Mosedale 46-7, 87 see also Thornsgill site Mosedale Beck and Wolf Crags site 4, 6, 46-51 Mosedale Gravel Member 37 Thornsgill and Mosedale site 48-51 Moss Heath 555, 557 Moss Lake, Liverpool 217, 399 Moss Pool 112 Mosser-Kirkstile Slates 330-2 mosses 51-2, 133-5, 138 **Brassington Formation 21** Crose Mere 279-84 Dimlington 140-1 Late-glacial 217-18, 220 Blea Tarn, Langdale 258 Blelham Bog 237 Gransmoor 258 Kildale Hall 213, 264-71 Low Wray Bay 224 Thorpe Bulmer 470-1, 479 Mother Cap Moor 306-10 Mott's field (South Cliffe) 44-5 mountain avens 392 mountain hare 88 Mousecroft Lane 112 Mousterian artefacts 88 muirburn 487, 493 Muncaster Delta 125 Muncaster Fell 123-5 Murat Street, Waterloo 355 Mutual Climatic Range 185-7, 259, 261-4 Nancy's Bay 541, 543-4, 548, 551-4 Napoleonic Wars 520-5 Nappa Scars 200-3 Nappin Member 37 Nar Valley Formation 38 Neasham Fen site 6, 357-9, 362, 380, 395-9, 473 Neogene deposits 21-4 Neolithic 240, 247-50, 309 axes 375, 494-6, 531, 574, 578, 588 clearance 360-2, 374-6, 428, 517-18

Hartlepool 529-31 Lindow Moss 501-2, 505-6 pottery 206 Seamer Carr 446 wattle 531 wooden artefacts 531 Neolithic-Bronze Age 417 Formby Point 569-82 Leash Fen 494-9 Netherlands 11, 39, 240-1, 367 Nethermost Cove 194 New Cowper 188, 191-3 New Cut 555-69, 571 New Guild 146 New Moss, Downholland 556 Newbiggin-by-the-Sea 154-6 Newbigging (Lanark) 163 Newer Drift 38-9 Newham 160-1 Newlands Beck 110-11 Newport-Wolverhampton esker chain 144-9 Newton pits 102 Newtondale and Hole of Horcum site 4, 6, 100, 127, 129, 171-6, 314, 460 see also Hole of Horcum Nidderdale 363-5 Nirex 42, 46, 89-91, 121-2 Nith basin 120 nivation 175-6, 290-1, 294, 296-7 terraces, Cross Fell 335-43 Nook Farm 360 Norber Erratics site 4, 6, 98, 200 - 3Norbury fan 148 Norman Conquest 498 Norse 240, 355, 365, 374-6, 398-9 clearance 491-3, 495-9, 517 North Atlantic 11, 16-17, 24-5, 28, 95-7 deglaciation 213, 218-19 North Basin, Low Wray Bay 221-8 North Channel 97, 126 North Charlton 163-4 North Cliffe 44-5 North Craven Fault 201, 512 North Fen, Malham Tarn 512, 514

Fen Bogs 461, 463

North Gill 354, 359-60, 461 North Lincolnshire 40-1 North Sands, Hartlepool 526-7 North Scale 46 North Sea Basins 21, 28, 33-7, 42, 158 Devensian 93-7, 292 North Sea Formation (Cromer Till) 36-9 North Sea glacial lobe 65-6, 79-81, 127-9 Dimlington 139-44 Kelsey Hill 79-81 Sewerby 72, 74-5 North Staffordshire uplands 26 - 7North Yorkshire Moors 39, 41-2, 46, 92-3, 98, 130, 211, 451 Bridestones 314-17 Dimlington 144 Fen Bogs 460-3 Gormire 464-9 Harwood Dale Moor 81-3 Holocene 353-65 ice retreat 169-70, 213-14, 256, 287-8, 316-18 Brimham Rocks 305 Hawes Water 270-1 Newtondale and Hole of Horcum 171-6 periglacial 5, 288, 314-17 Northern Drift 34-5 Northumberland 37, 101, 112, 114, 129, 219 Bradford Kames 158-64 Cheviot Tors 319-20 Holocene 351-65, 532-9 Humbleton Hill and the Trows 164-9 Low Hauxley 480-5 periglacial 287-8 Roman Wall 197-200 Northumberland Basin 336-43 Northumberland coast 33, 141, 154-8, 158-61 Holy Island 532-9 Sandy Bay 154-8 Norton Farm 112 Norway 1, 18, 34, 53, 88, 229, 241, 345, 449 Norwich Brickearth 17

nunataks 93, 211, 270, 301, 342-3 Oak Hill 145-6 Oakwood Formation 37, 41-2, 131-3 Chelford 87-8, 132-3 Lapwing Bed 37, 132-5 pre-Chelford stadial 131-3 Oakwood Quarry, Chelford 132-3 Oakwood Till (Formation) 41-2, 87-8, 132-3 Ochil Hills 288 Odderade 16 oil source rocks 24, 66-7, 69 OIS see Oxygen Isotope Stage Öland 517 Old Mere, Hornsea site 6, 351, 441, 455-60 Old River, Ancholme 589 Older Drift 38-41 Older Dryas 216, 222-8, 233, 237, 239-41, 310 Olduvai magneto-subchron 11, 15 Oligocene 11, 25 **Orrisdale Formation 37** Orrisdale Head Member 37 oscillations 11-12, 15-17, 95-6, 116, 126 Hawes Water Holocene 270-8 Late glacial 212-13, 218-19, 238-41 see also Gosforth oscillation osier bed, Willow Garth 442 ostracods 46, 59, 211-12 Castle Eden 51 Castlethorpe 589, 592-3 **Chelford Sands Formation** 132, 134 Dimlington 51, 140, 142 Formby Point 570, 573, 580 freshwater 51, 140, 459, 592 Hawes Water 277 Kildale Hall 264, 267-9 Oakwood Quarry 132-4 Oswestry 116-17 Otter Bank Sequence 97 Oughterside opencast mine 94, 112-13 Ouse Valley 94, 101, 354-5

