# Mass Movements in Great Britain

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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.

- Abele, G. (1974) Bergstürze in den Alpen ihre Verbreitung, Morphologie und Folgeerscheinungen. Wissenshaftliche Alpenvereinshefte, 25, 230.
- Addison, K. (1987) Debris flow during intense rainfall in Snowdonia, North Wales – a preliminary survey. *Earth Surface Processes* and Landforms, 12, 561–6.
- Aitkenhead, N., Chisholm, J.I. and Stevenson, I.P. (1985) Geology of the Country Around Buxton, Leek and Bakewell, Memoir of the British Geological Survey, Sheet 111 (England and Wales), HMSO, London, 168 pp.
- Al-Dabbagh, T. (1985) A study of residual shear strength of Namurian shale in respect of slopes in North Derbyshire. Unpublished PhD thesis, University of Sheffield.
- Anderson, F.W. and Dunham, K.C. (1966) *The Geology of Northern Skye*, Memoir of the Geological Survey of Great Britain, Sheet 80 and parts of 90, 81 and 91 (Scotland), HMSO, Edinburgh, 216 pp.
- Anon. [Cooper, R.G.] (1982) Mass movement phenomena. In Further Progress of the Geological Conservation Review (ed. G.P. Black). *Earth Science Conservation*, 19, pp. 27–9.
- Arber, M.A. (1939) The great landslip in 1839. *Country Life*, **23 December 1939**, 658–9.

- Arber, M.A. (1940) The coastal landslips of South-East Devon. Proceedings of the Geologists' Association, 51, 257–71.
- Arber, M.A. (1941) The coastal landslips of West Dorset. Proceedings of the Geologists' Association, 52, 273–83.
- Arber, M.A. (1962) Discussion. In Coastal cliffs: report of a symposium (J.A. Steers). *Geographical Journal*, **124**, pp. 303–20.
- Arber, M.A. (1971) The plane of landslipping on the coast of South-East Devon. In Applied Coastal Geomorphology (ed. J.A. Steers), Macmillan, London, Appendix.
- Arber, M.A. (1973) Landslips near Lyme Regis. Proceedings of the Geologists' Association, 84, 121–33.
- Ashford, S.A. and Sitar, N. (1995) Topographic amplification in steep slopes. In Proceedings of IS-Tokyo '95: The First International Conference on Earthquake Geotechnical Engineering, Tokyo, 14–16 November 1995 (ed. K. Ishihara), Balkema, Rotterdam, pp. 1153–8.
- Bailey, E.B. and Anderson, E.M. (1925) *The Geology of Staffa, Iona and Western Mull,* Memoir of the Geological Survey of Great Britain, Sheet 43 (Scotland), HMSO, Edinburgh, 107 pp.

- Bailey, E.B. and Maufe, H.B. (1916) *The Geology* of *Ben Nevis and Glen Coe, and the Surrounding Country*, Memoir of the Geological Survey of Great Britain, Sheet 53 (Scotland), HMSO, Edinburgh, 247 pp.
- Bailey, E.B. and Maufe, H.B. (1960) The Geology of Ben Nevis and Glen Coe, and the Surrounding Country, 2nd edn, Memoir of the Geological Survey of Great Britain, Sheet 53 (Scotland), HMSO, London, 307 pp.
- Baird, P.D. and Lewis, W.V. (1957) The Cairngorm floods 1956: summer solifluction and distributary flormation. *Scottish Geographical Magazine*, 73, 91–100.
- Ballantyne, C.K. (1981) Periglacial landforms and environments on mountains in the northern highlands of Scotland. Unpublished PhD thesis, University of Edinburgh.
- Ballantyne, C.K. (1986a) Landslides and slope failures in Scotland: a review. *Scottish Geographical Magazine*, **102**, 134–50.
- Ballantyne, C.K. (1986b) Protalus rampart development and the limits of former glaciers in the vicinity of Baosbheinn, Wester Ross. *Scottish Journal of Geology*, 22, 13–25.
- Ballantyne, C.K. (1987a) The Beinn Alligin 'rock glacier'. In Wester Ross: Field Guide (eds C.K. Ballantyne and D.G. Sutherland), Quaternary Research Association, Cambridge, pp. 134–7.
- Ballantyne, C.K. (1987b) Some observations on the morphology and sedimentology of two active protalus ramparts, Lyngen, northern Norway. *Arctic and Alpine Research*, **19**, 167–74.
- Ballantyne, C.K. (1990) The late Quaternary glacial history of the Trotternish Escarpment, Isle of Skye, Scotland, and its implications for ice-sheet reconstruction. *Proceedings of the Geologists' Association*, **101**, 171–86.
- Ballantyne, C.K. (1991a) The landslips 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, Cambridge, pp. 82–9.
- Ballantyne, C.K. (1991b) Scottish landform examples – 2. The landslides of Trotternish, Isle of Skye. Scotish Geographical Magazine, 107(2), 130–5.
- Ballantyne, C.K. (1992) Rock-slope failure and debris flow, Gleann na Guiserein, Knoydart: comment. Scottish Journal of Geology, 28, 77-80.

- Ballantyne, C.K. (1994) Gibbsitic soils on former nunataks: implications for ice sheet reconstruction. Journal of Quaternary Science, 9, 73–80.
- Ballantyne, CK (1997) Holocene rockslope failures in the Scottish Highlands. In *Rapid Mass Movement as a Source of Climatic Evidence for the Holocene* (eds J.A. Matthews, D. Brunsden, B. Frenzel, B. Gläser and M.M. Weiss), *Palaoklimaforschung*, No. 19, Gustav Fischer, Stuttgart, pp. 197–205.
- Ballantyne, C.K. (1998) Aeolian deposits on a Scottish mountain summit: characteristics, provenance, history and significance. *Earth* Surface Processes and Landforms, 23, 625–41.
- Ballantyne, C.K. (2002a) Paraglacial geomorphology. *Quaternary Science Reviews*, 21, 1935–2017.
- Ballantyne, C.K. (2002b) Debris flow activity in the Scottish Highlands: temporal trends and wider implications for dating. *Studia Geomorphologica Carpatho-Balcanica*, 36, 7–27.
- Ballantyne, C.K. (2002c) Geomorphological changes and trends in Scotland: debris flows. *Scottish Natural Heritage Commissioned Report*, F00AC107A, 27 pp.
- Ballantyne, C.K. (2003) A Scottish sturzstrom: the Beinn Alligin rock avalanche, Wester Ross. *Scottish Geographical Journal*, **119**, 159–67.
- Ballantyne, C.K. and Eckford, J.D. (1984) Characteristics of 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 Stone, J.O. (2004) The Beinn Alligin rock avalanche, NW Scotland: cosmogenic <sup>10</sup>Be dating, interpretation and significance. *The Holocene*, **14**, 448–53.
- Ballantyne, C.K., McCarroll, D., Nesje, A., Dahl, S.O. and Stone J.O. (1998a) The last ice sheet in North-West Scotland: reconstruction and implications. *Quaternary Science Reviews*, 17, 1149–84.
- Ballantyne, C.K., Stone, J.O. and Fifield, L.K. (1998b) Cosmogenic Cl-36 dating of postglacial landsliding at the Storr, Isle of Skye, Scotland. *The Holocene*, **8**, 347–51.

- Banham, P.H. (1968) A preliminary note on the Pleistocene stratigraphy of north-east Norfolk. *Proceedings of the Geologists' Association*, 79, 507–12.
- Banham, P.H. (1975) Glaci-tectonic structures: a general discussion with particular reference to the contorted drift of Norfolk. 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. 69–94.
- Barton, M.E. (1984) The preferred path of landslide shear surfaces in over-consolidated clays and soft rocks. In *IV International Symposium on Landslides*, Canadian Geotechnical Society, Toronto, Vol. 3, pp. 75–9.
- Bass, M.A. (1954) A study of the characteristics and origin of some major areas of landsliding in the eastern Pennines and the Isle of Wight. Unpublished MSc thesis, University of Sheffield.
- Bateman, T. (1861) Ten Years' Diggings in Celtic and Saxon Grave Hills, in the Counties of Derby, Stafford and York, from 1848 to 1858; with Notices of some Former Discoveries, Hitherto Unpublished, and Remarks on the Crania and Pottery from the Mounds, Smith, London, and Bemrose, Derby, 309 pp.
- Beck, A.C. (1968) Gravity faulting as a mechanism of topographic adjustment. *New Zealand Journal of Geology and Geophysics*, **11**, 191–9.
- Beckinsale, R.P. (1970) Physical problems of Cotswold rivers and valleys. Proceedings of the Cotteswold Naturalists Field Club, 35, 194–205.
- Bell, B.R. and Harris, J.W. (1986) An Excursion Guide to the Geology of the Isle of Skye, Geological Society of Glasgow, Glasgow, 317 pp.
- Bell, B.R. and Williamson, I.T. (2002) Tertiary igneous activity. In *The Geology of Scotland*, 4th edn (ed. N.H. Trewin), The Geological Society, London, pp. 371–407.
- Bennett, M.R. and Langridge, A.J. (1990) A two stage rockslide in Gleann na Guiserein, Knoydart. Scottish Journal of Geology, 97, 653-65.
- Bentley, M. and Dugmore, A.J. (1998) Landslides and the rate of glacial trough formation in Iceland. In *Mountain Glaciation* (ed. L.A. Owen), *Quaternary Proceedings*, No. 6, Wiley, Chichester, pp. 11–15.

- Bisci, C., Dramis, F. and Sorriso-Valvo, M. (1996)
  Rock flow (sackung). In Landslide Recognition: Identification, Movement and Causes (eds R. Dikau, D. Brunsden, L. Schrott and M.-L. Ibsen), International Association of Geomorphologists Publication, No. 5, John Wiley and Sons, Chichester, pp. 150–60.
- Bishop, A.W. and Morgenstern, N. (1960) Stability coefficient for earth slopes. *Géotechnique*, **10**, 129–50.
- Bjerrum, L. (1954) Geotechnical properties of Norwegian marine clays. *Géotechnique*, 4, 49–60.
- Bjerrum, L. (1966) Mechanism of progressive failure in slopes of overconsolidated plastic clays and clay shales. Journal of the Soil Mechanics and Foundations Division: Proceedings of the American Society of Civil Engineers, 93(SM5), 1–49.
- Bjerrum, L. and Jørstad, F.A. (1968) Stability of rock slopes in Norway. *Norwegian Geotechnical Institute Publication*, 79, 1–11.
- Bjerrum, L. and others (1969) A field study of factors responsible for quick clay slides. In Proceedings of the Seventh International Conference on Soil Mechanics and Foundation Engineering, Mexico City, 1969, Sociedad Mexicana de Mecánica de Suelos, Mexico City, Vol. 2, pp. B31–B40.
- Blikra, LH. and Nemec, W. (1998) Postglacial colluvium in western Norway: depositional processes, facies and palaeoclimatic record. *Sedimentology*, **45**, 909–59.
- Boggett, A.D. (1989) The Bretton Clough landslides, Derbyshire. *Mercian Geologist*, 11, 223–35.
- Botch, S.G. (1946) Les névés et l'érosion par la neige dans la partie Nord de l'Oural.
  Bulletin of the USSR Geographical Society, 78, 207-34 (translated from Russian by C.E.D.P., Paris).
- Boulton, G.S., Peacock, J.D. and Sutherland, D.G. (1991) Quaternary. In *Geology of Scotland*, 3rd edn (ed. G.Y. Craig), The Geological Society, London, pp. 503–43.
- Bovis, M.J. and Dagg, B.R. (1992) Debris flow triggering by impulsive loading: mechanical modelling and case studies. *Canadian Geotechnical Journal*, 29, 345–52.
- Bovis, M.J. and Evans, S.G. (1996) Extensive deformations of rock slopes in southern Coast Mountains, southwest British Columbia, Canada. *Engineering Geology*, 22, 163–82.

- Brabb, E.E. and Harrod, B.L. (eds) (1989) Landslides: Extent and Economic significance: Proceedings of the 28th International Geological Congress: Symposium on Landslides, Washington D.C., 17 July 1989, A.A. Balkema, Rotterdam, 385 pp.
- Brazier, V. and Ballantyne, C.K. (1989) Late Holocene debris cone evolution in Glen Feshie, western Cairngorm Mountains, Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, **80**, 17–24.
- Briggs, D. and Courtney, F. (1972) Ridge and trough topography in the North Cotswolds. *Proceedings of the Cotteswold Naturalists Field Club*, 94–103.
- Bromehead, C.E.N., Edwards, W., Wray, D.A. and Stevens, J.V. (1933) *The Geology of the Country Around Holmfirth and Glossop*, Memoir of the Geological Survey of Great Britain, Sheet 86 (England and Wales), HMSO, London, 209 pp.
- Bromhead, E.N. (1979) Factors affecting the transition between the various types of mass movement in coastal cliffs consisting largely of overconsolidated clay with special reference to Southern England. *Quarterly Journal of Engineering Geology*, **12**, 291–300.
- Bromhead, E.N. (1986) *The Stability of Slopes*, Surrey University Press, Glasgow, 373 pp.
- Bromhead, E.N. and Dixon, N. (1984) Pore water pressure observations in the coastal clay cliffs at the Isle of Sheppey, England. In *IV International Symposium on Landslides*, Canadian Geotechnical Society, Toronto, Vol. 1, pp. 385–90.
- Bromhead, E.N. and Dixon, N. (1986) Technical note: The field residual strength of London Clay and its correlation with laboratory measurements, especially ring shear tests. *Géotechnique*, 36, 449–52.
- Bromhead, E.N. and Vaughan, P.R. (1980) Solutions for seepage in soils with an effective stress dependent permeability. In Numerical Methods for Non-linear Problems: Proceedings of the International Conference Held at University College, Swansea, 2–5 September 1980 (eds C. Taylor, E. Hinton and D.R.J. Owen), Pineridge Press, Swansea, pp. 567–78.
- Brown, E. (2003) Interpreting Quaternary landscapes in the Loch Lomond and Trossachs National Park. In *The Quaternary of the Western Highland Boundary: Field Guide* (ed. D.J.A. Evans), Quaternary Research Association, London, pp. 69–74.