**Ouse-Trent-Humber** lowlands 143-4 outwash 211 Thornsgill 50-1, 100-1, 112-19, 147 moraine 79-80, 125, 264 systems see also sandur Over Owler Tor 307 Oxbow Bed 37 Oxbow opencast mine 89 Oxford Limestone 159-60 Oxfordshire till 34-5 Oxygen Isotope Stage 12-18, 35-46, 211, 274-7 2 37, 39, 70 3 88, 90, 134, 136 4 37, 39, 87, 90, 134, 136 5 50, 62, 134 5d-5a 76, 87, 134, 136, 292 5e 37-8, 43-6, 70, 76, 87, 134, 136, 138 6 43, 70, 134 6-8 37-8, 39, 41-3, 62, 70-1 7 41, 43-6, 50, 61, 65, 70, 532 9 37, 41, 43, 45, 50, 61, 70 10 37, 39 11 61 12 37-41 21-13 35-8 23-15 7 Palaeocene 11 Palaeogene 25 Palaeolithic 43, 88, 448 Upper 207, 220, 258-9, 264, 424 palaeomagnetic record 15, 68-9, 81, 222, 273-4 Holocene 351, 418 see also polarity; magnetic susceptibility palaeosols 42-4, 80-1, 129 Harwood Dale Moor site 81-3 Hoxnian 41 Lake District 80 Scandal Beck 62-5 Thames valley 80 Troutbeck 37, 46, 48-51 Wolstonian 42 palaeotemperatures 24-5, 35,

#### 354

paraglacial landform 345, 347 pararendzina soil 558 Parson Terrace 309 Passage Beds 314-17 Paston 17 Pastonian 17, 35-6, 73, 139 pastoralism 494-5 Patterdale 193 patterned ground 289-90 Cross Fell 289 Grasmoor 289, 328-32 Helvellyn 193-7, 289, 319 Late-Devensian 289 non-sorted, Skiddaw 332-4 Stiperstones 289, 297-302 stripes 289-90, 328-32 pavement, ice-scoured 343 see also limestone Pawlaw Mire 360-1 Peak District 26-7, 39-41, 99-101, 129, 211 caves 45, 88-9 periglacial 288, 310-14, 320-3 see also Derbyshire Peak District Pearsgill 102 peat 43-6, 49, 51, 62, 352-6, 366-7, 376, 493-8 acids 304, 306, 311-16 Bolton Fell Moss and Walton Moss 518-26 Castlethorpe 593 Featherbed Moss 487-93 Fen Bogs 460-3 Formby Point site 570 Gormire moss 464 Hartlepool 527, 529, 531 Hightown 583-8 Holy Island 533-4 Late-glacial 217-18 Leash Fen 494 Lindow Moss 499-508 Low Hauxley 480-1 Lytham 439-41 Martin Mere 402-8 Mere Sand Wood 401 Neasham Fen 398 raft, Malham Tarn Moss 512-15, 517-18 Mere Sands Wood 401 Wybunbury Moss 508-12

Red Moss 408-9 St Bees 180, 184-5, 187, 215 Scaleby Moss 366-7, 375-6 Skipsea Withow Mere 419-20, 428 Star Carr 443-5 The Bog, Roos 429, 435 Thornsgill and Mosedale 49-51, 87 Thorpe Bulmer 470 Valley Bog 377, 380-1 Willow Garth (Boynton) 437-8 Peckforton Mere 364 Peckmill Sand Member, St Bees 181-3, 185-6 Peel Place 102 Peel Place Sand and Gravel Member 124 Pelaw Member 37 Pendleian Limestone 198-9 Pennine 119, 128-9, 211, 213-20 Cross Fell 334-43 Holocene 352-4, 366 Robinson's Moss 357 Valley Bog 377-81 ice 33, 87, 97-101, 113, 287-8 ice limit 42, 87, 92-9, 291 slopes 39, 42, 46, 114, 169-70 South 21, 291, 310-14, 354 Featherbed Moss 352, 486-93 Leash Fen 493-9 thufurs 289, 335-6 tors 5, 295-302, 302-4, 304-6, 306-10, 310-14 Upper Teesdale 381–95 weathering 5, 21-2, 24-9 Pennine Fault 203, 335 Penrith Formation 37 Penrith Sandstone 102, 106 perched blocks, Norber Erratics 200-3 periglacial 4, 14, 35-6, 43, 56, 87, 93, 175-6, 187, 193-7, 203-8, 211-19, 287-348, 288, 329, 334, 494 Blackstone Edge 302-6 Blea Tarn, Langdale 243, 247

Brimham Rocks 304-6 Burbage Brook 303-10 Chelford 132-5 Cheviot Tors 319-20 Cross Fell 287, 334-43 Ecton 320-3 Fen Bogs 460-3 Four Ashes 136-8 Grasmoor 287, 328-32 Harwood Dale Moor 80-2 Helvellyn 193-7, 287 High Pike 287, 330 **Kesgrave Formation 35** Low Wray Bay, Windermere 222, 226-9 regolith 294, 297-348 Scotland 80, 288, 342-3 Sewerby 76 Skiddaw 287, 332-4 Stiperstones 297-302 Thornsgill and Mosedale 49-51 Throstle Shaw 323-5 Wasdale Screes 346-8 Wyns Tor 310-14 perimarine 352-3, 554, 580 permafrost 27, 35, 125, 287-9, 297 Ecton 322 Middle Devensian 89 runoff 175, 290-1 Stiperstones 301-2 Throstle Shaw 324 Peterlee Member 37 Peterlee Sands, Warren House Gill 54-5 Petteril Valley 42, 102, 110-12, 128 phreatic drainage 45-6 Giggleswick Scar 205-8 Phurt Member 37 phytoplankton 279 Pickering 172, 214 Pickering Beck 172, 460 Pickering Formation 37 Pickering pro-glacial Lake 81, 129, 169-75, 444 Pickstock 145, 148 pig 206, 446, 529, 578 Pigdon Hill 159-60, 163-4 Pilkenzane Formation 37, 42 Pin Hole Cave 88-90 pingo 289 The Bog, Roos 439