- Brown, M.C. (1973) Limestones on the eastern side of the Derbyshire outcrop of the Carboniferous Limestone. Unpublished PhD thesis, University of Reading.
- Brown, R.D. (1966) Recent landslips at Mam Tor. Don, 10, 13–18.
- Brown, R.D. (1977) Excursion Itineraries for the 6th British-Polish Seminar, Sheffield, Department of Geography, University of Sheffield, Sheffield.
- Brückl, E. and Parotidis, M. (2005) Prediction of slope instabilities due to deep-seated gravitational creep. *Natural Hazards and Earth System Sciences*, 5, 155–72.
- Brunsden, D. (1969) The moving cliffs of Black Ven. *Geographical Magazine*, **41**(5), 372-4.
- Brunsden, D. (1979) Mass movements. In Process in Geomorphology (eds C.E. Embleton and J.B. Thornes), Edward Arnold, London, pp. 130–86.
- Brunsden, D. (1984) Mudslides. In *Slope Instability* (eds D. Brunsden and D.B. Prior), Wiley, Chichester, pp. 363–418.
- Brunsden, D. (1985) The revolution in geomorphology: a prospect for the future. In *Geographical Futures* (ed. R. King), The Geographical Association, Sheffield, pp. 30–55.
- Brunsden, D. (1990) Tablets of stone: towards the ten commandments of geomorphology. *Zeitschrift für Geomorphologie, Supplementband*, 79, 1–17.
- Brunsden, D. (1996a) The case of the missing ductile layer. Journal of the Geological Society of China, 39(4), 535-56.
- Brunsden, D. (1996b) Landslides of the Dorset coast: some unresolved questions: The Scott Simpson lecture. *Proceedings of the Ussher Society*, 9, 1–11.
- Brunsden, D. and Allison, R.J. (1990) Geomorphology. In Landslides of the Dorset Coast (ed. R.J. Allison), British Geomorphological Research Group Field Guide, British Geomorphological Research Group, Sheffield, pp. 37–50.
- Brunsden, D. and Chandler, J.H. (1996)
  Development of an episodic landform change model based upon the Black Ven mudslide, 1946–1995. In Advances in Hillslope Processes (eds M.G. Anderson and S.M. Brooks), British Geomorphological Research Group Symposia Series, Wiley, Chichester, pp. 869–96.

- Brunsden, D. and Goudie, A.S. (1981) *Classic Coastal Landforms of Dorset*, Landform Guides, No. 1, The Geographical Association and British Geomorphological Research Group, Sheffield, 42 pp.
- Brunsden, D. and Ibsen, M.-L. (1994a) The nature of the European archive of historical landslide data, with specific reference to the United Kingdom. In *Temporal Occurrence and Forecasting of Landslides in the European Community. Final Report, Part 1. Methodology* (*Reviews*) for the Temporal Study of Landslides (ed. J.C. Flageollet), Contract 90 0025, Prog. EPOCH, European Community, pp. 21–70.
- Brunsden, D. and Ibsen, M.-L. (1994b) The temporal causes of landslides on the south coast of Great Britain. In *Temporal Occurrence and Forecasting of Landslides in the European Community. Final Report, Part 2, Vol. 1. Case Studies of the Temporal Occurrence of Landslides in the European Community* (ed. J.C. Flageollet), Contract 90 0025, Prog. EPOCH, European Community, pp. 339–83.
- Brunsden, D. and Ibsen, M.-L. (1994c) The spatial and temporal distribution of landslides on the south coast of Great Britain. In Temporal Occurrence and Forecasting of Landslides in the European Community. Final Report, Part 2, Vol. 1. Case studies of the Temporal Occurrence of Landslides in the European Community (ed. J.C. Flageollet), Contract 900025, Prog. EPOCH, European Community, pp. 385–423.
- Brunsden, D. and Ibsen, M.-L. (1997) The temporal occurrence and forecasting of land-slides in the European Community: summary of relevant results of the European Community EPOCH programme, Contract No. EPOC-CT-90.0025 (DTTE). In *Rapid Mass Movement as a Source of Climatic Evidence for the Holocene* (eds J.A. Matthews, D. Brunsden, B. Frenzel, B. Gläser and M.M. Weiß), *Paläoklimaforschung Paleoclimatic Research*, No. 19, Gustav Fischer, Stuttgart, pp. 401–7.
- Brunsden, D. and Jones, D.K.C. (1976) The evolution of landslide slopes in Dorset. *Philosophical Transactions of the Royal Society of London, Series A*, **283**, 605–31.
- Brunsden, D. and Kesel, R.H. (1973) Slope development on a Mississippi river bluff in historic time. *Journal of Geology*, 81, 576–97.
- Brunsden, D. and Thornes, J.B. (1979) Landscape sensitivity and change. *Transactions of the Institute of British Geographers*, 4, 463–84.

- Brunsden, D., Ibsen, M.-L., Lee, M. and Moore, R. (1995) The validity of temporal archive records for geomorphological processes. *Quaestiones Geographicae*, Special Issue No. 4, 1–13.
- Brunsden, D., Ibsen, M.-L., Bromhead, E. and Collison, A. (1996a) Final national report (June 1996). King's College London, United Kingdom. The Temporal Stability and Activity of Landslides in Europe with Respect to Climatic Change (TESLEC), European Commission Environment Programme, Contract No. EV5V-CT94-0454.
- Brunsden, D., Coombe, K., Goudie, A.S. and Parker, A.G. (1996b) The structural geomorphology of the Isle of Portland, southern England. *Proceedings of the Geologists' Association*, **107**, 209–30.
- Buckland, W. (1823) Reliquiae Diluvianae: or Observations on the Organic Remains Contained in Caves, Fissures and Diluvial Gravel, and on other Geological Phenomena Attesting the Action of an Universal Deluge, John Murray, London, 303 pp.
- Buckland, W. (1840) On the landslipping near Axmouth. Proceedings of the Ashmolean Society, 1, 1832–42.
- Burnett, A.D. and Fookes, P.G. (1974) A regional engineering geological study of the London Clay in the London and Hampshire Basins. *Quarterly Journal of Engineering Geology*, 7, 257–95.
- Cailleux, A. and Tricart, J. (1950) Un type de solifluction: les coulées boueuses. Révue de Géomorphologie Dynamique, 1, 4–46.
- Caine, N. (1982) Toppling failures from Alpine cliffs on Ben Lomond, Tasmania. Earth Surface Processes and Landforms, 7, 133–52.
- Cambers, G. (1973) The retreat of unconsolidated Quaternary cliffs. Unpublished PhD thesis, University of East Anglia.
- Cambers, G. (1976) Temporal scales in coastal erosion systems. *Transactions of the Institute* of British Geographers, 1(2), 246–56.
- Campbell, S. and Bowen, D.Q. (1989) *Quaternary of Wales*, Geological Conservation Review Series, No. 2, Nature Conservancy Council, Peterborough.
- Cancelli, A. and Pellegrini, M. (1987) Deepseated gravitational deformation in the Northern Appenines, Italy. In *Proceedings of the 5th International Conference and Field Workshop on Landslides (ICFL), Christchurch, New Zealand, 10–12 August 1987, pp. 1–8.*

- Casey, R. (1955) Contribution to 'Discussion on "Folkestone Warren landslips: investigations, 1948–50". Proceedings of the Institution of Civil Engineers, Railway Paper, No. 56, 429–60.
- Chandler, J.H. and Brunsden, D. (1995) Steady state behaviour of the Black Ven mudslide: the application of archival analytical photogrammetry to studies of landform change. *Earth Surface Processes and Landforms*, **20**, 255–75.
- Chandler, J.H. and Cooper, M.A.R. (1988) Monitoring the development of landslides using archival photography and analytical photogrammetry. *Land and Minerals Surveying*, 6, 576–84.
- Chandler, J.H. and Cooper, M.A.R. (1989) The extraction of positional data from historical photographs and their application to geomorphology. *Photogrammetric Record*, **13**(73), 69–78.
- Chandler, J.H., Kellaway, G.A., Skempton, A.W. and Wyatt, R.J. (1976) Valley slope sections in Jurassic strata near Bath, Somerset. *Philosophical Transactions of the Royal Society of London, Series A*, 283, 527–56.
- Chandler, J.H., Clark, J.S., Cooper, M.A.R. and Stirling, D.M. (1987) Analytical photogrammetry applied to Nepalese slope morphology, *Photogrammetric Record*, 12(70), 443–58.
- Chandler, R.J. (1984) Recent European experience of landslides in over-consolidated clays and soft rocks. In *IV International Symposium on Landslides*, Canadian Geotechnical Society, Toronto, Vol. 1, pp. 61–81.
- Chesher, J.A., Smythe, D.K. and Bishop, P. (1983) The geology of the Minches, Inner Sound and Sound of Raasay. *Report of the Institute of Geological Sciences*, **83**/6, 30 pp.
- Chigira, M. (1992) Long-term gravitational deformation of rocks by mass rock creep. *Engineering Geology*, **32**, 157–84.
- Churcher, R.A., Butler, B. and Bartlett, P.D. (1970) A further report on the caves of the Isle of Portland. *Transactions of the Cave Research Group of Great Britain*, 12, 291–8.
- Clark, A., Lee, M., and Moore, R. (1996) Landslide Investigation and Management in Great Britain: a Guide for Planners and Developers, Department of the Environment, HMSO, London, 120 pp.

- Clark, R. and Wilson, P. (2004) A rock avalanche deposit in Burtness Combe, Lake District, northwest England. *Geological Journal*, 39, 419–30.
- Clayton, K.M. (1974) Zones of glacial erosion. In Progress in Geomorphology (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. (1980) Coastal protection along the East Anglian coast, U.K. Zeitschrift für Geomorphologie, Supplementband, 32, 165–72.
- Clayton, K.M. (1989) Sediment input from the Norfolk cliffs, Eastern England – A century of coast protection and its effect. *Journal of Coastal Research*, 5(3), 422–33.
- Clayton, K.M. (1995) The coast. In *The National Trust: the Next Hundred Years* (ed. H. Newby), The National Trust, London, pp. 70–86.
- Clayton, K.M. and Coventry, F. (1986) An Assessment of the Conservation Effectiveness of the Modified Coast Protection Works at West Runton SSSI, Norfolk. *Nature Conservancy Council Report*, CSD 675.
- Clayton, K.M., McCave, I.N. and Vincent, C.E. (1983) The establishment of a sand budget for the East Anglian coast and its implications for coastal stability. In *Shoreline Protection: Proceedings of a Conference Organised by the Institution of Civil Engineers and Held at the University of Southampton on 14–15 September 1982*, Thomas Telford, London, pp. 91–6.
- Clough, C.T. (1897) Landslips. In *The Geology of Cowal* (eds W. Gunn, C.T. Clough and J.B. Hill), Memoir of the Geological Survey of Scotland, Sheet 29 and parts of 37 and 38 (Scotland), HMSO, Edinburgh, 333 pp.
- Conway, B.W. (1974) The Black Ven landslip, Charmouth, Dorset. *Report of the Institute of Geological Sciences*, 74/3, 16 pp.
- Conybeare, W.D. (1840) Extraordinary land-slip and great convulsion of the coast of Culverhole Point, near Axmouth. *Edinburgh New Philosophical Journal*, **29**, 160–4.
- Conybeare, W.D., Buckland, W. and Dawson, W. (1840) Ten Plates Comprising a Plan, Section and Views Representing the Changes produced on the Coast of East Devon between Axmouth and Lyme Regis by the Subsidence of the Land and the Elevation of the Bottom of the Sea on 26th December, 1839 and 3rd February 1840, John Murray, London.

- Coombe, E.D.K. (1981) Some aspects of coastal landslips and cliff-falls at Portland. Unpublished BA Dissertation, University of Oxford.
- Cooper, R.G. (1978) The discovery and exploration of the North Yorkshire windypits. *Ryedale Historian*, 9, 10–21.
- Cooper, R.G. (1979) Geomorphological studies in the Hambleton Hills, North Yorkshire. Unpublished PhD thesis, University of Hull.
- Cooper, R.G. (1980) A sequence of landsliding mechanisms in the Hambleton Hills, Northern England, illustrated by features at Peak Scar, Hawnby. *Geografiska Annaler*, **62A**(3–4), 149–56.
- Cooper, R.G. (1981) Four new windypits. *Caves* and *Caving*, 14, 3-4.
- Cooper, R.G. (1982) Further progress of the Geological Conservation Review. Mass movement phenomena. *Earth Science Conservation*, 19, 27–9.
- Cooper, R.G. (1983a) Fissures in the interior of the Isle of Portland. *William Pengelly Cave Studies Trust Newsletter*, 42, 1–3.
- Cooper, R.G. (1983b) Mass movement in caves in Great Britain. *Studies in Speleology*, 4, 37–44.
- Cooper, R.G. (1985) Conservation of geological features in the USA. *Earth Science Conservation*, 2, 9–12.
- Cooper, R.G. (1997) John Wesley at Whitestone Cliff, North Yorksbire, 1755, Borthwick Papers, No. 91, University of York, York, 25 pp.
- Cooper, R.G. and Solman, K.R. (1983) Fissures at Westcliffe, Isle of Portland. *Caves and Caving*, 22, 22–3.
- Cooper, R.G., Ryder, P.F. and Solman, K.R. (1976) The North Yorkshire windypits: a review. *Transactions of the British Cave Research Association*, 3, 77–94.
- Cooper, R.G., Ryder, P.F. and Solman, K.R. (1977) Caves in Lud's Church, North Staffordshire. *Bulletin of the British Cave Research Association*, **16**, 7.
- Cooper, R.G., Ryder, P.F. and Solman, K.R (1982) The windypits in Duncombe Park, Helmsley, North Yorkshire. *Cave Science*, 9, 1–14.
- Cooper, R.G., Graham, N. and Read, M. (1995) Solutional cave passages intersected by mass movement rifts in the Isle of Portland, Dorset. *Studies in Speleology*, **10**, 29–35.
- Cornish, R. (1981) Glaciers of the Loch Lomond Stadial in the western Southern Uplands of Scotland. *Proceedings of the Geologists' Association*, 92, 105–14.

- Corominas, J., Remond, J., Farias, P., Estevao, M., Zézere, J., Díaz de Terán, R., Dikau, R., Schrott, L., Moya, J. and González, A. (1996) Debris flow. In *Landslide Recognition, Identification, Movement and Causes* (eds R. Dikau, D. Brunsden, L. Schrott, and M.-L. Ibsen), John Wiley and Sons, Chichester, pp. 161–80.
- Cotton, C. (1685) *The Wonders of the Peake*, 2nd edn, 86 pp.
- Coussot, P. and Meunier, M. (1995) Recognition, classification and mechanical description of debris flows. *Earth Science Reviews*, 40, 209–27.
- Cripps, J.C. and Hird, C.C. (1992) A guide to the landslide at Mam Tor. *Geoscientist*, 2(3), 22–7.
- Cross, M. (1987) An engineering geomorphological investigation of hillslope stability in the Peak District of Derbyshire. Unpublished PhD thesis, University of Nottingham.
- Crosta, G. (1996) Landslide, spreading, deepseated gravitational deformation: analysis, examples, problems and proposals. *Geografia Fisica e Dinamica Quaternaria*, 19, 297–313.
- Cruden, D.M., Krauter, E., Beltran, L., Lefebvre, G., Ter-Stepanian, G.I. and Zhang, Z.Y. (1994)
  Describing landslides in several languages: The Multilingual Landslide Glossary. In Proceedings 7th International Congress International Association of Engineering Geology, 5-9 September 1994, Lisboa Portugal, (eds R. Oliveira and others), Balkema, Rotterdam, pp. 1325-33.
- Cullum-Kenyon, S. (1991) A post-glacial debris flow near the Spittal of Glenshee, Perthshire. Unpublished BSc Honours Dissertation, University of St Andrews.
- Cunliffe, B.W. (1977) The Saxon Shore some problems and inconsistencies. In *The Saxon Shore* (ed. D.E. Johnston), Council for British Archaeology, London, pp. 1–6.
- Cunliffe, B.W. (1980a) Excavations at the Roman Fort at Lympne, Kent 1976–1978. *Britannia*, 11, 227–88.
- Cunliffe, B.W. (1980b) The evolution of Romney Marsh: a preliminary survey. In Archaeology and Coastal Change (ed. F.H. Thompson), Society of Antiquaries of London Occasional Papers, No. 1, Society of Antiquaries, London, pp. 37–53.
- Curry, A.M., Walden, J. and Cheshire, D.A. (2001) The Nant Ffrancon 'protalus rampart': evidence for Late Pleistocene paraglacial landsliding in Snowdonia, Wales. *Proceedings of the Geologists' Association*, **112**, 317–330.