Pinus sylvestris-Quercus zone 280 - 4planation 26-9 plankton 240, 242-3 Pleistocene 11-18, 33-83, 100-10, 129, 150, 303 erosion 204 Holy Island 532-9 human remains 206 Pastonian 35 tors 295, 303-4, 310-14 Pliocene 11, 21-3, 27-8, 51, 51, 55, 82 ploughing blocks 290, 341-2 Pocket Deposits 21-4, 40, 58 podsol 318, 375 Point of Ayre Formation 37 polarity 13, 18, 36 see also magnetic susceptability polje 272-8 pollen 354 **Basement Series** 74–5 **Baventian** 34 Brassington 21 Burbage Brook 309 Chelford 133-4 Dimlington 142 Downholland Moss 558-9, 559-65 Early Devensian 49, 88, 131-5, 136 Four Ashes 44, 87-8, 136, 138 Ipswichian 44, 49, 63, 65, 136 Ludworth Intake 169-71 Middle Pleistocene 41, 88 Neogene 21-2 reworking 214, 256 St Bees 180, 183-5, 187 Speeton 44, 68-9 pollen assemblages and assemblage zones 17, 17, 37, 44, 63-4, 68, 138; 183-7, 211-12, 216-18, 220, 234, 236, 241, 243, 244-8, 253-7, 268-9, 274-8, 282, 367-75 Blea Tarn, Langdale 241-50 Blelham Bog 233-41 Bolton Fell Moss 518-21, 523-6 Chelford 134 Crose Mere 278-84, 279-84

Cumbria 367-75 Downholland Moss 559-65, 568-9 Fen Bogs 460-3 Four Ashes 44, 87-8, 136 Gormire 466-9 Gransmoor 259-64 Hartlepool 527-31 Hawes Water 272-8 Hightown 586-8 Holy Island 533-8 Kildale Hall 264-71 Late-glacial 211, 213-20 Leash Fen 494-8 Lindow Moss 501-2 Low Hauxley 481-4 Low Wray Bay 217, 219, 222-30, 239 Lytham 542-7, 549-50, 552, 559-68 Malham Tarn Moss 514-18 Martin Mere 406-7 Mere Sands Wood 402-3 Neasham Fen 395-8 Old Mere, Hornsea 456-60 Red Moss 410-11 Red Sike Moss 386-92, 394 St Bees 182-5 Scaleby Moss 368-73 Scandal Beck 62-5 Seacote Peat Member 182-3 Skipsea Bail Mere 414-17 Skipsea Withow Mere 420-7 Star Carr 447-51 Tadcaster 251-7 The Bog, Roos 429-35 Thorpe Bulmer 473-8 Upper Teesdale 382, 386-92, 394 Thurstaston 382 Valley Bog 378-9 Walton Moss 518-19, 521-3, 525-6 Willow Garth (Boynton) 437-42 Wybunbury Moss 511 polygons 289-90 Cross Fell site 336-43 Grasmoor 328-32 Helvellyn 193 Skiddaw 332-4 Stiperstones 297-302 Pontesbury 297 Pontnewydd Cave 44

Port-y-Waen 218 Portland 41 Poulton-le-Fylde 216-18 Pow Beck Peat Member, St Bees 182-7 Pow Hill 357-8 Powburn 363 Praetiglian 36 pre-Boreal 398, 443, 552 pre-Devensian 33-83, 115, 171-6 Advance 69-71 Stadial 46-51, 87 Prees Heath 101, 114-19 Prees Hill 114-18 Prescot Moss 361 Preselli Hills 288, 296, 301 Preston 158-60, 163-4 Prismatic Clay 54-8, 154, 157-8 Prospect Hill 145, 148 protalus rampart 290, 294 Cross Fell 343 Skiddaw 288, 333-4 protozoa 515 proximal iceflow 199-200 pseudo-erratics 201 Purple Till, Dimlington site 140-1 see also Withernsea Till push moraine 142 quartzite tors 5, 297-302 Quaternary 11-18 Lower 33-8 see also Cromerian; Bestonian; Baventian; Pastonian Middle 33, 38-43 see also Anglian; Hoxnian; Wolstonian; Ipswichian to 5e Upper 33, 43-6 see also Upper Ipswichian; Flandrian; Holocene Queen's Crag 198-9 Queensway, Lytham 539-40 Quercus-Alnus glutinosa zone 281 - 4Quercus-Betula zone 282-4 Quick Moss 358-60, 363-5

radiocarbon dates 45, 49,

### General index

88-93, 96, 126, 129 Blea Tarn, Langdale 244-7, 249-50 Blelham Bog 212, 233, 236-7, 239 Bolton Fell Moss 519-20, 524 Castlethorpe 591, 593 Chelford 87, 131, 134 Crose Mere 279-84 Cross Fell 432, 434-5 Dimlington 138, 141-2, 144, 431 Downholland Moss 556-7, 559-62, 566-7 Featherbed Moss 488-90, 493 Fen Bogs 460-2 Formby Point 570, 576-7, 579-82 Four Ashes 89, 138 Gormire 465, 467, 469, 479 Gransmoor 258, 258-9, 264 Hartlepool 528-31 Hightown 584 Holocene 355-65 Holy Island 534, 536-7, 539 Kildale Hall 213, 265, 270-1 Late-glacial 6, 211-13, 215-17, 219-20 Late-glacial-Holocene 309, 367-8 Leash Fen 494-8 Lindow Moss 499-501, 504-6 Low Hauxley 480-1, 484-5 Low Wray Bay 221-2, 228-30 Lytham 553-4 Martin Mere 408 Mere Sands Wood 401 Neasham Fen 395-8 Old Mere, Hornsea 455, 459-60 Red Moss 401, 409-12 Red Sike Moss 382, 391 St Bees 183-5 Scaleby Moss 220, 367-76 Scandel Bay 62 Sewerby 73 Shippersea Bay 60 Skipsea Bail Mere 413-14, 417

Skipsea Withow Mere 420, 422, 428 Star Carr 453-4 Tadcaster 256 The Bog, Roos 425, 431-6 Thorpe Bulmer 469, 471, 478-9 Upper Teesdale 382, 391 Valley Bog 377, 379, 381 Walton Moss 522 Willow Garth 436-8 radionuclide dating 230 radium isotope dating 277-8 rafts 79, 81, 139-42, 154-8, 335 see also ice Raincliff Formation 37 Raise 194 Raise How 188 raised beaches 532-9 raised bog 351-2, 365-77 Downholland Moss 554 Malham Tarn Moss 512-18 raised mires, Bolton Fell Moss and Walton Moss 517-19 Martin Mere 402-8 Raleigh-Taylor instabilities 154 Ramsar sites 512 Ramsay Member 37 Ravenglass 128, 186 Ravenglass Till Member 123, 178 Rawthey valley 62, 98 Raygill Delf Cave 45 Raygill Delf Formation 37 readvance theory 53-8, 91, 94-5, 124-7, 185-7 Red Moss site 4, 6, 357–9, 380, 401, 408-13 Red Pike 27 Red Sike Moss 358, 377, 381-95 see also Upper Teesdale site Red Tarn (Helvellyn) 194-5 Red Tarn Moss 375-6 reed and sedge peat 501-8 reeds 135 reedswamp 279, 353, 359-60, 461, 586-7 Crose Mere 279 Downholland Moss 563. 566-7 Hightown 586-7 Star Carr 443, 448-54