- Dade, W.B. and Huppert, H.E. (1998) Longrunout rockfalls. *Geology*, 26, 803-6.
- Darton, D.M., Dingwall, R.G. and McCann, D.M. (1981) Geological and geophysical investigations in Lyme Bay. *Report of the Institute of Geological Sciences*, 79/10, 24 pp.
- Davenport, C.A., Ringrose, P.S., Becker, A., Hancock, P. and Fenton, C. (1989) Geological investigation of late and post glacial earthquake activity in Scotland. In *Earthquakes at North Atlantic Passive Margins: Neotectonics and Postglacial Rebound* (eds S. Gregersen and P. Basham), Kluwer Academic Publishers, Dordrecht, pp. 175–94.
- Dawson, A.G., Matthews, J.A. and Shakesby, R.A. (1986) A catastrophic landslide (sturzstrom) in Verkilsdalen, Rondane National Park, southern Norway. *Geografiska Annaler*, **68A**, 77–87.
- De Freitas, M.H. and Watters, R.J. (1973) Some field examples of toppling failure. *Géotechnique*, 23, 495–514.
- Delderfield, E.R. (1976) *The Lynmouth Flood Disaster*, 8th edn, E.R.D. Publications, Exmouth, 160 pp.
- Denness, B. (1972) The reservoir principle of mass movement. Report of the Institute of Geological Sciences, 72/7, 13 pp.
- Dikau, R., Brunsden, D., Schrott, L. and Ibsen, M.-L. (eds) (1996) *Landslide Recognition*, Wiley, Chichester, 251 pp.
- Dixon, N. and Bromhead, E.N. (1986) Ground-water conditions in the coastal landslides of the Isle of Sheppey. In Groundwater in Engineering Geology: Proceedings of the 21st Annual Conference of the Engineering Group of the Geological Society (eds J.C. Cripps, F.G. Bell and M.G. Culshaw), Engineering Geology Special Publication, No. 3, The Geological Society, London, pp. 51–8.
- Dixon, N. and Bromhead, E.N. (1991) The mechanics of first-time slides in the London Clay cliff at the Isle of Sheppey, England. In Slope Stability Engineering: Developments and Applications: Proceedings of the International Conference on Slope Stability organized by the Institution of Civil Engineers and Held on the Isle of Wight on 15-18 April 1991 (ed. R.J. Chandler), Thomas Telford, London, pp. 277-82.
- Doornkamp, J.C. (ed.) (1988) Planning and Development: Applied Earth Science Background: Torbay, Geomorphological Services for the Department of the Environment, Newport Pagnall, 109 pp.

- Doornkamp, J.C. (1990) Landslides in Derbyshire. *East Midland Geographer*, **13**(2), 22–62.
- Drayton, M. (1622) The Second Part or Continuance of Poly-Olbion from the Eighteenth Song. Containing all the Tracts, Rivers, Mountaines, and Forests Intermixed with the most Remarkable Stories, Antiquities, Wonders, Rarities, Pleasures, and Commodities of the East, and Northerne parts of this Isle, Lying Betwixt the Two Famous Rivers of Thames, and Tweed, Printed by Augustine Mathewes for John Marriott, John Grismond and Thomas Dewe, London.
- Drew, F. (1864) The Geology of the Country Between Folkestone and Rye, Including the Whole of Romney Marsh, Memoir of the Geological Survey of Great Britain, Sheet 4 (England and Wales), HMSO, London, 27 pp.
- Eigenbrod, K.D. (1975) Analysis of the pore pressure changes following the excavation of a slope. *Canadian Geotechnical Journal*, **12**, 424–40.
- Elliott, R.V. (1979) The Upper Carboniferous rocks of the Ewden Valley, South Yorkshire. *Mercian Geologist*, 7, 43–9.
- Elliott, R.W.V. (1977) Staffordshire and Cheshire landscapes in Sir Gawain and the Green Knight. North Staffordshire Journal of Field Studies, 17, 20–49.
- Ellis, N.V., Bowen, D.Q., Campbell, S., Knill, J.L., McKirdy, A.P., Prosser, C.D., Vincent, M.A. and Wilson, R.C.L. (1996) *An Introduction to the Geological Conservation Review*, Geological Conservation Review Series, No. 1. Joint Nature Conservation Committee, Peterborough, 131 pp.
- Ellis-Gruffydd, I.D. (1972) The glacial geomorphology of the upper Esk basin (South Wales) and its right bank tributaries. Unpublished PhD thesis, University of London.
- Emeleus, C.H. and Bell, B.R. (2005) British Regional Geology: the Palaeogene volcanic districts of Scotland, 4th edn, British Geological Survey, Nottingham, 212 pp.
- Emeleus, C.H. and Gyopari, M.C. (1992) *British Tertiary Volcanic Province*, Geological Conservation Review Series, No. 4, Chapman and Hall, London, 259 pp.
- Evans, D.J.A. and Hansom, J.D. (1998) The Whangie and the landslides of the Campsie Fells. *Scottish Geographical Magazine*, **114**, 192–6.

- Evans, D.J.A. and Hansom, J.D. (2003) The Whangie and paraglacial landslides of the Campsie Fells. In *The Quaternary of the Western Highland Boundary: Field Guide* (ed. D.J.A. Evans), Quaternary Research Association, London, pp. 76–80.
- Evans, I.S. (1997) Process and form in the erosion of glaciated mountains. In *Process* and Form in Geomorphology (ed. D.R. Stoddart), Routledge, London.
- Evans, S.G. (1984) Landslides in Tertiary basaltic successions. In *IV International Symposium* on Landslides, Canadian Geotechnical Society, Toronto, pp. 503–10.
- Farmer, I.S. (1968) Engineering Properties of Rocks, E. and F.N. Spon Ltd, London, 180 pp.
- Fearnsides, W.G., Bisat, W.S., Edwards, W., Lewis, H.P. and Wilcockson, W.H. (1932) The geology of the eastern part of the Peak District. *Proceedings of the Geologists' Association*, 43, 152–91.
- Fenton, C.H. (1991) Neotectonics and palaeoseismicity in North West Scotland. Unpublished PhD thesis, University of Glasgow.
- Fenton, C.H. (ed.) (1992) Neotectonics in NW Scotland: a Field Guide, University of Glasgow, Glasgow.
- Fiennes, C. (1947) The Journeys of Celia Fiennes (ed. C. Morris), The Cresset Press, London, 376 pp.
- Firth, C.R. and Stewart, I.S. (2000) Postglacial tectonics of the Scottish glacio-isostatic uplift centre. *Quaternary Science Reviews*, **19**, 1469–93.
- Fitton, E.P. and Mitchell, D. (1950) The Ryedale windypits. *Cave Science*, 2(12), 162–84.
- Flageollet, J.C. (1989) Landslides in France: a risk reduced by recent legal provisions. In *Landslides: Extent and Economic Significance* (eds E.E. Brabb and B.L. Harrod), Balkema, Rotterdam, pp. 157–67.
- Fleming, S. (1978) Reports and Documents in Reference to the Location of the Line and a Western Terminal Harbour, Maclean Roger & Co., Ottawa.
- Flint, R.F. (1957) *Glacial and Pleistocene Geology*, Wiley, New York, 553 pp.
- Folk, R.L. (1959) Practical petrographic classification of limestones. Bulletin of the American Association of Petroleum Geologists, 79, 1–38.
- Ford, T.D. (1977) Carboniferous volcanic activity. In *Limestones and Caves of the Peak District* (ed. T.D. Ford), Geo Abstracts, Norwich, pp. 61–9.

- Ford, T.D. and Hooper, M.J. (1964) The caves of the Isle of Portland. *Transactions of the Cave Research Group of Great Britain*, 7, 13–37.
- Franks, J.W. and Johnson, R.H. (1964) Pollen analytical dating of a Derbyshire landslip: the Crown Edge landslides, Charlesworth. *New Phytologist*, **63**, 209–16.
- Gale, A.S. (1987) Field meeting at Folkestone Warren, 29th November, 1987. Proceedings of the Geologists' Association, 100, 73–82.
- Gallois, R.W. (1965) British Regional Geology: The Wealden District, 4th edn, HMSO, London, 101 pp.
- Geomorphological Services Ltd (1988) Applied Earth Science mapping for planning and development: Torbay, Devon. *Report to the Department of the Environment*.
- Gerber, E. and Scheidegger, A.E. (1969) Stressinduced weathering of rock masses. *Eclogae Geologicae Helveticae*, 62, 401–15.
- Ghosh, S.K. (1979) Analytical Photogrammetry, Pergamon, New York, 203 pp.
- Gibson, R.E. (1963) An analysis of system flexibility and its effect on time lag in pore-water pressure measurements. *Géotechnique*, 13, 1–11.
- Gifford, J. (1953) Landslides on Exmoor caused by the storm of 15th August, 1952. *Geography*, **38**, 9–17.
- Godard, A. (1965) Recherches de Géomorphologie en Écosse du Nord-Ouest, Publications de la Faculté des lettres de l'Université de Strasbourg, No. 1, les Belles Lettres, Paris, 703 pp.
- Golledge, N.R. and Hubbard, A. (2005) Evaluating Younger Dryas glacier reconstructions in part of the western Scottish Highlands: a combined empirical and theoretical approach. *Boreas*, 34, 274–86.
- Gordon, J.E. (1977) Morphometry of cirques in the Kintail–Affric–Cannich area of northwest Scotland. *Geografiska Annaler*, **59A**, 177–94.
- Gordon, J.E. (1992) Conservation of geomorphology and Quaternary sites in Great Britain: an overview of site assessment. In Conserving Our Landscape: Proceedings of the Conference Conserving our Landscape: Evolving Landforms and Ice-Age Heritage, Crewe UK, May 1992 (eds C. Stevens, J.E. Gordon, C.P. Green and M.G. Macklin), Nature Conservancy Council, Peterborough, pp. 11–21.
- Gordon, J.E. (1993) Beinn Alligin. In *Quaternary of Scotland* (eds J.E. Gordon and D.G. Sutherland), Geological Conservation Review Series, No. 6, Chapman and Hall, London, pp. 118–22.

- Gordon and Sutherland (1993) *Quaternary of Scotland*, GCR Volume No. 6, Chapman and Hall, London, pp. 118–22.
- Gordon, J.E. and Mactaggart, F. (1997) The Quaternary of Islay and Jura – report of short Field Meeting. *Quaternary News*, **83**, 31–4.
- Gostelow, T.P. (1974) Slope development in stiff overconsolidated clays. Unpublished PhD thesis, University of London.
- Goudie, A.S. and Hart, J. (1976) The Cleeve Hill slip-troughs. In *Field Guide to the Oxford Region* (ed. D. Roe), University of Reading for the Quaternary Research Association, Reading, pp. 55–60.
- Graham, N. and Ryder, P.F. (1983) Sandy Hole, Isle of Portland. *Cave Science*, **10**, 171–80.
- Grainger, P. and Kalaugher, P.G. (1995) Renewed landslide activity at Pinhay, Lyme Regis. *Proceedings of the Ussher Society*, **8**, 421-5.
- Grainger, P., Tubb, C.D.N. and Neilson, A.P.M. (1985) Landslide activity at the Pinhay water source, Lyme Regis. *Proceedings of the Ussher Society*, 6, 246–52.
- Green, A.H., Le Neve Foster, C. and Dakyns, J.R. (1887) *The Geology of the Carboniferous Limestone, Yoredale Rocks and Millstone Grit of North Derbyshire*, Memoir of the Geological Survey of Great Britain, parts of sheets 88SE, 81NE, 81SE, 72NE, 82NW, 82SW and 71NW (England and Wales), HMSO, London, 212 pp.
- Green, R.D. (1968) The Soils of Romney Marsh, Bulletin of the Soil Survey of Great Britain (England and Wales), No. 4, Agricultural Research Council, Harpenden, 158 pp.
- Gregersen, O. and Sandersen, F. (1989) Landslide: extent and economic significance in Norway. In *Landslides: Extent and Economic Significance* (eds E.E. Brabb and B.L. Harrod), Balkema, Rotterdam, pp. 133–9.
- 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. (ed.) (2003) Cairngorms landscape website: http://www.fettes.com/Cairngorms/ index.htm
- Hall, A.M. and Jarman, D. (2004). Quaternary landscape evolution – plateau dissection by glacial breaching. In *The Quaternary of the Central Grampian Highlands* (eds S. Lukas, J.W. Merritt and W. Mitchell), Quaternary Research Association, London, pp. 26–40.

- Hallam, A. (1991) Jurassic, Cretaceous and Tertiary sediments. In *Geology of Scotland*, 3rd edn (ed. G.Y. Craig), The Geological Society, London, pp. 439–53.
- Hawkins, A.B. (1977) Jurassic rocks of the Bath area. In *Geological Excursions in the Bristol District* (ed. R.J.G. Savage), University of Bristol, Bristol, pp. 119–32.
- Hawkins, A.B. and Kellaway, G.A. (1971) Field Meeting at Bristol and Bath with special reference to new evidence of glaciation. *Proceedings of the Geologists' Association*, 82, 267–92.
- Hawkins, A.B. and Privett, K.D. (1979) Engineering geomorphological mapping as a technique to elucidate areas of superficial structures; with examples from the Bath area of the south Cotswolds. *Quarterly Journal of Engineering Geology*, **12**, 221–33.
- Hawkins, A.B. and Privett, K.D. (1981) A building site on cambered ground at Radstock, Avon. Quarterly Journal of Engineering Geology and Hydrogeology, 14, 151–67.
- Hawkins, A.B. and Privett, K.D. (1985) Residual strength of cohesive soils. *Ground Engineering*, **18**, 22–9.
- Hayes, R.H. (1962) Buckland's Windypit: an account of the excavations. *Peakland* Archaeological Society Newsletter, 9, 23–9
- Hayes, R.H. (1987) Archaeological finds in the Ryedale Windypits. *Studies in Speleology*, 7, 31-74.
- Haynes, V.M. (1977a) The modification of valley patterns by ice-sheet activity. *Geografiska* Annaler, **59A**, 195–207.
- Haynes, V.M. (1977b) Landslip associated with glacier ice [Ben Hee]. Scottish Journal of Geology, 13, 337–8.
- Haynes, V.M. (1995) Scotland's landforms: a review. Scottish Association of Geography Teachers Journal, 24, 18–37.
- Henkel, D.J. (1967) Local geology and the stability of natural slopes. *Proceedings of the American Society of Civil Engineeers: Journal of the Soil Mechanics and Foundations Division*, **93**(SM4), 437–46.
- Hepworth, O. (1954) Some Historical Notes on Stocksbridge and District, Stocksbridge Urban District Council, 38 pp.
- Higgs, G. (1997) Black Monutain Scarp, Carmarthenshire. In *Fluvial Geomorphology* of Great Britain (ed. K.J. Gregory), Geological Conservation Review Series, No. 13, Chapman and Hall, London, pp. 167–171.

- Hill, H.P. (1949) The Ladybower Reservoir. Journal of the Institution of Water Engineers, 3, 414-33.
- Hinchliffe, S. (1998) The structure and evolution of relict talus accumulations in the Scottish Highlands. Unpublished PhD thesis, University of St Andrews.
- Hinchliffe, S. (1999) Timing and significance of talus slope reworking, Trotternish, Isle of Skye, Scotland. *The Holocene*, 9, 483–94.
- Hinchliffe, S. and Ballantyne, C.K. (1999) Talus accumulation and rockwall retreat, Trotternish, Isle of Skye, Scotland. Scottish Geographical Journal, 115, 53–70.
- Hinchliffe, S., Ballantyne, C.K. and Walden, J. (1998) The structure and sedimentology of relict talus, Trotternish, northern Skye, Scotland. *Earth Surface Processes and Landforms*, 23, 545–60.
- Hoek, E. and Bray, J.W. (1977) Rock Slope Engineering, revised 2nd edn, Institution of Mining and Metallurgy, London, 402 pp.
- Hoek, E. and Bray, J.W. (1981) Rock Slope Engineering, 3rd edn, Institution of Mining and Metallurgy, London.
- Hollingworth, S.E. and Taylor, J.H. (1951) The Northampton Sand Ironstone: Stratigraphy, Structure and Reserves, Memoir of the Geological Survey of Great Britain, HMSO, London, 211 pp.
- Hollingworth, S.E., Taylor, J.H. and Kellaway, G.A. (1944) Large-scale superficial structures in the Northampton ironstone field. *Quarterly Journal of the Geological Society of London*, **100**, 1–44.
- Holmes, G. (1984) Rock-slope failure in parts of the Scottish highlands. Unpublished PhD thesis, University of Edinburgh.
- Holmes, G. and Jarvis, J.J. (1985) Large-scale toppling within a Sackung type deformation at Ben Attow, Scotland. *Quarterly Journal of Engineering Geology*, 18, 287–9.
- Hooke, J.M. and Bray, M.J. (1995) Coastal groups, littoral cells, policies and plans in the UK. *Area*, 27.4, 358–68.
- Hsü, K. (1975) Catastrophic debris sreams (sturzstroms) generated by rockfalls. *Bulletin* of the Geological Society of America, **86**, 129–40.
- Huddart, D. and Glasser, N.E. (2002) *Quaternary of Northern England*, Geological Conservation Review Series, No. 25, Joint Nature Conservation Committee, Peterborough, 745 pp.

- Hudson, J.D. and Trewin, N.H. (2002) Jurassic. In *The Geology of Scotland*, 4th edn (ed. N.H. Trewin), The Geological Society, London, pp. 323–50.
- Hull, E. and Green, A.H. (1866) The Geology of the Country Around Stockport, Macclesfield, Congleton and Leek, Memoir of the Geological Survey of Great Britain, sheets 81NW and 81SW, HMSO, London, 102 pp.
- Hunter, J. (1869) Hallamshire, the History and Topography of the Parish of Sheffield, revised by Alfred Gatty, Sheffield, from an 1819 original.
- Hutchison, J. and Leafe, R. (1996) Shoreline management: a view of the way ahead. In *Coastal Management: Putting Policy into Practice* (ed. C.A. Fleming), Thomas Telford, London, pp. 352–60.
- Hutchinson, J.N. (1965) Survey of the coastal landslides of Kent. *Building Research Station Note*, EN35/65, 9–26.
- Hutchinson, J.N. (1967) The free degradation of London Clay cliffs. In Proceedings of the Geotechnical Conference, Oslo 1967: on Shear Strength Properties of Natural Soils and Rocks, Norwegian Geotechnical Institute, Oslo, Vol. 1, pp. 113–18.
- Hutchinson, J.N. (1968a) Mass movement. In *The Encyclopedia of Geomorphology* (ed. R.W. Fairbridge), Encyclopedia of Earth Sciences Series, Vol. 3, Reinhold Book Corp., New York, pp. 688–96.
- Hutchinson, J.N. (1968b) Field meeting on the coastal landslides of Kent, 1–3 July 1966. *Proceedings of the Geologists' Association*, 79, 227–37.
- Hutchinson, J.N. (1969) A reconsideration of the coastal landslides at Folkestone Warren, Kent. *Géotechnique*, 19, 6–38.
- Hutchinson, J.N. (1970) A coastal mudflow on the London Clay cliffs at Beltinge, north Kent. *Géotechnique*, **20**, 412–38.
- Hutchinson, J.N. (1971) Warden Point landslide. Annual Slide Report for IAEG/UNESCO, 1971.
- Hutchinson, J.N. (1973) The response of London Clay cliffs to differing rates of toe erosion. *Geologia Applicata e Idrogeologia*, 7, 222–39.
- Hutchinson, J.N. (1976) Coastal landslides in cliffs of Pleistocene deposits between Cromer and Overstrand, Norfolk, England. In *Laurits Bjerrum Memorial Volume: Contributions to Soil Mechanics* (eds N. Janbu, F. Jørstad and B. Kjaernsli), Norges Geotekniske Institutt, Oslo, pp. 155–82.

- Hutchinson, J.N. (1979) Various forms of cliff instability arising from coast erosion in south-east England. *Fjellsprengningsteknikk Bergmekanikk Geoteknikk*, Vol. 19, pp. 1–32.
- Hutchinson, J.N. (1983) The geotechnics of cliff stabilisation. In Shoreline Protection: Proceedings of a Conference Organized by the Institution of Civil Engineers and Held at the University of Southampton on 14–15 September 1982, Thomas Telford, London, pp. 215–22.
- Hutchinson, J.N. (1984) Landslides in Britain and their countermeasures. *Journal of the Japan Landslide Society*, **21**, 1–21.
- Hutchinson, J.N. (1988) General report: morphological and geotechnical parameters of landslides in relation to geology and hydrogeology. In Landslides: Proceedings of the Fifth International Symposium on Landslides, 10–15 July 1988, Lausanne (ed. C. Bonnard), Balkema, Rotterdam, Vol. 1, pp. 3–35.
- Hutchinson, J.N. (1991) Periglacial and slope processes. In *Quaternary Engineering Geology* (eds A. Forster, M.G. Culshaw, J.C. Cripps, J.A. Little and C.F. Moon), *Geological Society Special Publication*, No. 7, Geological Society Publishing House, London, pp. 283–331.
- Hutchinson, J.N. and Bhandari, R.K. (1971) Undrained loading, a fundamental mechanism of mudflows and other mass movements. *Géotechnique*, **21**, 353–8.
- Hutchinson, J.N. and Gostelow, T.P. (1976) The development of an abandoned cliff in London Clay at Hadleigh, Essex. *Philosophical Transactions of the Royal Society of London*, *Series A*, **283**, 557–604.
- Hutchinson, J.N. and Millar, D.L. (2001) The Graig Goch landslide dam, Meirionydd, mid-Wales. In *The Quaternary of West Wales: Field Guide* (eds M.J.C. Walker and D. McCarroll), Quaternary Research Association, London, pp. 113–25.
- Hutchinson, J.N., Bromhead, E.N. and Lupini, J.F. (1980) Additional observations on the Folkestone Warren landslides. *Quarterly Journal of Engineering Geology*, **13**, 1–31.
- Hutchinson, J.N, Poole, C., Lambert, N. and Bromhead, E.N. (1985) Combined archaeological and geotechnical investigations of the Roman fort at Lympne, Kent. *Britannia*, 16, 209–36.
- Hutchinson, P.O. (1840) A Guide to the Landslip Near Axmouth, Devonshire, Together with a Geological and Philosophical Enquiry into

its Nature and Causes, and a Topographic Description of the District, John Harvey, Sidmouth.

- Ibsen, M.-L. (1994) Evaluation of the temporal distribution of landslide events along the south coast of Britain, between Straight Point and St Margaret's Bay. Unpublished MPhil thesis, Kings College, University of London.
- Ibsen, M.-L. and Brunsden, D. (1996) The nature, uses and problems of historical archives for the temporal occurrences of landslides, with specific reference to the south coast of Britain, Ventnor, Isle of Wight. *Geomorphology*, **15**, 241–58.
- Ibsen, M.-L. and Brunsden, D. (1997) Mass movement and climatic variation on the south coast of Great Britain. In *Rapid Mass Movement as a Source of Climatic Evidence* for the Holocene (eds J.A. Matthews, D. Brunsden, B. Frenzel, B. Gläser and M.M. Weiß), *Paläoklimaforschung – Paleoclimatic Research*, No. 19, Gustav Fischer, Stuttgart, pp. 171–82.
- Innes, J.L. (1983) Lichenometric dating of debris-flow deposits in the Scottish Highlands. *Earth Surface Processes and Landforms*, 23, 545-60.
- Innes, J.L. (1985) Magnitude-frequency relations of debris flows in northwest Europe. *Geografiska Annaler*, **67A**, 23–32.
- Iversen, R.M. and Major, J.J. (1986) Groundwater seepage vectors and the potential for hillslope failure and debris flow mobilization. *Water Resources Research*, 22, 1543–48.
- Janbu, N. (1973) Slope stability computations. In *Embankment Dam Engineering* (eds R.C. Hirschfield and S.J. Poulos), Wiley, New York, pp. 47–86.
- Jarman, D. (2002) Rock slope failure and landscape evolution in the Caledonian Mountains, as exemplified in the Abisko area, northern Sweden. *Geografiska Annaler*, 84A, 213–24.
- Jarman, D. (2003a) Paraglacial landscape evolution – the significance of rock slope failure. In *The Quaternary of the Western Highland Boundary: Field Guide* (ed. D.J.A. Evans), Quaternary Research Association, London, pp. 50–68.
- Jarman, D. (2003b) The Glen Shiel rock slope failure cluster. In *The Quaternary of Glen Affric and Kintail: Field Guide* (ed. R. Tipping), Quaternary Research Association, London, pp. 165–83.

- Jarman, D. (2003c): The An Sornach rock slope failure. In *The Quaternary of Glen Affric and Kintail: Field Guide* (ed. R. Tipping), Quaternary Research Association, London, pp. 63–74.
- Jarman, D. (2003d) Tullich Hill rock slope failures, Glen Douglas. In *The Quaternary of the Western Highland Boundary: Field Guide* (ed. D.J.A. Evans), Quaternary Research Association, London, pp. 200–208.
- Jarman, D. (2003e) Beinn Fhada the context for large-scale slope deformation. In *The Quaternary of Glen Affric and Kintail: Field Guide* (ed. R. Tipping), Quaternary Research Association, London, pp. 149–56.
- Jarman, D. (2004a) Rock slope failures of the Gaick Pass. In *The Quaternary of the Central Grampian Highlands: Field Guide* (eds S. Lukas, J. Merritt and W. Mitchell), Quaternary Research Association, London, pp. 103–111.
- Jarman, D. (2004b) The Cobbler a mountain shaped by rock slope failure. *Scottish Geographical Journal*, **120**, 227–40.
- Jarman, D. (2006) Large rock slope failures in the Scottish Highlands: characterisation, causes and spatial distribution. *Engineering Geology*, **83**(1–3), 161–82.
- Jarman, D. and Ballantyne, C.K. (2002) Beinn Fhada, Kintail: a classic example of large-scale paraglacial rock slope deformation. *Scottish Geographical Journal*, **118**, 59–68.
- Jarman, D. and Reid, E. (2003) Postglacial rock slope failures and slope features in Strathfarrar. In *The Quaternary of Glen Affric and Kintail: Field Guide* (ed. R. Tipping), Quaternary Research Association, London, pp. 119–121.
- Jarman, D. and Stewart, I.S. (2004) What role have palaeoseismic shocks played in triggering large paraglacial slope instabilities in the mountains of Western Europe? Abstract, European Geophysical Union, Nice, NH 3.06.
- Johnson, A.M. and Rahn, P.H. (1970) Mobilization of debris flows. Zeitschrift f
  ür Geomorphologie, Supplementband, 9, 168–86.
- Johnson, A.M. and Rodine, J.R. (1984) Debris flow. In *Slope Instability* (eds D. Brunsden and D.B. Prior), John Wiley and Sons, Chichester, pp. 257–361.
- Johnson, R.H. (1965) A study of the Charlesworth landslides near Glossop, north Derbyshire. *Transactions of the Institute of British Geographers*, 37, 111–26.
- Johnson, R.H. and Vaughan, R.D. (1983) The Alport Castles, Derbyshire: a south Pennine

slope and its geomorphic history. *East Midland Geographer*, **8**(3), 79–83.

- Johnson, R.H. and Walthall, S. (1979) The Longdendale landslides. *Geological Journal*, 14, 135–58.
- Johnstone, G.S. and Mykura, W. (1989) British Regional Geology: the Northern Highlands of Scotland, 4th edn, HMSO, London, 219 pp.
- Jones, C.M. (1980) Deltaic sedimentation in the Roaches Grit and associated sediments (Namurian  $R_2b$ ) in the south-west Pennines. *Proceedings of the Yorksbire Geological Society*, **43**, 39–67.
- Jones, D.K.C. (1980) The Tertiary evolution of south-east England with particular reference to the Weald. In *The Shaping of Southern England* (ed. D.K.C. Jones), *Institute of British Geographers Special Publication*, No. 11, Academic Press, London, pp. 13–47.
- Jones, D.K.C. (1981) Southeast and Southern England, The Geomorphology of the British Isles, Methuen, London, 332 pp.
- Jones, D.K.C. and Lee, E.M. (1994) Landsliding in Great Britain, HMSO, London, 351 pp.
- Jukes-Browne, A.J. (1900) The Cretaceous rocks of Britain, Volume 1: The Gault and Upper Greensand of England, Memoir of the Geological Survey of the United Kingdom, HMSO, London, 499 pp.
- Kazi, A. and Knill, J.L. (1969) The sedimentation and geotechnical properties of the Cromer Till between Happisburgh and Cromer, Norfolk. *Quarterly Journal of Engineering Geology*, 2, 63–86.
- Keeping, W. (1882) The glacial geology of central Wales. *Geological Magazine*, 9, 251–7.
- Kellaway, G.A. (1972) Development of nondiastrophic Pleistocene structures in relation to climate and physical relief in Britain. In Proceedings of the 24th International Geological Congress, Section 12: Quaternary Geology (ed. J.E. Gill), International Geological Congress, Ottawa, pp. 136–46.
- Kellaway, G.A. and Taylor, J.H. (1968) The influence of land-slipping on the development of the City of Bath, England. In *Report of the* 23rd Session of the International Geological Congress, Czechslovakia, 1968 (ed. M. Malkovský), Academia, Prague, Vol. 12, pp. 65–76.
- Kellaway, G.A., Redding, J.H., Shephard-Thorne, E.R. and Destombes, J.P. (1975) The Quaternary history of the English Channel. *Philosophical Transactions of the Royal Society of London, Series A*, **279**, 189–218.