Wybunbury Moss 508-12 regolith 289-94, 318 Reighton Gap, Speeton Shell Bed 66-8, 71 Reighton Sands 65-6 reindeer 43, 79, 88-9, 206, 265, 419 **Reuverian** 36 rhinoceros 43, 75, 79, 88 rhododendron 250 Ribble Estuary 540, 551, 569 Ribble Valley 130 Ribblesdale 204 Richworth Moor 488–9 **Ridgeacre Formation 13** Rievaulx Abbey 467 **Ringinglow Formation 37** Willow Garth (Boynton) 436 Risehow 121, 191-3 Rishworth Moor 361-2, 488-9, 494-5 river alluviation 43, 355 river incision 41-2, 44, 102, 291, 308-9, 355 Bridestones 316-17 Thornsgill and Mosedale site 47.50-1 River Leven 264 river systems 87 river terraces 43-4 Robin Hood's Cave, Cresswell 42-3, 88-90 Robin Proctor's Scar 200-3 Robinson's Moss 357-60 Rockcliffe Formation 37 Rockcliffe Scar 113 rockwall instability 345 roddens 554, 565-6, 568-9 rodent 51, 59, 423 Roman 279, 309, 356, 363, 374-5, 398-9 agriculture 463, 489-93, 523-6 Leash Fen 494-9 Lindow Moss 506-7 Roman Wall site 4, 6, 197–200, 292, 321 Romano-British 363-4, 465-9, 479, 523-6 cave occupation 206 Featherbed Moss 489, 490-3 Fen Bogs 463

#### General index

Hartlepool 531 Ronaldkirk 473 Roos 144 see also The Bog, Roos Roos Carr figurines 436 Roos Drain 429 Rose Hill 128 Rose Hill Member 37 Ross Links 532-3 Ross Low 533 Rossall Beach 211 Rossendales 27, 356, 363 Rostherne Mere 364 Rosthwaite moraine 119 Rothersdyke Till 124 Rothwell 39, 129 rotten rock 22, 28, 82 see also weathering, deep Rough Hill 145-6 Round Hill, Holme St Cuthbert 188-93 Round Hill, Staffordshire 145-6 Routh Quarry 220 Rumex-Artemisia zone 226, 236 - 7Rumex-Gramineae zone 214, 224, 227, 236 Rumex-Gramineae-Rubiaceae zone 237 Rushley Green Member 13 Rusland Moss 352, 363 rye 495, 504 Ryhope Member 37 Ryton 112 Saalian 36, 39-40, 42 sainfoin 394 St Annes on Sea 540, 551 St Bees Head Bed 37, 121-6 St Bees Sands and Gravels, St Bees 125, 181-7 St Bees Sandstone, St Bees 111, 186 St Bees Silt Member 123, 181 St Bees Silts and Clays, St Bees 181 - 7St Bees site 4-6, 94, 97, 101-2, 111, 116, 120-8, 177-87, 191, 217, 239

pollen 180, 183–5, 215, 217, 220 St Bees Till Member **37**, 181–7 *see also* How Man Till

Member St Brelades 42 St Cuthbert's Isle 532 St George's Field, York 363 Salix cinerea-Betula pubescens-Phragmites australis zone 588 Salix cinerea-Galium palustre zone 588 Salix berbacea zone 241-2 Salix berbacea-Cyperaceae-Lycopo dium selago zone 224, 228 Salix herbacea-Lycopodium selago zone 236 Salix berbacea–Oxyria zone 23 saltmarsh 529-31, 559-65, 580-2, 584-6 Holocene 352-3 Salvin Ridge 486-7, 492 Sandbeds Fan site 6, 288, 325-8 Sandbeds Gill 325-7 Sandiway 116 sandur systems 50-1, 91, 101-5, 146 Annaside and Gutterby Banks 178-9 **Ellesmere Embayment** 114 - 19St Bees 62, 185-6 Warren House Gill 54 Sandy Bay site 5-6, 154-8 Sandy Lane Mammalian Assemblage Zone 44 saprolite 29 Scafell Formation 37 Scafell Pike 121 Scale Beck Till 124 Scaleby Moss site 6, 220, 357-9, 366-77, 532-5 bog body 507 Scandal Beck Bed 37, 62-5 Scandal Beck site 6, 42, 46, 62-5 . Scandinavia 39, 42, 100, 174, 240 - 1erratics 51-2, 59-60, 76, 139, 141-2 ice 42, 320 Scandinavian Drift 51-6 Scar Close 201-3 Scar Top 204

Scarisbrick 27, 402 Scar Top 204 Schoolboys Cave 206 'schwingmoor', Wybunbury Moss 508-12 Scotby Park 128 Scotland, Windermere Interstadial 217 Scottish, Devensian ice 87-8, 91-9, 114-29, 138 erratics 53, 88, 139, 141-2, 152, 155 Highlands 97, 100, 127, 174-5, 342-3, 449 ice 33, 38, 40-2 Readvance 91-9, 102, 115-16, 120-2, 124-9 Annaside and Gutterby Banks 179 Holme St Cuthbert 187-93 St Bees 180-1, 185-7 Scaleby Moss 366, 377 Scottish Asphodel 393 sea-level changes 4, 17-18, 24, 43-4, 76-7, 80 Devensian 71, 87, 96, 119-20, 125-6 Downholland Moss 554-69 Formby Point 569-82 Hartlepool 526 Holme St Cuthbert 187 Holocene 352-3, 355, 584-8 Holy Island 532, 534-9 Low Hauxley 484-5 Lytham index 539-54 Northumberland coast 535, 539 see also raised beach Sea Mill 180-5 Seacombe Formation 37 Seacote Hotel 184-5 Seacote Peat Member 125, 181 - 7St Bees 180-7 Seagaris Moss 557-8 Seaham Harbour Member 37 Seamer Carrs 215-16, 220, 256, 269, 461 and Star Carr 443-4, 446 charcoal and alder 558 double peak Betula 428, 473
Holocene 360 late-Interstadial 428, 431, 467, 473 Seascale 121 bog body 507 Seascale Glacigenic Formation 125 Seascale Moss 507 Seathwaite 355-6 Seathwaite Tarn 242, 363, 375-6 Seaton Carew 526 sedge and reed peat, Lindow Moss 501-8 sedge-tundra 213-19, 229, 479 Sedgefield 112 sedgepeat 366-7, 376, 377-8 sedges 134, 138, 226, 229, 236 Blea Tarn, Langdale 250 Bradford Kames 217 Kildale Hall 265-71 Star Carr 446, 448, 450 Tadcaster 255-6 seepage moisture theory 294, 312, 316-17 Sefstrom glacier 142-3 Sefton coast dunes 355, 569-82 Seisdon Formation 37 Trysull Member 37 Selby 39, 143 Selker Bay 176 Selker Formation 37 Annaside and Gutterby Banks 176-9 Settle 45, 130, 203, 207, 218 Severn Basin 279 Severn River 114-19, 147-8 Sewell's Cave 206 Sewerby 143 Sewerby Gravels, Sewerby 72-3. 75-7 see also Flamborough Member Sewerby site 4, 6, 42, 45, 61, 69, 71-7, 79-80, 292 Shap granite 25 Sheep Hill 145-8 Sheffield 39-40, 42 Sheldrake Pool 532 Shelf Brook 486 Shellag Formation 37

Shelve Inlier 297 Sheraton 57-8 Sherwood Sandstone, Wybunbury Moss 508 Shibdon Pond 361 Shining Bank Quarry 40 Shippersea Bay (Easington) site 5-6, 45, 58-62 Shirdley Hill Sand Formation 37, 219-20, 292 Downholland Moss 556-7, 561, 569 Formby Point 570, 577-8 Martin Mere 404-6 Mere Sands Wood 398-402 Shotton Brickpit 57-8 shrews 423 Shrewsbury 114-19, 148, 297 Shrewsbury Formation 37 Shropshire, Crose Mere 278-84, 279-84 Stiperstones 297-302 Shropshire Lowlands 37, 90-3, 112, 146-7, 291 Holocene 355 Late-glacial 216-18, 278-84 Silverdale Moss 272 Simonswood Moss 359-60, 364 sink-holes 21, 312-14 Six Fathom Hazel 336 Skell Moor 363 Skelmersdale 27 Skelsmerg Tarn 272 Skiddaw site 4, 6, 24-5, 121, 193-7, 287-90, 323, , 328, 330 - 4Skiddaw Slate 46, 137, 194-7, 323-5 Grasmoor 328-32 Skiddaw 332-4 Skipsea Bail Mere site 4, 6, 72, 143, 215-16, 356, 413-17, 419, 428, 431, 439, 443-55 Skipsea Low Mere 413-14, 416, 419 Skipsea Member 77 Drab Clay 140 Kelsey Hill site 78-81 Skipsea Till Dimlington site 139-44 Kelsey Hill site 80-1 Sewerby 75-7 Speeton 65, 69-71

Yorkshire coast 74-5, 142-4 see also Drab-Skipsea Till; Skipsea Member Skipsea Withow Gap(Hole) 416, 419, 425-6, 428 Skipsea Withow Mere site 4, 6, 214, 216, 218-19, 270, 361, 413, 418-29 Skipton Earthquake 207 Skye 175, 291 Snaefell Formation 37 snails 59, 80, 268, 274 Sniggery Wood 355 Snitterby Limestone, Castlethorpe 589 snow-bed 213, 224, 332-4, 342 communities 236, 241 soil 356, 363, 376-7 erosion 218, 354-5 solifluction 40, 112, 169-71, 175, 314 Blea Tarn, Langdale 243 Blelham Bog 238 Brimham Rocks 305 Burbage Brook 306-10 Cross Fell 341-3 Devensian 88 Dimlington 271 Ecton 322 Helvellyn 194-7 lobes 196, 290, 294 periglacial processes 290-1, 294, 296 sheets 294 terraces 194-7 solution hollows 21-4, 99-100, 200-3, 312 Dinantian 24 Pennines 23-4 Wybunbury Moss 508 Solway 25, 91, 94-9, 120-7, 130 Holocene 352, 363 Solway Basin 192, 336 Solway Formation 37 sorted stones 197, 289-90, 294, 299-302 Great Dun Fell 339-43 sorted stripes 289-90, 294, 299-302, 328-32 Helvellyn 193-7, 332 Skiddaw 332-4 South Basin, Low Wray Bay

221-2, 229 South Bloomfield 160 South Cave 39 South Charlton 163-4 South Cliffe 44-5 South Craven Fault 203 South Medwin Valley 163 South Shields 52, 61 South Tyne system 102, 334-6 Southern Gritstone Moor 494 Southern Uplands 92, 94, 97, 119.336 Southport 402, 580 Soyland Moor 358-9 Spalding Moor 39 SPECMAP record 13-18 Speeton Clay, Speeton site 66-71 Speeton moraine 41 see also Wykeham moraine Speeton Shell Bed, Ilfordian 71 Reighton Gap 66-7 Speeton site 42, 44, 61, 65-71 Speeton site 5-6, 41, 42, 44, 61, 65-71, 143 speleothem, Cromerian 36-8 Early and Middle Devensian 89 Hoxnian 41 Late-glacial 213 post-Ipswichian 45 Wolstonian 43 Sphagnum cuspidatum/ recurvum mire 514 Spider Cave 205-8 Spiggot Hill 512-14 Spindlestone 159-64 Spital Burn 154 Spring Hill Member 13 spring sapping 175-6 see also steepheads; pocket valleys Springfield Planation 589 spruce 87-8 Spurn Point 42 Staffordshire 26-7, 89, 92, 114, 144-9 facies 37 Four Ashes 136-9 Holocene 360, 364 Late-glacial 215, 217 Stainmore ice movement 39,