- Kilburn, C.R.J. and Sørensen, S-A. (1998) Runout lengths of sturzstroms: the control of initial conditions and of fragment dynamics. *Journal of Geophysical Research*, 103, 877–84.
- Koh, A. (1990) Black Ven. In Landslides of the Dorset Coast (ed. R.J. Allison), British Geomorphological Research Group Field Guide, British Geomorphological Research Group, London, pp. 95–105.
- Koor, N. (1989) A slope failure in the London Clay cliffs at Warden Point, Isle of Sheppey. Unpublished MSc Thesis, University of London.
- Lang, W.D. (1928) Landslips in Dorset. Natural History Magazine, 1, 201–9.
- Lang, W.D. (1959) Report on Dorset natural history for 1958 – Geology. Proceedings of the Dorset Natural History and Archaeological Society, 80, 22.
- Lant, C. (1973) The Mam Tor Landslip. Unpublished MSc Thesis, Imperial College, University of London.
- Lapworth, H. (1911) The geology of dam trenches. Transactions of the Institution of Water Engineers, 16, 25.
- Leafe, R. (1998) Conserving our coastal heritage – a conflict resolved? In *Coastal Defence and Earth Science Conservation* (ed. J.M. Hooke), Geological Society of London, Bath, pp. 10–19.
- Leafe, R. and Radley, G. (1994) Environmental benefits of soft cliff erosion. Proceedings of the 29th MAFF Conference of River and Coastal Engineers, 4–6 July, 1994, MAFF, London, pp. 3.1.1–3.1.13.
- Lee, E.M. (1998) Problems associated with the prediction of cliff recession rates for coastal defence and conservation. In *Coastal Defence* and Earth Science Conservation (ed. J.M. Hooke), Geological Society of London, Bath, pp. 46–57.
- Lee, G.W. (1920) The Mesozoic Rocks of Applecross, Raasay and North-East Skye, Memoir of the Geological Survey of Great Britain (Scotland), HMSO, Edinburgh, 93 pp.
- Lee, S.J. (1976) Aspects of coastal landslides on the Isle of Sheppey, Kent. Unpublished BSc project, Kingston Polytechnic.
- Leland, J. (1744) The Itinerary of John Leland the Antiquary, 2nd edn, J. Fletcher, Oxford.
- Linton, D.L. (1940) Some aspects of the evolution of the Rivers Earn and Tay. Scottish Geographical Magazine, 56, 1–11, 61–79.
- Linton, D.L. (1949) Watershed breaching by ice in Scotland. *Transactions of the Institute of British Geographers*, 15, 1–16.

- Linton, D.L. (1957) Radiating valleys in glaciated lands. *Tidjschrift van bet Nederlandsch Aardrijkskundig. Geootschap*, 74, 297–312.
- Linton, D.L. (1967). Divide elimination by glacial erosion. In Arctic and Alpine Environments (eds H.E. Wright and W.H. Osburn), Indiana University Press, pp. 241–8.
- Linton, D.L. and Moisley, H.A. (1960) The origin of Loch Lomond. Scottish Geographical Magazine, 76, 26–37.
- Lounsbury, R.W. (1962) Landslips in the Ashop valley, Derbyshire, England. In Abstracts for 1961, Geological Society of America Special Paper, No. 68, Geological Society of America, New York, p. 219.
- Lukas, S. (2005) Younger Dryas moraines in the NW Highlands of Scotland: genesis, significance, and potential modern analogues. Unpublished PhD thesis, University of St Andrews.
- Lukas, S. and Lukas, T. (2006) A glacial geology and geomorphology map of the far NW Highlands, Scotland, parts 1 and 2. *Journal of Maps*, **2006**, 43–58
- Lupini, J.F. (1980) The residual strength of soils. Unpublished PhD thesis, Imperial College, University of London.
- Macfadyen, W.A. (1970) Geological Highlights of the West Country, Butterworth, London, 296 pp.
- MAFF and others (1995) Shoreline Management Plans: a Guide for Coastal Defence Authorities, Ministry of Agriculture, Fisheries and Food, London, 24 pp.
- Mahr, T. (1977) Deep-reaching gravitational deformations of high mountain slopes. Bulletin of the International Association of Engineering Geologists, 16, 121–7.
- Maquaire, O. and Gigot, P. (1988) Reconnaissance par sismique réfraction de la décompression et de l'instabilité des falaises vives du Bessin (Normandie, France). *Geodinamica Acta* (*Paris*), 2(3), 151–9.
- May, F., Peacock, J.D., Smith, D.I. and Baker, A.J. (1993) *Geology of the Kintail District*, Memoir of the British Geological Survey, Sheet 72W and part of 71E (Scotland), HMSO, London, 74 pp.
- May, VJ. (2003) Dungeness and Rye Harbour, Kent and East Sussex. In *Coastal Geomorphology* of Great Britain (VJ. May and J.D. Hansom), Geological Conservation Review Series, No. 28, Joint Nature Conservation Committee, Peterborough, pp. 310–26.

- May, V.J. and Hansom, J.D. (2003) Coastal Geomorphology of Great Britain, Geological Conservation Review Series, No. 28, Joint Nature Conservation Committee, 737 pp.
- McKirdy, A.P. (1990) A handbook of earth science conservation techniques. In *Earth Science Conservation in Great Britain: a Strategy* (ed. Nature Conservancy Council), Nature Conservancy Council, Peterborough, Appendices.
- McQuhae, E.A. (1977) In *East Anglia: Localities* of *Geomorphological Importance* (ed. Nature Conservancy Council, Geology and Physiography Section), Nature Conservancy Council, Newbury, pp. 44–5.
- Millward, R. and Robinson, A. (1975) *The Peak District*, The Regions of Britain, Eyre Methuen, London, 301 pp.
- Moore, I. and Kokelaar, P. (1998) Tectonicallycontrolled piecemeal caldera collapse: a case study of Glencoe volcano, Scotland. *Bulletin* of the Geological Society of America, **110**, 1448–66.
- Moore, R.M. (1988) The clay mineralogy, weathering and mudslide behaviour of coastal cliffs. Unpublished PhD thesis, University of London.
- Morgenstern, N.R. and Price, V.E. (1965) The analysis of the stability of general slip surfaces. *Géotechnique*, **15**, 79–93.
- Morton, N. (1969) Lower and middle Jurassic of Raasay. In International Field Symposium on the British Jurassic. Excursion No. 4: Guide for Western Scotland (eds J.D. Hudson and N. Morton), University of Keele, Keele, pp. D10–D16.
- Motyka, J.M. and Brampton, A.H. (1993) Coastal Management. Mapping of littoral cells. *Hydraulics Research Wallingford Report*, **SR 328**, 102 pp.
- Muir Wood, A.M. (1955a) Reply to discussion on "Folkestone Warren landslips: investigations, 1948–50". Proceedings of the Institution of Civil Engineers, Railway Paper, No. 56, 460–4.
- Muir Wood, A.M. (1955b) Folkestone Warren landslips: investigations, 1948–50. Proceedings of the Institution of Civil Engineers, Railway Paper, No. 56, 410–28.
- Muir Wood, A.M. (1970) Correspondence on Hutchinson 1969. *Géotechnique*, 20, 110–13.
- Muir Wood, A.M. (1971) Engineering aspects of coastal landslides. *Proceedings of the Institution of Civil Engineers*, **50**, 257–76.
- Muir Wood, A.M. (1994) Geology and geometry: period return to Folkestone Warren. In Proceedings of the Thirteenth International

Conference on Soil Mechanics and Foundation Engineering, New Delbi, 5–10 January 1994, Oxford and IBH Publishing Co., New Delhi, pp. 23–30.

- Musson, R.M.W (1989) Accuracy of historical earthquake locations in Britain. *Geological Magazine*, **126**, 685–9.
- Musson, R.M.W., Neilson, G. and Burton, P.W. (1984) Macroseismic Reports on Historical British Earthquakes: III – Central Scotland and Western Highland. *Global Seismology Research Group Reports*, **209**, 202 pp.
- NCC (1991) A Guide to the Selection of Appropriate Coast Protection Works for Geological Sites of Special Scientific Interest, Nature Conservancy Council, Peterborough.
- Neilson, G. and Burton, P.W. (1985) Instrumental magnitudes of British earthquakes. In Earthquake Engineering in Britain: Proceedings of a Conference Organized by the Institution of Civil Engineers and the Society of Earthquake and Civil Engineering Dynamics, beld at the University of East Anglia, 18–19 April 1985, Thomas Telford Ltd, London, pp. 41–3.
- Nichol, D. (2002) Slope instability and landslide research in North Wales. In *Landslides and Landslide Management in North Wales* (eds D. Nichol, M.G. Bassett, and V.K. Deisler), National Museum of Wales Geological Series, No. 22, Cardiff, pp. 9–13.
- O'Connor, M. and Graham, N. (1996) The caves of the Isle of Portland, Wessex Cave Club Occasional Publication, Series 3, No. 3, Wessex Cave Club, Pangbourne, 104 pp.
- Ordnance Survey (1964) Geological Survey of Great Britain (Scotland): Northern Skye, 1:63 360 scale map, drift edition, Ordnance Survey, Chessington.
- Osman, C.W. (1917) The landslips of Folkestone Warren and thickness of the Lower Chalk and Gault near Dover. *Proceedings of the Geologists' Association*, 28, 59–84.
- Palmer, J. and Radley, J. (1961) Gritstone tors of the English Pennines. Zeitschrift für Geomorphologie, Neue Folge, Supplementband, 5, 37-52.
- Parks, C.D. (1991) A review of the possible mechanisms of cambering and valley bulging.
  In *Quaternary Engineering Geology* (eds A. Forster, M.G. Culshaw, J.C. Cripps, J.A. Little and C.F. Moon), *Geological Society Special Publication*, No. 7, Geological Society Publishing House, London, pp. 373–80.

Peacock, J.D. and May, F. (1993) Pre-Flandrian slope deformation in the Scottish Highlands: examples from Glen Roy and Glen Gloy. *Scottish Journal of Geology*, 29, 183–9.

- Peacock, J.D., Mendum, J.R. and Fettes, D.J. (1992) *Geology of the Glen Affric District*, Memoir of the British Geological Survey, Sheet 72E (Scotland), HMSO, London, 81 pp.
- Pearson, G.W. and Stuiver, M. (1986) Highprecision calibration of the radiocarbon time scale, 500–2500 B.C. *Radiocarbon*, **B28**, 839–62.
- Pitts, J. (1974) The Bindon landslip of 1839. Proceedings of the Dorset Natural History and Archaeological Society, **95**, 18–29.
- Pitts, J. (1979) Morphological mapping in the Axmouth–Lyme Regis Undercliffs, Devon. *Quarterly Journal of Engineering Geology*, 12, 205–17.
- Pitts, J. (1982) An historical survey of the landslips of the Axmouth–Lyme Regis undercliffs, Devon. *Proceedings of the Dorset Natural History and Archaeological Society*, **103**, 101–6.
- Pitts, J. (1983a) The temporal and spatial development of landslides in the Axmouth-Lyme Regis Undercliffs National Nature Reserve, Devon. *Earth Surface Processes and Landforms*, **8**, 584–603.
- Pitts, J. (1983b) The recent evolution of landsliding in the Axmouth-Lyme Regis Undercliffs National Nature Reserve. *Proceedings of the Dorset Natural History and Archaeological Society*, **105**, 119–25.
- Pitts, J. (1986) The form and stability of a double undercliff: an example from South-West England. *Engineering Geology*, **22**, 209–16.
- Pitts, J. and Brunsden, D. (1987) A reconsideration of the Bindon landslide of 1839. *Proceedings of the Geologists' Association*, 98, 1–18.
- Pitty, A.F. (1966) A simple device for the field measurement of hillslopes. *Journal of Geology*, 76, 717–20.
- Prior, D.B., Stephens, N. and Douglas, G.R. (1970) Some examples of modern debris flows in N.E. Ireland. *Zeitschrift für Geomorphologie*, 14(3), 275–88.
- Radbruch-Hall, D.H. (1978) Gravitational creep of rock masses on slopes. In *Rockslides and Avalanches, 1: Natural phenomena* (ed. B. Voight), Developments in Geotechnical Engineering, 14A, Elsevier, Amsterdam, pp. 607–57.

- Radbruch-Hall, D.H., Varnes, D.J. and Savage,
  W.Z. (1976) Gravitational spreading of steep-sided ridges ("sackung") in western United States. Bulletin of the International Association of Engineering Geology, 14, 23-35.
- Rapp, A. (1960) Recent development of mountain slopes in Karkevagge and surroundings, northern Scandinavia. *Geografiska Annaler*, 42, 65–200.
- Reid, C. (1882) *The Geology of the Country Around Cromer*, Memoir of the Geological Survey of Great Britain, Sheet 68E (England and Wales), HMSO, London, 103 pp.
- Rib, H.T. and Liang, T. (1978) Recognition and identification. In *Landslides: Analysis and Control* (eds R.L. Schuster and R.J. Krizek), *National Research Council (U.S.) Transportation Research Board Special Report*, No. 176, National Academy of Sciences, Washington D.C., pp. 34–80.
- Richards, A. (1971) The evolution of marine cliffs and related landforms in the Inner Hebrides. Unpublished PhD thesis, University of Wales, Aberystwyth.
- Richardson, B.D. (1996) Soft engineering on the coast: where to now? In *Coastal Management: Putting Policy into Practice* (ed. C.A. Fleming), Thomas Telford, London, pp. 219–28.
- Ringrose, P.S. (1989) Recent fault movement and palaeoseismicity in western Scotland. *Tectonophysics*, 163, 305–14.
- Rizzo, V. and Leggeri, M. (2004) Slope instability and sagging reactivation at Maratea (Potenza, Basilicata, Italy). *Engineering Geology*, **71**, 181–98.
- Roach Smith, C. (1850) The Antiquities of Richborough, Reculver and Lymne, in Kent, J.R. Smith, London, 272 pp.
- Roach Smith, C. (1852) Report on Excavations Made on the Site of the Roman Castrum at Lymne, in Kent, in 1850, London.
- Roberts, G. (1840) An Account and Guide to the Mighty landslip of Dowlands and Bindon, Near Lyme Regis, December 25, 1839, Daniel Dunster, Lyme Regis.
- Robinson, A.H.W. (1949) Deep clefts in the Inner Sound of Raasay. Scottish Geographical Magazine, 65, 20–5.
- Rose, J (2001) Moelwyn Mawr. In The Quaternary of West Wales: Field Guide (eds M.J.C. Walker and D. McCarroll), Quaternary Research Association, London, pp. 153–63.