57-8,94-5 Stainmore Syncline 203 Stainmore Trough 335-6 Staircase Cave 206, 206 staircase surfaces theory 26-9 Standrop 319-20 Stanton Harcourt 41 Stanwix shales 46 Star Carr site 6, 213, 218, 352-3, 360-5, 414, 423, 428, 443-55 Starr Hills 356, 359, 539-42, 551-3 Steng Moss 362-5 steppe 51, 214 steppe-tundra 42, 215-19, 259-61 Steward Shield Meadow 363 Stiperstones Member, Stiperstones 297-302 Stiperstones site 5-6, 288, 293, 289-90, 297-302 stoat 88 Stockport Formation 13, 37, 113 Chelford 132-5 Four Ashes 138 Late Devensian 113, 235 Lower Boulder Clay 135 Middle Sands and Gravels 135 Thurstaston 149-54 Upper Boulder Clay 135 Stockton Moors 145, 148 Stockton-on-Tees 56 stone pavements 175, 290 storm beach, Gransmoor 258 Strensham Court Bed 13 Striding Edge 194 Strine Brook 8, 145, 148 stripes 289-90, 294 Cross Fell 335-43 Grasmoor 328-32 Helvellyn 193-4 Skiddaw 332-4 Stiperstones 297-302 structural benches, Burbage Brook 306-10 Stublick Fault 203, 335-6 Stump Cross Bed 37, 88-9 Stump Cross Cave 88-9 Sty Head Tarn 214, 217 subglacial 144-9 surges 72, 75-7, 92,

119-27, 142-3 tunnel valleys 39-40, 79, 101, 120-7 subglacial channels 100-2, 153 Annaside and Gutterby Banks 178-9 **Giggleswick Scar** 204 Humbleton Hill and the Trows 164-9 Ludworth Intake 169-71 subglacial sediments 104-10, 112-13, 114-30 Bradford Kames 159-64 Dimlington 140-2 St Bees 186-7 Sandy Bay 154-8 Thurstaston 152 Sunbiggin Tarn 272 submerged forest 352-3, 526-32, 573-4, 579, 582-8 Sudbury Formation 35 Sugar Limestone 381-3, 393-4 Sulby Member 37 Sumba Island 17 Sunbiggin Tarn 272 Sunderland Formation 37 Superior Peat and Forest Bed, Hightown 584 supraglacial 91-3, 96, 110-12 Bradford Kames 163-4 Cheshire-Staffordshire 114-19 Kirkham moraine 91, 114 surge behaviour 72, 75-7, 92, 270Annaside and Gutterby Banks 179 Devensian 119-27, 142-3 suslik, red-cheeked 88 Sutton 22, 145, 148 Sutton Bank 464 Sutton Formation 37, 145 Svalbard 142-5 Swaddles Hole Member 37 Swale Valley 94, 101 swamp-carr 586 swamps 138, 577, 589-93 see also reedswamp Swanscombe Member 13 Sweat Mere 279 sweet gum 55 Swettenham Formation 37 Swindon Hill 362

Swirrel Edge 194 sword 206 syphon 206–8

Tabular Hills 288, 314-17 Tadcaster site 6, 215-17, 251-7, 269-70 **Binley Bog Formation** 251 - 7double peak Betula 414, 428, 435, 473 Holocene 254-7 Interstadials 253-7, 431 Loch Lomond Stadial 253-7, 473 Talkin Tarn 105, 107-10 tall-herb 214-15, 255, 265-9 Holocene 357, 479 Tarlsclough Moss 401-2, 406, 408 Team Valley 129 Tees Estuary 352, 355, 526, 532 Tees Valley 57, 75, 94, 101 Holderness deposits 129, 142 - 3Holocene 352, 355, 357-60, 365, 380 Late-glacial 214, 217, 220, 473 Upper 334-5, 342-3 see also Upper Teesdale teeth, perforated 446 temperature 21, 24-5, 35-8, 211 - 20Chelford 134-5 cycles 11-17 Gransmoor 259-64 Late Devensian 180, 186-7, 267-70 Low Wray Bay 225-6 periglacial 287, 289, 329, 334, 345-7 see also climate; climate shifts; oscillations tephra 352, 363 terraces 290, 294 cryplanation 175, 291, 297-9 flat-topped 101 solifluction 290 terrestrialization 508-12 Tertiary 7, 11-12, 309-14

and later uplift 24-9, 207, 301 sediments 21-5, 51-8 weathering 297, 303, 310 - 14Thames 35, 41, 69, 82 The Arch or Lion's Mouth Cave 88 The Bog, Roos site 6, 215-17, 220, 256, 269-71, 425, 427-36, 439-42, , 455-60, 473 pollen assemblage zones 433 The Rib 555, 557-9, 571 The Slake 531 The Snook 532 The Spectacles 146, 148 The Trows 165-9 thermal doming 24-9 thermal regime 96, 100, 262, 264, 316 Burbage Brook 310 Cheviot 320 Cross Fell 342 Devensian 50 Great Almscliff Crag 318 Late Devensian 96, 99-100 pre-Devensian 40 Roman Wall 199 Thurstaston 153-4 see also basal thermal regime thermokarst 289, 292 thermoluminescence dating 74, 271, 292 Chelford 87, 131-2 Mere Sands Wood 401-2 Thieves Moss 201, 517 Thomas Gillat's Colley Hey 540, 544-5, 551 Thomason's Hollow 392, 486-7 Thoraby Formation 37 Thorn Waste Moor 353, 360, 362, 364 Thornsgill Beck 4, 6, 41, 46-51 Thornsgill Formation 37, 42, 46-8 Thornsgill and Mosedale site 46-51, 87 see also pre-Devensian Stadial

Thornsgill and Mosedale site 4, 6, 8, 37, 41-2, 46-51, 87 Thornsgill Till 22, 46, 87 Thornsgill and Mosedale site 48-51 see also Troutbeck Palaeosol Thornythwaite moraine 119 Thorpe Bulmer Farm and Dene 470 Thorpe Bulmer site 6, 216–17, 256, 269-70, 363-5, 398-9, 414, 428, 431, 435, 469-79 Threlkeld Formation 37, 46-51 Threlkeld Till Member 37, 48-51, 87 Late Devensian 87 Thornsgill and Mosedale site 46-51 Throstle Shaw site 6, 288, 292, 323-5 thufurs 289, 294 Cross Fell 335-43 Thurnian 17, 33-4, 36 Thursby eskers 101 Thurstaston site 4-6, 149-54, 292 tiger, sabre-toothed 33 Tiglian 36 Tinker's Sike 381-2, 385, 391-4 Toad's Mouth Gravel deposit, Burbage Brook 309 Tock How Farm 240 Todmorden valley 29 Top Moss 360, 362, 364 tors 4-6, 29, 288, 290, 292-7 dolomitized 310-14 formation models 292-7, 302, 304, 306-10, 312-15, 318 limestones 314-17, 320-3 Millstone Grit 292-6, 302-14, 317-19, 334-43 Pennine 293-6, 297-314 quartzite 293-7, 297-302 Stiperstones 297-302 Totley Moss 488-9 trackway, Hightown 584, 586-8 Star Carr 443, 446, 453-5 Trafalgar Square Member 13, 41 tree pollen 214-19, 254,

265-9, 274-7, 279-84 Low Wray Bay 223-9 tree stumps 356, 360, 362, 481, 526-31 Hightown 580-8 Trefgarn 296 Trent Basin 27, 146-8 tripartite theory 90-1, 102, 112-13, 131, 135 Annaside and Gutterby Banks 176-8 Late glacial 211, 219, 272 St Bees 180-2 Sandy Bay 154-8 Shippersea Bay 58-62 Thurstaston 149-54 Warren House Gill 53-8 see also Stockport Formation Trotternish 288 Troutbeck 27, 47-8 Troutbeck Palaeosol 37, 46, 48-51 Trow Rocks 52 The Trows, See Humbleton Hill and the Trows Trunk Member 37 Trysull 292 Trysull Member 37 tufa 41-3, 194, 512, 515, 518 Castlethorpe 589, 592-3 tundra 215-16, 219-20, 238-41, 255, 268 Hawes Water 272-8 Low Wray Bay 222-6 Skipsea Withow Mere 422, 427-8 Stump Cross 88-9 Tadcaster 253, 255 Thorpe Bulmer 479 Willow Garth 442 tundra-woodland 238, 272-3 tunnel valleys 39-40, 79, 101-2, 121, 147 Tweed Valley 94, 130, 319, 326.336 Tweed–Cheviot ice 57–8, 94, 101 Twistleton Scars 201-3 Tyne Gap 57-8, 94-5, 101, 335, 342-3 Tyne mouth 52, 197 Tyne Valley 101-2, 129, 154 Holocene 334, 361, 365

Tyne-Wear complex 129 U-series dating method 17-18, 42-3, 45, 49 Chelford 87, 134 Hawes Water 277 Pin Hole Cave 88 Stump Cross Cave 88-9 Uldale 122-7 Ulverston surface 46 unconformities W and X 121-2, 126 undermelt 91 unloading 345 Uphall Pit 44 upland basin mires 354 uplift 21, 24-9, 55 coastal 532-9, 554, 559-64 Upper Boulder Clay, Chelford 132 - 5St Bees 180-2 Sandy Bay 154-8 Shippersea Bay (Easington) 59 Stockport Formation 135, 151 - 3Thurstaston 149-54 Warren House Gill 52-8 see also Horden Till Upper Cave Earth 89 Upper diamicton, Thurstaston 149-54 Upper Freshwater Bed 17 Upper Gravel, Speeton 67, 70-1 Upper Laminated Clay, Low Wray Bay 222-30 Upper reddish till, Sandy Bay 155 Upper Tees Clay 129 Upper Teesdale site 6, 357, 377, 381-95, 392-6 Upper Western Irish Sea Formation 123-5 Upton Warren 139 Upton Warren Interstadial 89, 116-17 Upton Warren Member 13 Vaccinium-Hylacomium mire 514 Vale of Eden 24, 88, 334-6, 342-3 drumlin field 62

Vale of Pickering 65, 70-1, 144, 172 Holocene 352-3, 358, 360-5, 423 Late-glacial 214-16, 220, 436 Star Carr 213, 218, 353, 443-55 Willow Garth (Boynton) 436-42 Vale of Threlkeld 46-51 Vale of York 41-2, 94, 112-13, 119, 129 Gormire 464-9 Holocene 351-65 Late-glacial 214, 219-20, 256, 292, 316 subglacial tunnel valleys 39, 143 Tadcaster 251-7 tills 39, 143 see also Askham Bog Valley Bog site 6, 360, 377-81, 395, 398 bog and humanity 377, 380 - 1bryophyte peat 377 shale and sandstone 377 Valley Farm Soil 82 varves 222-9, 241, 426 vegetation 365-77, 469-79 change 4, 87, 211-15, 272-3 climate shifts 518-26 Kildale Hall 268, 271 Landam clearance 240 pioneer 213, 226, 228-9, 255, 268, 347 Holderness 427, 435 see also barley; cereal; grassland; herbs; pollen assemblage; fen vegetation; forest clearance; wheat; woodland; tree; Fossil index ventifacts 133, 292 Venus Bank 112 vertical stones 196 Victoria Bed 37 Victoria Quarry Cave 33, 45, 218 Villefranchian fauna 33 voles 423 Vrica 11

Waalian 36 Wakefield 39 Waldringfield Member 35 Walkers Brow pit 103-4 Walker's Heath 358-60 Wallsend 197 Walney 46, 121 Walney Island 179 Walton Moss site 363, 377, 518-19 Waltonian 17, 36 Wampool River misfit 128 Wansbeck River 101, 129, 154 Waren Gap 159-60 Warren House Formation 37 Warren House Gill site 4, 6, 35-7, 51-8, 62, 127 Warren House Till 42, 52-4, 56, 62 Warthe 40 Warton Crag 45 Warwick Bridge 128 Wasdale Screes site 4, 6, 120, 122-8, 288, 321, 343-8, 508 Wastwater 343-6 Water Icicle Close Cave 36-8 water vole 35-6, 38, 75 Waverley Wood Member 13 Weald 27, 288 Wear Formation 37, 62 Wear Valley 94, 101, 128-9 Weardale 363, 365 Weardale granite 25, 335-6 weathering 21, 40, 46, 48, 57-8 Burbage Brook 306-10 chemical 290, 297, 302, 316-17 see also etch pits Corbel formula Cross Fell 335-43 deep 5, 29, 198, 295, 297, 302-4 Blackstone Edge 302-4, 318 Burbage Brook 307 Cheviot 320 Roman Wall 198 Wyns Tor 312-14 differential 292-6, 315 Hessle Till 140–1 honeycomb 307, 317 insolation 345 Late-Devensian-Holocene