- Russell, W.A. (1985) Investigation into andslides around Hallaig, East Raasay. Unpublished BSc (Hons) thesis, University of Strathclyde.
- Sandeman, E. (1918) The Derwent Valley Waterworks. *Minutes of Proceedings of the Institution of Civil Engineers*, **206**, 152.
- Savage, W.Z. and Varnes, D.J. (1987) Mechanics of gravitational spreading of steep-sided ridges ('Sackung'). Bulletin of the International Association of Engineering Geologists, 35, 31–6.
- Savigear, R.A.G. (1952) Some observations on slope development in South Wales. Transactions of the Institute of British Geographers, 18, 31–51.
- Schumm, S.A. and Chorley, R.J. (1964) The fall of Threatening Rock. *American Journal of Science*, **262**, 1041–54.
- Selby, M.J. (1982) *Hillslope Materials and Processes*, Oxford University Press, Oxford, 264 pp.
- Selby, M.J. (1993) *Hillslope Materials and Processes*, 2nd edn, Oxford University Press, Oxford, 451 pp.
- Sellier, D. and Lawson, T.J. (1998) A complex slope failure on Beinn nan Cnaimhseag, Assynt, Sutherland. Scottish Geographical Magazine, 114, 85-93.
- Sharp, R.P. (1942) Mudflow levées. Journal of Geomorphology, 5, 222-7.
- Sharpe, C.F.S. (1938) *Landslides and Related Phenomena*, Columbia University Press, New York, 137 pp.
- Sherlock, R.L. (1960) British Regional Geology: London and Thames Valley, 3rd edn, HMSO, London, 62 pp.
- Sissons, J.B. (1967) *The Evolution of Scotland's Scenery*, Oliver & Boyd, Edinburgh, 259 pp.
- Sissons, J.B. (1975) A fossil rock glacier in Wester Ross. *Scottish Journal of Geology*, **11**, 83–6.
- Sissons, J.B. (1976) A fossil rock glacier in Wester Ross. Reply to W.B. Whalley. *Scottish Journal* of Geology, **12**, 178–9.
- Sissons, J.B. (1977) The Loch Lomond Readvance in the northern mainland of Scotland. In *Studies in the Scottish Lateglacial Environment* (eds J.M. Gray and J.J. Lowe), Pergamon Press, Oxford, pp. 45–59.
- Sissons, J.B. and Cornish, R. (1982) Differential isostatic uplift of crustal blocks at Glen Roy, Scotland. *Quaternary Research*, 18, 268–88.

- Skempton, A.W. (1946) Discussion of Folkestone Warren landslips: research carried out in 1939 by the Southern Railway. *Proceedings of the Institution of Civil Engineers, Railway Paper*, No. 19, 29–33.
- Skempton, A.W. (1964) Long-term stability of clay slopes. *Géotechnique*, 14, 77–101.
- Skempton, A.W. (1970) First time slides in overconsolidated clays. Géotechnique, 20, 320–4.
- Skempton, A.W. (1977) Slope stability of cuttings in brown London Clay. In Proceedings of the ninth International Conference on Soil Mechanics and Foundation Engineering, Tokyo, 1977, Japanese Society of Soil Mechanics and Foundation Engineering, Tokyo, Vol. 3, pp. 261–70.
- Skempton, A.W. and DeLory, F.A. (1957) Stability of natural slopes in London Clay. In Proceedings of the Fourth International Conference on Soil Mechanics and Foundation Engineering, London, 12–24 August 1957, Butterworths Scientific Publications, London, Vol. 2, pp. 378–81.
- Skempton, A.W. and Hutchinson, J.N. (1969) Stability of natural slopes and embankment foundations. In Proceedings of the Seventh International Conference on Soil Mechanics and Foundation Engineering, Mexico City, 1969, Sociedad Mexicana de Mecánica de Suelos, Mexico City, pp. 291–340.
- Skempton, A.W. and Petley, D.J. (1967) The strength along structural discontinuities in stiff clays. In Proceedings of the Geotechnical Conference, Oslo, 1967: on Shear Strength Properties of Natural Soils and Rocks, Norwegian Geotechnical Institute, Oslo, Vol. 2, pp. 29–46.
- Skempton, A.W. and Weeks, A.G. (1976) The Quaternary history of the Lower Greensand escarpment and Weald Clay vale near Sevenoaks, Kent. *Philosophical Transactions* of the Royal Society of London, Series A, 238, 493–526.
- Skempton, A.W., Leadbeater, A.D. and Chandler, R.J. (1989) The Mam Tor landslide, north Derbyshire. *Philosophical Transactions of the Royal Society of London, Series A*, 329, 503–47.
- Smart, J.G.O., Bisson, G. and Worssam, B.C. (1966) Geology of the Country Around Canterbury and Folkestone, Memoir of the Geological Survey of Great Britain, sheets 289, 305 and 306 (England and Wales), HMSO, London, 337 pp.

- Soldati, M (2004) Deep-seated gravitational slope deformation. In *Encyclopedia of Geomorphology* (ed. A. Goudie), Routledge, London, pp. 226–8.
- Solomon, J.D. (1932) The glacial succession on the north Norfolk coast. *Proceedings of the Geologists' Association*, 43, 241–71.
- Spears, D.A. and Amin, M.A. (1981) A mineralogical and geochemical study of turbidite sandstones and interbedded shales, Mam Tor, Derbyshire, UK. *Clay Minerals*, 16, 333–45.
- Statham, I. (1976) Debris flows on vegetated screes in the Black Mountain, Carmarthenshire. *Earth Surface Processes*, **1**, 173–80.
- Steers, J.A. (1964) *The Coastline of England and Wales*, 2nd edn, Cambridge University Press, Cambridge, 750 pp.
- Stephenson, D., Bevins, R.E., Millward, D., Highton, A.J., Parsons, I., Stone, P. and Wadsworth, W.J. (1999) *Caledonian Igneous* rocks of Great Britain, Geological Conservation Review Series, No. 17, Joint Nature Conservation Committee, Peterborough, 648 pp.
- Stevenson, I.P. and Gaunt, G.D. (1971) The Geology of the Country Around Chapel-en-le-Frith, Memoir of the Geological Survey of Great Britain, Sheet 99 (England and Wales), HMSO, London, 444 pp.
- Steward, H.E. and Cripps, J.C. (1983) Some engineering implications of chemical weathering of pyritic shale. *Quarterly Journal* of Engineering Geology, **16**, 281–9.
- Stewart, I.S., Sauber, S. and Rose, J. (2000) Glacio-seismotectonics: ice sheets, crustal deformation and seismicity. *Quaternary Science Reviews*, **19**, 1367–89.
- Stone, B. (ed.) (1974) Sir Gawain and the Green Knight, 2nd edn, Penguin Books, Harmondsworth, 185 pp.
- Stone, J.O., Ballantyne, C.K. and Fifield, L.K. (1998) Exposure dating and validation of periglacial weathering limits, northwest Scotland. *Geology*, 26, 587–90.
- Sutherland, D.G. (1984) The Quaternary deposits and landforms of Scotland and the neighbouring shelves: a review. *Quaternary Science Reviews*, **3**, 157–254.
- Swash, A.R.H., Leafe, R.N. and Radley, G.P. (1995) Shoreline Management Plans and environmental considerations. In *Directions in European Coastal Management* (eds R. Healy and P. Doody), Samara Publishing, Cardigan, pp. 161–7.

- Takahashi, T. (1981) Debris flow. Annual Review of Fluid Mechanics, 13, 57–77.
- 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), Wiley, Chichester, pp. 189–205.
- Tate, C.J. (1995) Late Quaternary glacial history and environmental change in southern Rossshire, Scotland. Unpublished PhD thesis, University of St Andrews.
- Taylor, D.W. (1948) Fundamentals of Soil Mechanics, John Wiley and sons, New York, 700 pp.
- Thompson, R.W.S. (1949) Discussion. In The Ladybower Reservoir (ed. H.P. Hill). Journal of the Institution of Water Engineers, 3, pp. 414–33, 427–8.
- Thorn, C.E. (1976) Quantitative evaluation of nivation in the Colorado Front Range. *Bulletin* of the Geological Society of America, **87**, 1169–78.
- Thorn, C.E. (1979) Ground temperatures and surficial transport in colluvium during snowpatch meltout: Colorado Front Range. *Arctic and Alpine Research*, **11**, 41–52.
- Thorn, C.E. (1988) Nivation: a geomorphic chimera. In Advances in Periglacial Geomorphology (ed. M.J. Clark), Wiley, Chichester, pp. 3–31.
- Thorn, C.E. and Hall, K. (1980) Nivation: an arctic–Alpine comparison and reappraisal. *Journal of Glaciology*, **25**, 109–24.
- Thorp, P.W. (1981) A trimline method for defining the upper limit of the Loch Lomond Advance glaciers: examples from the Loch Leven and Glen Coe areas. *Scottish Journal of Geology*, **17**, 49–64.
- Thorp, P.W. (1987) Late Devensian ice sheet in the western Grampians, Scotland. *Journal of Quaternary Science*, **2**, 103–12.
- Tinkler, K.J. (1966) Slope profiles and scree in the Eglwyseg valley, North Wales. *Geographical Journal*, **132**, 379–85.
- Tolkein, J.R.R. and Gordon, E.V. (eds) (1967) *Sir Gawain and the Green Knight*, 2nd edn, revised by N. Davis, Clarendon Press, Oxford, 232 pp.
- Toms, A.H. (1946) Folkestone Warren landslips: research carried out in 1939 by the Southern Railway. *Proceedings of the Institution of Civil Engineers, Railway Paper*, No. 19, 3–25.

- Toms, A.H. (1953) Recent research into the coastal landslides at Folkestone Warren, Kent, England. In Proceedings of the Third International Conference on Soil Mechanics and Foundation Engineering, Mexico City, Switzerland, 16tb–17th August 1953, Organising Committee ICOSOMEF, Zurich, Vol. 2, pp. 288–93.
- Treagus, J.E. (2003) The Loch Tay Fault: type section geometry and kinematics. *Scottish Journal of Geology*, **39**, 135–44.
- Trenter, N.A. and Warren, C.D. (1996) Further investigations at the Folkestone Warren landslide. *Géotechnique*, 46(4), 589–620.
- Turnbull, J.M. and Davies, T.R.H. (2006) A mass movement origin for cirques. *Earth Surface Processes and Landforms*, 31, 1129–48.
- Van Steijn, H., de Ruig, J. and Hoozemans, F. (1988) Mophological and mechanical aspects of debris flows in parts of the French Alps. *Zeitschrift für Geomorphologie*, **32**, 143–61.
- Varnes, D.J. (1978) Slope movement types and processes. In Landslides: Analysis and Control (eds R.L. Schuster and R.J. Krizek), National Research Council (U.S.) Transportation Research Board Special Report, No. 176, National Academy of Sciences, Washington D.C., pp. 11-33.
- Vaughan, P.R. and Walbancke, H.J. (1973) Pore pressure changes and the delayed failure of cutting slopes in overconsolidated clay. *Géotechnique*, 23, 531–9.
- Vear, A. and Curtis, C. (1981) A quantitative evaluation of pyrite weathering. *Earth Surface Processes and Landforms*, 6, 191–8.
- Viner-Brady, N.E.V. (1955) Folkestone Warren landslips: remedial measures, 1948–1954. Proceedings of the Institution of Civil Engineers, Railway Paper, No. 57, 429–41.
- Wanklyn, C. (1927) *Lyme Regis: a Retrospect*, 2nd edn, Hatchards, London, 283 pp.
- Ward, W.H. (1945) The stability of natural slopes. *Geographical Journal*, **105**, 170–91.
- Ward, W.H. (1962) Discussion in 'Coastal cliffs: report of a symposium'. *Geographical Journal*, **128**, 309–13.
- Watson, E. (1966) Two nivation cirques near Aberystwyth, Wales. *Biuletyn Peryglacjalny*, 15, 79–101.
- Watson, E. (1968) The periglacial landscape of the Aberystwyth region. In *Geography at Aberystwyth* (eds E.G. Bowen, H. Carter and A.J. Taylor), University of Wales Press, Cardiff, pp. 35–49.

- Watson, E. (1970) The Cardigan Bay area. In The Glaciations of Wales and Adjoining Regions (ed. C.A. Lewis), Geographies for Advanced Studies, Longman, Harlow, pp. 125–45.
- Watson, E. (1976) Field excursions in the Aberystwyth region. *Biuletyn Peryglacjalny*, 26, 79–112.
- Watson, E. and Watson, S. (1977) Nivation forms and deposits in Cwm Ystwyth. In *Guidebook for Excursion C9: Mid and North Wales, 10th INQUA Congress* (eds D.F. Ball and E. Watson), Geo Abstracts, Norwich, pp. 24–7.
- Watters, R.J. (1972) Slope stability in the metamorphic rocks of the Scottish Highlands. Unpublished PhD thesis, Imperial College, University of London.
- Werritty, A. (1997) Allt Coire Gabhail, Highland (NN 164553). In *Fluvial Geomorphology of Great Britain* (ed. K.J. Gregory), Geological Conservation Review Series, No. 13, Chapman and Hall, London, pp. 81–3.
- West, R.G. (1968) Pleistocene Geology and Biology, Longman, London, 377 pp.
- West, R.G. and Banham, P.H. (1968) Short field meeting on the north Norfolk coast. *Proceedings of the Geologists' Association*, 79, 493–507.
- Whalley, W.B. (1976) A fossil rock glacier in Wester Ross. Scottish Journal of Geology, 12, 175–9.
- Whittow, J.B. (1977) Geology and Scenery in Scotland, Penguin, Harmondsworth.
- Wilson, P. (2005) Paraglacial rock-slope failures in Wasdale, western Lake District, England: morphology, styles and significance. *Proceedings of the Geologists' Association*, 116, pp. 349–61.
- Wilson, P. and Smith, A. (2006) Geomorphological characteristics and significance of Late Quaternary paraglacial rock-slope failures on Skiddaw Group terrain, Lake District, NW England. *Geograkiska Annaler*, 88A, 237–52.
- Wilson, P., Clark, R. and Smith, A. (2004) Rock-slope failures in the Lake District: a preliminary report. *Proceedings, Cumberland Geological Society*, 7, 13–36.
- Wilson, V., Welch, F.B.A., Robbie, J.A. and Green, G.W. (1958) Geology of the Country Around Bridport and Yeovil, Memoir of the Geological Survey of Great Britain, sheets 312 and 327 (England and Wales), HMSO, London, 239 pp.