#### 304

limestone 200-3, 310-13 mechanical 302-4, 304, 306 pits 307, 310, 317 Sandy Bay 154-8 Speeton 67-9 Weaver's Hill 145, 148-9 Wee Bankie moraine 92, 97 Weelhead Moss 220, 391 Weichselian 36, 39, 236, 240 - 1Welsh Readvance 34, 114-19 Little 114-19 Wem moraine 114-19 Wensleydale 94, 101, 361-2 Wessenden Head Moor 488 West Allendale 343 West End Channel 512, 514 West House Moss 461 West Moor 220 Doncaster 129 West Pin Hole (Dog Hole) 90 West Runton Member 13, 17, 38 West Runton site 38 Westfield Farm, Armthorpe 44 Westnewton 187, 191-3 Wetheral 128 Wharfe Valley 72, 98, 119, 143, 517 Great Almscliff Crag 317-19 Tadcaster 251-7 Whattal Moss 279 wheat 504, 507 Wheeldale Gill 362 Wheelton 27 Whicham valley 128, 179, 289 Whin Hill 108-10 Whin Sill 59, 157, 159-64, 197-200 Holy Island 532-9 Upper Teesdale 381-3, 394 Whinneyhill Coppice Clay Member 123 Whitbarrow 45 Whitby to Pickering Railway 463 Whitchurch 95, 114-19, 145-9 Whitchurch-Woore moraine 114 - 19White Marr 413 White Moss 217, 220, 357-60 White Peak 322 Whitehaven 123-8, 180-2, 185 Whitelee Letch 532-4 Whitestone Cliff 464 Whitrig Bog 212, 264, 274 Whixall Moss 362, 507 Wicks Wood Gap 571, 573-4, 579-80 Widdybank Fell 381-95 Wigton 46 Wigton Formation 37 Williamson's Moss 359, 361, 552 Willow Garth (Boynton) site 4, 6, 47, 213, 217-19, 220, 256, 360, 362, 364, 417, 436-42 Willowford 42 Winch Gill Member 37 Windermere 212-13, 239, 243, 351 see also Low Wray Bay Windermere Formation 37 St Bees Head Bed 37 Windermere Interstadial 125, 211-12, 216-19 Blea Tarn, Langdale 241-50 Blelham Bog 230-41 Hawes Water 272-8 Kildale Hall 264–71 Low Wray Bay 220-30 Ludworth Intake 169 Malham Tarn Moss 516-17 Mere Sands Wood 399-401 organic sediments 399-401 oscillations 218, 255, 259, 264, 269-70, 273-7 Red Moss 409-12 St Bees 180 Star Carr 446-55 Tadcaster 255-6 Windermere Interstadial, Late, Red Moss 409 Windy Knoll Cave 88 Winmarleigh Moss 364 Winshields Crag 198-9 Winster 23, 310 Winteringham 119 Winterton 119 Winyards Nick 307 Wirral 353, 356, 587 Thurstaston 149-54 Withernsea Member, Bog, Roos 429-31 see also Withernsea Till Withernsea Till 72, 78-81 Dimlington site 139-44

Hessle Till 140–1 Kelsey Hill site 78-81 Witherslack Hall 216, 218, 272, 359 Withow wetland system 413 Wiza Beck Valley 42 wolf 44-5, 88, 576 Wolf Crags Corrie 50 Wolf Crags Formation 37, 46-8, 125 Thornsgill and Mosedale site 46-51 see also Loch Lomond Stadial Wolf Crags Gravel 48-51 Wolf Crags Till 48-51 Wolston 17, 38 Wolstonian 13, 17, 33-4, 36-43,95 Drigg and Carleton 89-90 Speeton 69-71 Warren House Gill 54-6 Wolverhampton 44, 93, 138, 146-9 Wolverhampton Line 117 wolverine 88-9 wood artefacts 421, 436 Neolithic 531 Skipsea Bail Mere 413 Star Carr 444-6 stacks 428, 443 wood sage 344 Woodham Knoll, Little Crosby 578 woodland 42, 51, 63, 256 Blea Tarn, Langdale 241-50 Blelham Bog 232-41 Burbage Brook 308-9

Castlethorpe 593 Crose Mere 279-84 Cross Fell 343 Hawes Water 272-8 park 6-17, 215-19, 225, 241 Wooler 101, 164-5 Woore moraine 114, 116-17 Worksop 42 Wortley 45 Wrekin 117, 147-8 Wrexham Delta-terrace 116-18 Wrexham-Ellesmere-Whitchurch moraine 91, 93, 114-19 Wansbeck Valley 101 Wybunbury Moss site 6, 508-12 Wye Valley 41-2 Wyke House Farm 407 Wykeham moraine 65-6, 70 Wyllin Member 37 Wyns Tor site 5-6, 293, 310-14

Xifeng loess 14–15

Y Carneddau 296 Y Glyderau 296 Yetholm Loch 359 York 72, 95, 97, 101, 143 St George's Field 363 Yorkshire 44, 218, 220 Burbage Brook 306–10 chert 34 coast 33–4, 56, 71–7 facies **3**7

Giggleswick Scar 203-8 glaciation 72, 92-3 Gransmoor 257-64 Great Almscliff Crag 314-17 Sewerby 71-7 Speeton 65-71 Star Carr 443-55 see also North York Moors; Yorkshire Dales; Yorkshire Wolds Yorkshire Dales 38, 93-5, 99, 113, 130 Malham Tarn Moss 512-18 Norber Erratics 200-3 Yorkshire Wolds 29, 39-40, 42, 72, 81 Baventian 35 Devensian 129, 292 Dimlington 143-4 Holocene 357, 360-5, 433-42 Late glacial 211, 213, 217 nivation 175-6, 290-1 periglacial 290-2 solution hollows 23, 29 Willow Garth (Boynton) 436-42 Younger Dryas 211, 218-19, 2256, 229, 236 Blea Tarn, Langdale 242-7 Blelham Bog 237-41 Burbage Brook 306-10 Cheviot Tors 319-20 Hawes Water 271-8 loess 292 Tadcaster 252-7 see also Loch Lomond Stadial Ystwyth Valley 175, 291