- Wimbledon, W.A., Benton, M.J., Bevins, R.E., Black, G.P., Bridgland, D.R., Cleal, C.J., Cooper, R.G. and May, V.J. (1995) The development of a methodology for the selection of British geological sites for conservation: Part I. Modern Geology, 20, 159–202.
- Wood, A. (1942) The development of hillside slopes. Proceedings of the Geologists' Association, 53, 128–40.
- Wood, J.N. (1949) The Sheffield Water Undertaking. Journal of the Institution of Water, 3, 395–413.
- Worssam, B.C. (1963) *Geology of the Country Around Maidstone*, Memoir of the Geological Survey of Great Britain, Sheet 288 (England and Wales), HMSO, London, 152 pp.
- WP/WLI (1993) The Multilingual Landslide Glossary, The International Geotechnical

parliminary espon. Proceedings, Laurebraland

Societies' UNESCO Working Party for World Landslide Inventory, Published by the Canadian Geotechnical Society.

- Young, C.J. (1980) The pottery. In Excavations at the Roman Fort at Lympne, Kent 1976–78 (ed. B.W. Cunliffe). *Britannia*, 11, pp. 274–283.
- Younger, M. (1990) Will the sea always win? Coastal management in northeast Norfolk. *Geography Review*, **3**, 2–6.
- Zaruba, Q. and Mencl, V. (1969) *Landslides and Their Control*, Academia, Prague, 205 pp.
- Zischinsky, U. (1966) On the deformation of high slopes. In Proceedings of the First Congress of the International Society of Rock Mechanics Congress, Lisbon, 25th September-1st October 1966, Laboratorio Nacional de Engenharia Civil, Lisbon, Vol. 2, pp. 179-85.

340

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

abandoned cliffs 19 London Clay 290, 291-2 Stutfall Castle 259, 279, 280, 282 Aberystwyth Grits 119 Affric-Kintail-Glen Shiel rock slope failure cluster 47, 48, 52 Alport Castles, Derbyshire 20, 155, 155-62 age of failure 161-2 Birchin Hat (Unit A) 157, 158, 158 depth and mode of failure 161 - 2division into two sectors 156. 156-7 Edale Shales 155-6 geological controls 162 groundwater and failure morphology 161 Little Moor 157, 158, 160, 162 lower slopes 157, 159, 161 The Tower (Unit B) 157, 158. 158-9 Unit D 157, 158-161 Unit G 160 Unit H 157, 160, 161 zone F 157, 159 An Socach, Monar 54-5 An Sornach, Affric 54-5, 91 antiscarps 44-5, 46, 102, 105 Glen Ample 87, 91

Beinn Fhada 44, 45, 56-8, 58, 60, 62 Benvane 74, 76-7, 76, 81, 82 'pop-ups' co-inciding with Glen Shiel Fault swarm 74 Aonach Sgoilte, Knoydart, antiscarp 45, 46 Ardnandave Sandstone Formation 78 arêtes 43, 67, 68, 69 Aonach Meadhoin 67, 68 Cofa Pike (Fairfield) 43, 44 and horns 43, 98, 99 Lake District 43 Sgurr na Ciste Duibhe 62, 64 Argyll/Arrochar Alps 33 armchair source slides 41, 41, 96.105 arrested translational slides 39, 40 - 1Ben Hee 41, 99 Atherfield Clay 279, 281 avalanche gullying 131 Axmouth-Lyme Regis, Devon-Dorset 19, 20, 20, 26, 209-23, 307 1839 slip at Bindon 211-18, 223 mechanisms 222 reconstruction of pre-1839 slope profile 215-16, 216 stability analyses 216 The Chasm 210, 211

1840 slip at Whitlands 218 - 19Bindon cliffs 210, 211 Chapel Rock landslide 211, 220-1, 220 Charton Bay 210, 211, 211 1969 slip 219 Culverhole Cliffs 210, 211, 219 Dowlands Cliff 211, 211, 219 Goat Island 216-19, 217 Haven Cliffs 210, 211, 219 Humble Point slope failure 219 National Nature Reserve 189, 209, 240 Pinhay Bay 210, 211, 211, 219 Rousdon 219 Ware Cliffs 211, 211, 221 Westbury Formation 212, 215, 216 Baosbheinn, Torridon 35, 115-16 Bath University see Entrance Cutting at Bath University Beacon Hill Flags 162

Bearreraig Sandstone Formation 205, 206 Beinn Alligin, Highland 20, 36, 54–5, 111–16 cataclasmic rock slope failure 41

main failed mass, three

corrie rock slope failure 111 - 12cosmogenic dating 35, 114 delayed paraglacial responses 55, 115, 116 long runout deposit 111, 112, 113, 114, 114-5, 116 rock-avalanche 111-12, 112 Beinn Artair see The Cobbler Beinn Bhàn see Benvane Beinn Bheula Schist Formation 96 Beinn Bhreac, Loch Lomond 67 Beinn Bhuidhe rock slope failure, Arnisdale, Loch Hourn 34, 34 Beinn Each, Glen Ample 82, 83 antiscarp array 87, 91 'eggbox architecture/celtic knotwork' 87, 89, 90 lineaments 87, 88 rock slope failure 88, 90 see also Glen Ample Beinn Fhada, Highland 20, 35, 36, 38, 40, 44, 54-5, 55, 56-62 pre-glacial watershed 52, 57 Loch Lomond Stade 57 mechanics of deformation 59-61 rock slope deformation 44, 45, 56-8, 57-9, 58, 60 antiscarps 44, 45, 56, 56-8, 58, 60, 62 sackung-type deformation 60, 62 large-scale bulges 57-8, 58, 59, 59 Beinn an Lochain North, Arrochar Alps 54-5 crag collapse 42, 43 encroachment of rock slope failure 44 sub-cataclasmic rock slope failure 41-2, 43, 97 Beinn Shiantaidh, Jura 35 Ben Attow see Beinn Fhada Ben Gulabin see Carn Dubh Ben Hee, Highland 20, 36, 38, 44.99-107 An Gorm-choire 100-3 failure geometry 104-5, 106

tiers 101, 102, 102, 103, 105 periglacial blockfields 102 reconstruction of topography 105, 106 sub-glacial flutes 101, 103, 105 arrested translational slides 41, 99 Coire na Saidhe Duibhe 103 Ben Nevis 33 Ben Our, Glen Ample 40, 53, 54-5, 62, 82, 83, 84, 91 Glen Ample side 86 platy deformation/dislocation 84, 84, 86, 86-7, 91 ragged tear scarp 84, 85, 86 rock slope failure 84, 85, 86 scarplets 84, 85 slump bowls 86 springs 86 translational sliding and extensional creep 86 see also Glen Ample Benvane, Stirling 20, 36, 44, 54-5, 74-82 antiscarps 44, 74, 76, 81, 82 arrested slides 41 Devensian glacial downcutting 81 platy deformation 81, 82 rock slope failure 74, 78, 80, 81 Bessin Cliffs, Normandy 7 Birdsall Brow, North Yorkshire 6 Black Ven, Dorset 20, 26, 189, 223-44 Belemnite Marl cliffs 225, 231, 235, 238 Black Ven Marls 225-6 caprock-and-aquiclude pairs 223 Chert Beds 225 cliff profile 225, 226 episodic landform change models 231, 235-43 Foxmould Cliffs 225 Gault Clay 225 mudslides and mudflows 225, 231, 235 photogrammetry 227, 227, 228-9, 230

present understanding of spatial relationships 243.244 'reservoir principle' 231 sand-runs 227 Spittles area 240, 243 Upper Greensand 225, 231, Black Ven Marls 225, 226 Blacknor Cliffs, Dorset 20, 189, 249-52 cliff-face bearing speleothems 250-1 debris slope 251, 251 joint widening 249-52 toppling failure 250-1 Blue Lias 210, 225, 226 bog flows; bog bursts 9 Brick Kiln Dale Gravels 301, 309, 310 Broadford Beds 205, 206, 207 Buckland's Windypit, North Yorkshire 20, 189, 246, 252-5 complex pattern of hillside trenches 252 labyrinth 252, 253, 254 occupation by Bronze Age man 252 Cader Idris 33 cambering 9, 22, 28, 38, 189, 195 Cleeve Hill 192 Great Oolite 193, 201 Canyards Hills, Sheffield 20, 162 - 5**Broomhead Reservoir 165** Ewden Valley 162, 162 Huddersfield White Rock 162 irregular ridges 162, 163, 164 caprock-and-aquiclude pairs 223 **Carboniferous** Limestone Series sites 145-6, 145 Carboniferous strata landslides 145 Carn Dubh, Perthshire 20, 36, 107 - 11debris flows 107, 110-11 **Bingham flows 110** debris lobes 108-10, 108,

109, 111

failure scar 108 lowered summit 67 setting 107-8 sub-cataclasmic failure 42, 109 translational failure 107 Carn na Con Dhu, Mullardoch 54-5 Castle Hill landslide 6 cataclasmic and sub-cataclasmic failure 41-2 cataclasmic failure 39, 41, 53, 115, 116 sub-cataclasmic failure 41-2, 43, 66, 69, 96, 97, 109 Chale Bay, Isle of Wight 19 Chalk strata, landslide complexes 6 Ciste Dhubh, Affric 54-5 climatic factors, European **Commission** initiatives **EPOCH** project 5-6 **TESLEC** project 5, 6 Cluanie-hybrid type slide 36, 41,67 type example, Druim Shionnach 70-4 coastal landsliding, present-day process 3, 140. see also relevant site reports The Cobbler, Argyle and Bute 20, 36, 38, 43, 44, 48, 52, 53, 54-5, 91-9 An t-Sron rock slope failure 93, 96, 99 antiscarps 44 arrested slides 41 Beinn Narnain 93, 98, 98 erratic boulders 93, 97 main rock slope failure 92-6 North Peak 92, 96, 97-8 Panel 1 92-3, 97 Panel 2 93-4 Panel 3 94-5, 97 Panel 4 95, 97 source arête 92 South Peak, horn 92, 97 west summit ridge 98 Coire Gabhail, Highland 20, 35, 131, 132-6 age of failure 136 alluvial accumulation 136 cataclasmic rock slope failure 41

debris accumulations 132, 133, 134, 135, 134-5 debuttressing 135, 136 delayed paraglacial responses 55 failure scars 132-3, 133 mode of failure 134-6 setting 132, 133 talus cones 132 compound landslides 9, 29 corrie development 43-4, 105, 107 cosmogenic dating 35, 114, 136 Trotternish Escarpment 196, 201 Creag Langall Sill 200, 200 Creag Leucach Quartzite Formation 108 creep 9, 38, 72, 73, 86, 97, 103, 211, 249 Attadale, Loch Carron 55 intermittent 167 internal deformation 72, 73 mass creep 9, 37, 87 progressive 3, 9 Creigiau Eglwyseg, see Eglwyseg Scarp Cromer Till sequence 309 geotechnical properties 313, 313 Cwm-du, Ceredigion 20, 33, 35, 119-28 deposits 122-3, 123 solifluction deposits 122 product of a denudation system 119 surface topography 121-2, 121 Dalradian Supergroup 37 debris flows 9, 110-11, 131-2, 138 disrupt fall-sorting of rockfall talus 132

20, 36, 52, 54-5, 61, 70-4 Cluanie-Glen Shiel breach valley 68, 70 Coire an t-Slugain 73 block-flexural toppling 72 - 3headscarp and antiscarp 70-1, 71, 72 rock slope failure in corrie enlargement 70, 73-4 type example of 'Cluaniehybrid' type rock slope failure 70, 70, 71, 72, 73 wider landscape evolution 68, 73-4 earthflows and mudslides 27 Edale Shales 155-6, 155, 169, 175, 184-5, 184 Eglwyseg Scarp, Clwyd 20, 145, 147-53 bedrock slope 152 clitter 147, 150, 152 Craig Arthur 148-9, 152 Devensian till 148, 149, 153 free faces 149-50, 152 gullies 147, 147 initiation of escarpment 148 Lower Grey and Brown Limestone 147, 149 Middle White Limestone 147, 149 Pinfold Buttress 148, 152 River Eglwyseg 148, 149 scarp retreat 148 scree slopes 147, 149-52 slope profiles 150, 151, 152 Entrance Cutting at Bath University, Avon 19, 20, 193-6 Bathampton Hill 195 dip-and-fault structure 193, 194, 195, 195, 196 Great Oolite, gull-bound blocks 195-6

Druim Shionnach, Highland

EPOCH project 5-6, 6

failure surfaces, non-circular 28–9

listric 9, 28, 170, 171, 179 Fairfield rock slope failure, Lake District 43, 44

Llyn-y-Fan Fâch 137, 138,

139-40, 141, 142

debris slides debris levées 132

debris runout 107, 201

debuttressing 136, 201

see also debris runout;

debris slides 131, 140, 210-11

deglacial unloading 115, 116

falls 9, 11, 12 Chalk falls 264, 275, 276, 277 fall sorting 152 primary and secondary see also rockfalls faults, ancient, re-activation of 115 feeder bluffs, Norfolk coast 308, 314, 316, 317, 319 fissures 103, 158, 205 Buckland's Windypit 252-5 Hob's House 154, 154 Lud's Church 165, 166, 167 tension fissures 64, 65, 67, 84, 158 see also joints flows 9, 11, 12 fluid alteration, Glen Shiel Fault 66 foliation (schistosity) 37, 37, 66, 73, 96 Folkestone Beds 261, 266, 273, 274, 275 Folkestone Warren, Kent 6, 19, 20, 26, 259, 259, 260-79, 307 1915 landslip 260, 261, 264, 264, 265, 275-8 1937 landslip 264, 264, 265 1940 landslip 264, 264, 265 age 278-9 classifications of slide types 270 - 1coastal factors 267-8, 267, 268 contemporary movements 278 geotechnical investigations 268-70, 269, 271 'High Cliff' 260, 262 hydrology 264-7 seasonal fluctuations in piezometric levels 266, 267 landsliding history 263-4 retrogression mechanism 272-5, 272, 273, 274, 275 The Roughs 263, 266, 277, 279 stratigraphy 261-3, 273, 274,275 'Undercliff' 261 Foxmould 221, 222, 225, 226 freeze-thaw movements 3, 9

Gault Clay 225, 226, 259, 284 Folkestone Warren 261, 262-3, 264, 268-9, 272, 273, 274, 275 Gimingham Sands 309, 309, 310 glacial breaching 44, 48, 53, 55, 74, 80 Ample-Lubnaig breach 90 Bealach nam Meirleach (Ben Hee) 100, 103, 107 Forth-Tay divide 82, 90 Glen Croe 99 Glen Shiel 52, 68, 69 Rest-and-be-thankful Pass 99 rock slope failure 38, 40, 47, 48, 49, 50, 51, 99 Scottish Highlands 48, 49 glacio-isostatic adjustment 81, 90-1, 115, 136 Gleann na Guiserein, Knoydart 111 Gleann Taitneach Fault 110, 111 Glen Affric 33 An Sornach rock slope failure 54-5, 91 Glen Ample, Stirling 20, 36, 44, 81, 82-91 antiscarps 44, 91 neotectonic activity 82 rock slope failure cluster 83, 90 - 1see also Beinn Each; Ben Our Glen Finglas 81 Glen Pean, Knoydart 36, 54-5 Glen Roy-Loch Lochy rock slope failure cluster 33, 47, 48, 52 Glen Shiel breach 52, 68, 69 Glen Shiel Fault 62, 64, 66, 74 **Glencoe Volcanic Formation** 132 **Glenfinnan Group 73** Glenuaig, Strathcarron 54-5 graben morphology 28, 28, 221 Graig Goch (Tal-y-llyn) 33, 53 Great Oolite 193, 195, 201 Grev Corries 33 Grisedale House 33 gullying 210, 225 avalanche gullying 131

139-40, 139, 141, 142 gulls 193, 194-5 Hadleigh Castle, Essex 291 abandoned cliff 19 Hallaig, Isle of Raasay 20, 189, 204-7, 208 backward rotation of blocks 201 Beinn na'Leac 207, 207, 209 crags of Creag nan Cadhaig 205 Pabbay Shale 205, 206 recent tectonic activity 207 - 9stratigraphical sequence 205, 206, 206 widened joints 205-6 Hambleton Hills, mass-movement caves 255 Hambleton Oolite 245, 255 Hastings Beds 259 headscarps 61, 70, 71, 95 heave radial heave 211 toe heave 205, 293 Hell's Glen, Cowal 54-5 High Halstow, Kent 19, 20, 289, 291-2, 291 London Clay cliffs 291-2 stepped rotational slips 292 Hob's House, Derbyshire 20, 145, 153-4 blocks 153, 153, 154, 154 enterable fissure in cliff-face 154.154 Hob's House Coral Band 155 large-scale rotational slip 153, 155 Honister Pass 33 Huddersfield White Rock 162, 165 Hythe Beds 263, 279, 281 Inferior Oolite 190 Intermediate Beds 309, 309, 310, 313-14 isostatic re-adjustment 7, 48, 207 see also glacio-isostatic adjustment

debris flows 132

Llyn-y-Fan Fâch 137-8,

joints 37, 37, 66, 96, 110, 149, 162, 205, 206, 225, 244 tectonically initiated 248 widened 244, 250, 250, 272 Blacknor Cliffs 249–52 Hallaig 205–6 Peak Scar 247, 247 see also fissures

Keuper Marls 210 Kintail 33, 69 Kirkstone Pass 33 Knoydart 33

Lake District 35, 44, 52 landslides 6, 9, 10-11, 10, 12, 13, 15, 16, 35, 115-16, 145, 263, 279 Axmouth-Lyme Regis 211, 220-1, 220 compound 9, 25, 29, 43 comprehensive survey (1984-87) by GSL 3-4, 4 dry or granular slides 131 Folkestone Warren 263, 279 Stutfall Castle 283, 284 on talus slopes 131-2 **Trotternish Escarpment** 198-9, 203, 204 see also mudslides; rockslides; rotational slips; translational slides Leda Myalis Sands 309 legal protection of GCR sites 24-5 Lias Clay 195-6, 223 liquefaction 211, 221 listric failure 9, 28, 170, 171, 179 Llyn-y-Fan Fâch, Carmarthenshire 20, 132, 137-42 debris flows 137-142, 140 deep gullies 137, 137, 138-9, 139, 141-142 headwall 137, 147 Loch Tay Fault 82, 83 Glen Ample 90 Loch Vaich, Ross-shire 54-5 Lochaber 33 loess flows 9 London Clay mass movements 289-304, 290 High Halstow 291-2 Warden Point 292-303

Lower Lias Belemnite Marl 225, 226 Black Ven Marls 225, 226 Lud's Church, North Staffordshire 20, 165–7 vertical fissure in Roaches Grit 165, 166, 167

Mam na Cloiche, Airde, Knoydart 54-5 Mam Nick slide 179, 181, 182 Mam Tor Beds 169, 171, 176, 184 Mam Tor, Derbyshire 19, 20, 26, 27, 167-83 division of landslide debris 169-72, 170 failure character and geometry 167, 170, 171, 177, 179-80 geotechnical analyses 176-8 Iron Age hillfort 169, 178-9, 181, 182, 183 landsliding records 172-4, 178-9 landslipping and shaping of Mam Tor ridge 181-3 Back Tor 182 Cold Side 182 Mam Nick 181, 182 lower 'earthflow' sector (C) 172 Mam Tor Beds 169, 170 middle transitional sector (B) 171-2, 172 rainfall and groundwater 174-6, 175 stages in development 180-1, 180 typical Pennine slump flow 183 upper 'slump' sector 169-71, 170, 171 Mamores-Grey Corries cluster 33.74 Meall Buidhe, Knoydart 54-5 Meallan Sidhein, Loch Striven 54-5 Melbourn Rock 263, 273, 274, 275 metamorphic rocks 36-7 Middle Chalk 261, 263, 269, 273, 274, 275 Millstone Grit 145, 146-7, 155

Moine Supergroup 37, 57, 73, 103 - 4Monsal Dale Limestones, Hob's House 154-5 Morar Group 66 mudflows 26, 223 climatic and volcanic 9 and mudslides 26-7 mudslides 9, 26-7, 211, 223 Mullach Coire a'Chiur, Cowal 54-5 Mullach Fraoch-choire, Glen Affric 54-5 sub-cataclasmic debris lobe 42.42 The Multilingual Landslide Glossary 8, 9, 10-16, 11, 12, 14-16, 27 Mundesley Sand 309, 311 Na Gruagaichean, Mamores, Lochaber 44, 45, 89 neotectonic activity 207-8, 209 Glen Ample 82 rock slope failure 48 Sgurr na Ciste Duibhe 68-9 nivation processes 127 Norfolk 318 see also Trimingham Cliffs North Wales, Tal-y-llyn trough 33, 35, 52 North-east England, reported landslide distribution poor 3 nunataks 198 Arrochar peaks 46, 97 Benvane 81 **Ossian Fault 136** Oxford Clay 252, 255 Pabbay Shale 205, 206, 206 paraglacial rock slope failure 34, 55, 97, 115, 116 Peak District National Park, 146-7 Peak Scar, North Yorkshire 20, 189, 244-9 mechanisms for features 248-9 Murton Cave 247, 247, 248, 249 north-facing cliff 244, 246-7

Moelwyn Mawr 33

tilted rock-masses 245, 248, 248 toppling failure 245, 245 windypits 245-6, 246 Portland Sands 250 Portland Stone 250, 251, 251 Portree Shale 206 Postlip Warren, Gloucestershire 20, 190-3, 190, 191, 192 Cleeve Hill, deeply dissected by dry-valley systems 190 Purbeck Marls 250 pyrite (FeS<sub>2</sub>) 175 Quaternary Period 53-5 Queen's Cairn Fault 136 Quiraing see Trotternish Escarpment **Raasay Ironstone Formation** 205, 206 regressive slips 210 ridge-and-trough features 164, 164, 165, 189 Roaches Grit 165, 166, 167 Robinson-Hindscarth, Buttermere 35 rock avalanches 9, 136, 202 Baosbheinn landslide 35. 115-16 Beinn Alligin 111-16, 112, 113, 114 rock slope failure 48-9, 50, 52-3, 52, 110, 111 Affric-Kintail-Glen Shiel 47, 48, 52 Arrochar Alps-Cowal-Luss Hills 47, 48, 50, 99 clusters 48-9, 52-3 corrie initiation and development 100, 105, 107 diversity of 38-43 arrested translational slide 40-1 cataclasmic and subcataclasmic failure 41-2 slope deformation 38, 40 glacial-paraglacial rock slope failure cycle 105 Glen Ample 83, 90-1 Glen Roy-Loch Lochy 47, 48 Glencoe-Mamore-Grey Corries (Loch Aber) 47, 48 Knoydart 47, 48

land-shaping effects 43-5 antiscarps 44-5 arêtes and horns 43 corrie development 43-4 valley widening and ridge reduction 44 Loch Ericht-Gaik 47, 48, 49 and lithologies 36, 37, 38-43, 38, 39 Southern Highlands and Kintail 40 rockslides 38 significance of in older mountain areas 56 spatial distribution and root causes 45-53 Trossachs-Lochearnhead 47, 48, 50 rockfalls 131, 210 frost-wedging in rock fissures 131 talus piles 131 slumps 223 undercutting of the cliff-face 131 rockslides 38, 39 rotational slips 9, 20, 28, 196, 223, 268, 289, 296 Axmouth-Lyme Regis 19, 210 Black Ven 225, 238 High Halstow 291-2 London Clay 291-2 Trimingham Cliffs 311, 312-13, 312 Rowlee Bridge, Derbyshire 20, 155-6, 155, 184-6 Edale Shales and Mam Tor Beds 184 folds 184-5, 184 fluvial erosion processes 185, 186 Ladybower Dam construction 185, 185 valley-bulging 184-5, 186 ruptures 74, 91, 111, 160, 162 Rushup Edge-Mam Tor-Lose Hill ridge landslipping and shaping 181-3 major landslide encroachment 168, 169

sackung-type deformation 38, 60, 62 sagging of mountain slopes 9, 38, 39 sand-runs 211, 227, 238 sandflows 223 Sanguhar 33 Scalpa Sandstone Formation 205, 206 schistosity see foliation (schistosity) schists 37 Moine schists 73 Scottish Highlands great diversity of rock slope failures 35 large rock slope failures 39, 47, 54-5 main rock slope failure clusters 48-9, 50, 52-3, 52 shift in main watersheds result of glacial breaching 48, 49 slope failures in aerial photographs 35 Second Till 309, 309, 311 seismic trigger 48, 67, 69, 97, 110, 111, 115, 136, 208 Sgurr a' Bhealaich Dheirg, Glenshiel 54-5, 74 Sgurr, Bhreac, Fannich 54-5 Sgurr na Ciste Duibhe, Highland 20, 36, 40, 45, 48, 52, 54-5, 62-9 classic rock slope failure features 62, 63, 64, 64, 65, 66 complex failures 43 fretted arête 43, 62, 64 glacial breaching 52, 68, 69 highest and steepest failed slope in Britain 53, 62 lowered summit area 62, 64, 67 neotectonic activity 68-9 Sgurr na Conbhaire, Monar 54-5 Sgurr na Feartaig, Strathcarron 54-5 Sgurr na Lapaich, Affric 54-5 Shacklow Wood Lava, 'toadstones' 155 Shale Grit 155, 159, 161 Shales-with-Beef 210, 219

Black Ven 225, 226, 226 Shoreline Management Plans (SMPs) 318 Norfolk coast 317 site selection 17-25 aims 19 described sites 21, 22 legal protection of sites 24-5 methods of selection 17-20 representativeness 22-4 site classification 20, 21, 22 suggested candidate sites 18 supplementary sites in Scotland 20, 35-36 slope deformation 38-40 compressional 38, 39, 70 extensional 38, 39 largest/highest in the Highlands approach Alpine dimensions 53, 54-5 typical scale in the Alps 53 see also Beinn Fhada; rock slope deformation slumps/slumping 155, 159, 223 Mam Tor 169-71 marine 209 Quaternary deposits, North Norfolk coast 19 slump bowls 86 soil creep 3, 9, 19 solifluction 3, 7, 9, 122, 127, 128 periglacial 282 terraces 124, 125 South Wales Coalfield, landslides in Rhondda valleys 5 Southern Highlands, rock slope failures character, number and extent 40 pattern of 50, 81 Southern Uplands 35 speleothems 250-1, 252 storm-response movements 176, 178 The Storr see Trotternish Escarpment Strath Nethy 36, 36 Streap, Glenfinnan 54-5 stress release 60, 111, 115, 116, 169 by crumpling 185 joints 110, 133, 135, 248

Trotternish Escarpment 201, 202, 203, 204 Stress-relief 299, 301-2, 303, 304 sturzstroms 9, 41, 112 Stutfall Castle, Kent 20, 259, 259, 279-85 abandoned marine cliff 279, 280, 280, 281 accumulation zone 280-1, 282, 282 archaeological excavations 285 landslides first phase 284, 285 post-date fort construction 283 second phase 284, 285 Roman fort 279, 282, 283, 284, 285 Tal-y-llyn (Graig Goch) 33, 35, 52

talus accumulations 131, 202-3, 202, 204 cones 131, 132, 133, 134 creep 3, 9, 152 slopes 131-2 tension features 61, 73, 101 cracks 101, 159, 227, 238, 239, 294, 296 trenches 73, 77, 86 tensional spreading Glen Ample 86, 86-7 The Cobbler 94, 95, 96-7 **TESLEC** project 5, 6 Third Till (formerly Contorted Sand) 309-10, 309 toppling 8, 9, 11, 12, 13, 61, 103, 189, 204, 210, 217, 217, 223 Glen Ample 87, 89, 90 Blacknor Cliffs 249-52 block-flexural 60, 72-3, 72 flexural 296, 304 Peak Scar 245, 245, 249 Torridonian sandstone Beinn Alligin 112, 115 joint-block scale failure 37 translational slides 9, 22, 44, 86, 110, 221 Beinn Fhada 60-1 Benvane 74-82 cataclasmic 39

Cluanie area 41 The Cobbler 37, 92-9 extensional spreading features 70 see also armchair translational slides; arrested translational slides Trimingham Cliffs, Norfolk 20, 307, 308-19 cliff aspect 316, 316 cliff hydrology 311-13, 312 cliff protection 307, 308, 308, 314-16, 315, 317 feeder bluffs 308, 316, 317, 319 mass movements 313-14, 313, 318 recession rates 314, 314 Sidestrand and Trimingham Cliffs SSSI 316 stratigraphy and lithology 308-11, 309, 310 Trotternish Escarpment, Isle of Skye 19, 20, 189, 196-204 geology and topography 196-8, 203 Quiraing landslide 20, 196, 199-200, 202, 204, 307 structure and mode of landsliding 200-1, 200, 204 talus accumulations 202-3, 202, 204 The Storr landslide 196, 199, 204 timing and activity of landsliding 201-2, 204 Tullich Hill (Luss Hills) 54-5 pattern of short-travel upward movement 86 wedge-source complex 41, 42 Upper Greensand 259 Bindon slip 212, 212, 213, 214 Black Ven 221, 225, 226, 231

valley-bulging 9, 22, 28, 38, 159, 161, 189 Beinn Fhada 57–8, 58, 59, 59 Rowlee Bridge 184–5, 186 valley widening and ridge reduction 40, 44

Warden Point, Kent 19, 20, 289, 292–303 first-time slides 303–4 Hutchinson's interpretation 296–9, 297–8, 305 London Clay 293, 294 porewater pressure, implications of 299–301, 300 section K37 295, 296 section K38 295, 296, 302, *302*, 304 section K39 294, 295 section K40 293–4, 295 slope stability 301–4 Wasdale *33* Weald Clay 259, 279–80,

281–2, *282* Westbury Formation 212, 215, 216 World Heritage Sites 24 Dorset to East Devon World Heritage Site 24

Yorkshire, 1755 landslip 6

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